HOPE FOR TOMORROW

A STUDENT-ATHLETE CONCUSSION MANAGEMENT PROGRAM DEVELOPMENT GUIDE

FOR

SCHOOL BOARDS, POST-SECONDARY INSTITUTIONS & MINOR SPORT ORGANIZATIONS

Written by:

ROBERT KIRWAN, OCT, M.A. (Ed)

Featuring…

Preparation, Identification & Rehabilitation Protocols

Return to Play - Return to Learn - Return to Baseline

Training Programs for Administrators, Coaches, & Student-Athletes

Guidelines for Parents & Classroom Teachers

HOPE FOR TOMORROW
Student-Athlete Concussion Management Program Development Guide

Date of Publication: March 12, 2013

Written by: Robert Kirwan, OCT, M.A. (Education)

Consulting Neuropsychologist: Dr. Michael Czarnota, Ph. D.

Web Site: www.concussionmanagementpartners.com

Published by
CMP Concussion Management Partners Inc.
4456 Noel Street, Val Therese ON P3P 1S8
Phone: (705) 969-7215

CMP Concussion Management Partners Inc. is a firm comprised of experienced professional associates providing Student-Athlete Concussion Management Program services to School Boards, Post-Secondary Institutions and Minor Sport Organizations.

SPECIAL NOTICE

This Program Development Guide is a compilation of information and material which has been found through extensive research and study of sport-related concussions from a wide variety of sources. Every effort has been made to identify the sources of information and to give appropriate credit. There has been no deliberate attempt to plagiarize while putting this Guide together. It is intended to be used as a resource document for people who wish to develop their own concussion management program and is not being held out in any way as an original creation by the authors. This Program Development Guide is intended for use by school boards and minor sport organizations in the development of their own individual concussion management protocols and procedures and is being offered free of charge upon request.

Welcome To
Students Parents Coaches

C. M. P.
Concussion Management Partners Inc.

Overcoming The Curse of Knowledge In Dealing With Concussion Management

An Introduction to
CMP Concussion Management Partners
by
Robert Kirwan, President & CEO

During my 28 year career as a classroom teacher I was always puzzled with how difficult it was for me to teach my students mathematics. It wasn't as if I didn't know anything about math. After all, I graduated with a degree in Mathematics and Economics from Laurentian University and I have always loved working on math problems and theories. As a result, I thought it would be relatively easy to be a good math teacher. It wasn't. As a matter of fact, I often became extremely frustrated when my pupils failed to grasp the "simplest of concepts" no matter how hard I tried to explain.

On the other hand, I wasn't much of a reader or writer while I was growing up myself. Nevertheless, I always found it easy to communicate with others. For most of my adult life I have been writing editorials and publishing magazines and web sites. Reading and writing are as natural for me today as walking. I am not an expert in the mechanics of writing, but I am able to communicate my feelings and people seem to enjoy my style.

What amazed me the most as a classroom teacher is that I never had any difficulty or anxiety when it came to teaching my students how to write. Former students comment on how patient and encouraging I was and how I provided them all with a love of writing that has remained with them years after they left my class. I often became frustrated when teaching math, but I do not recall experiencing that feeling while teaching writing.

The reason for this strange phenomenon became crystal clear to me when I read about the "Curse of Knowledge". I wanted to share my discovery before you continue reading this Program Development Guide. It will help you understand why this document is written the way it is, with a great deal of effort taken to bring what is a very complex subject down to a level which can be understood by everyone, from student-athletes to parents and coaches. I am sure that if you are a teacher, a coach, a parent/guardian, a school board administrator, a school principal, a minor sport administrator, or anyone who has a responsibility for teaching others, you will appreciate this little story.

In order to help you understand what the "Curse of Knowledge" is all about, let me explain how in 1990, a lady by the name of Elizabeth Newton earned a Ph. D. in psychology at Stanford University by studying a simple game in which she assigned people to one of two roles: "tappers" or "listeners".

Tappers received a list of twenty-five well-known songs, such as "Happy Birthday to You" and the "Star Spangled Banner". Each tapper was asked to pick a song and tap out the rhythm to a listener by knocking on a table. The listener's job was to guess the song, based on the rhythm being tapped.

The listener's job in this game is quite difficult. Over the course of Newton's experiment, 120 songs were tapped out. Listeners guessed only 2.5 percent of the songs. That's right! They could only identify 3 of the songs out of a total of 120.

But what Newton discovered next is truly remarkable and made me think of my own involvement in teaching, coaching or parenting young people. Before the listeners guessed the name of the song, Newton asked the tappers to predict the odds that the listeners would guess correctly. The tappers predicted that the odds would be 50 percent.

Tappers actually got their message across one time in 40, but they thought they were getting their message across one time in two. Newton explained that when a tapper taps, she is "hearing the song in her head". Try it yourself. Think about a familiar song and tap it out with your finger. You will find that it is impossible to avoid hearing the tune in your head. Meanwhile, as Newton discovered during her experiment, the listeners are not hearing the same thing at all. All they can hear is a bunch of disconnected taps very much like a strange Morse Code.

In the experiment Newton noticed that the tappers were flabbergasted at how hard the listeners seemed to be working to pick up the tune. The tappers were thinking, "Isn't the song obvious?" The tappers looked disgusted when a listener guessed "Happy Birthday" for "The Star Spangled Banner".

Newton pointed out that it is hard to be a tapper. The biggest problem is that tappers have been given knowledge (the song title) that makes it impossible for them to imagine what it's like to lack that knowledge. When they are tapping, they can't imagine what it is like for the listeners to hear isolated taps rather than a song. This is the "Curse of Knowledge"

This "Curse of Knowledge" has been with me during my entire career when it came to teaching mathematics to students. According to Newton, "Once we know something, we find it hard to imagine what it was like not to know it. Our knowledge has "cursed" us. And it becomes difficult for us to share our knowledge with others, because we can't readily re-create our listener's state of mind."

So when it came to teaching mathematics, I had so much more knowledge than my students that it was extremely difficult for me to remember what it was like for me when I was first learning the concepts myself. But when it came to teaching writing, my "lack of knowledge" allowed me to better appreciate where my students were coming from. It enabled me to teach

them in a way that they could better understand and I showed more appreciation for their struggles. I had an easier time identifying where they were coming from.

The same thing applies to coaching and helps to explain why so many of the star players in hockey or any other sport for that matter, make such poor coaches. The best coaches are usually people who were skilled players, but were not considered superstars. For example, Tiger Woods might not be a very good golf coach because it would be hard for him to imagine what it would be like not to be a good golfer.

And so, as I put together this Program Development Guide, I tried to remain conscious of the fact that it is important for my readers to "hear the song in my head" and to understand the message we have when it comes to dealing with concussions that are experienced by young student-athletes. It has been important for me to translate the complex information about the brain into something that will be understood by parents, coaches, teachers, student-athletes and all partners involved. I found that my "lack of training" in the medical field actually helped me in this regard. In the end, it turned out just like teaching writing. My passion and my appreciation for how difficult the subject matter is to understand has helped me create a Program Development Guide that I think you will find is very easy to read and which will help you better appreciate your own particular roles and responsibilities when it comes to the preparation, identification and rehabilitation protocols and procedures relevant to concussion management.

IT'S ALL ABOUT EMPOWERMENT

This Program Development Guide has been written with one main objective: to empower school boards, post-secondary institutions and minor sport organizations to develop a practical, effective, coordinated approach in dealing with sport-related injuries that result in brain trauma concussions among their student-athletes.

Our mission is to assist school boards, post-secondary institutions and minor sport organizations in Canada and the United States in the development of a concussion management program specifically designed to meet their local needs and objectives. We want to help school leaders and minor sport administrators develop a Concussion Management Program which includes the establishment of consistent standards in the areas of training of coaching staff members and student-athletes, the education of parents and teachers, and effective protocols for sport-related concussion preparation, identification and rehabilitation.

CREATING TRUE AWARENESS AMONG PARENTS/GUARDIANS

We also want to help parents/guardians become more aware of the implications of concussions and the impact this type of injury can have on the future of their children. To that end, we feel parents/guardians should be allowed to assume a significant level of responsibility when it comes to the well-being of their children, both as students and as athletes. We go to great lengths to outline the home accommodations and personal lifestyle choices that are key to the successful rehabilitation of children, teenagers and young adults who happen to suffer from a concussion.

RECOGNIZING THE ROLE OF CLASSROOM TEACHERS

We also feel that since concussions are brain injuries that produce mostly functional symptoms in the physical, cognitive, psychological, and emotional domains, it is very important for classroom teachers to be included in the identification and rehabilitation process when it comes to school-age student-athletes.

FRAMEWORK FOR LOCAL TRAINING PROGRAM

This Program Development Guide has been created as a working document that is intended to be used by individual school boards and minor sport organizations to formulate their own customized Student-Athlete Concussion Management Program which will be consistent with universally accepted principles and procedures that have been found to be among the best practices around the world.

While we are confident that the Program Development Program Guide contains most of the elements needed in order to construct an excellent framework model, we also acknowledge that leaders of education institutions and minor sport organizations may have their own unique issues and concerns that they would like to address. That is why this guide does not contain a ready-made, pre-packaged program. We cannot create a one-size fits all program that will be sufficient for the concussion management of all student-athletes. Every situation is different, and while we acknowledge that there are many principles and procedures that will be universally suitable for all organizations, it is important that each individual school board, post-secondary institution or minor sport organization address its own uniqueness and challenges.

The Program Development Guide contains many options from which to choose that can easily be adopted by steering committees thereby saving valuable time in putting together a solid program that will begin protecting student-athletes as soon as possible.

This Program Development Guide also includes the background information which would constitute the framework for a formal training & certification course. This is something that we feel should be a mandatory requirement for all School & Minor Sport Administrators, Coaches and Student-Athletes.

PROGRAM DEVELOPMENT CONSULTANT

Mr. Robert Kirwan, OCT, M.A.(Ed) ***Education & Training Consultant***

Robert Kirwan, OCT, M.A. (Ed) has a Masters Degree in Education Administration and is a current a member of the Ontario College of Teachers. He spent 28 years as a classroom teacher before opening up a private professional practice as an education, training and staff development consultant.

He was elected in 2010 to serve as a School Board Trustee in the Province of Ontario. In this role he became aware of the need to provide a much higher standard of care for student-athletes in the area of concussion management, particularly with respect to the identification and rehabilitation of concussed students. He also discovered the importance of formal "return-to-learn" protocols in the successful treatment of concussions. When he met Dr. Michael Czarnota in the summer of 2011, the two of them decided to establish a partnership to address these needs.

Kirwan specializes in working with school administrators and classroom teachers to help with the identification and rehabilitation of students with concussions. He is especially concerned about the number of concussions that children may be receiving from their free-play at recess as well as from their physical education classes and from intra-mural sports activities. He feels that many sport-related concussions may in fact be due to the accumulation of sub-concussive damage over time that children experience from their day-to-day living.

Robert Kirwan provides independent consultation services with respect to the academic implications of sport-related concussions among student-athletes, including accommodation guidelines for classroom teachers, home care guidelines for parents/guardians, and lifestyle adjustments student-athletes must consider in dealing with the effects of a concussion.

Mr. Kirwan has a great deal of experience as a player, coach and association leader in a wide variety of sports. He has also been directly involved with the True Sport Movement and believes that good sport can make a positive contribution to student-athletes and will add to the quality of life of the entire community. He feels that by participating in school sports student-athletes benefit from enjoying their favourite sport activities while maintaining focus on their academic studies. It is a balance that will serve them well in the future.

Kirwan, with consultation from Dr. Czarnota, is the author of the CMP Program Development Guide which is used as the primary resource during workshops and in-service training sessions with school boards and minor sport organizations. He also produced a couple of video presentations to supplement the Program Development Guide.

He is currently taking on the role of President & CEO of CMP Concussion Management Partners Inc., a company in which he is also a Principal Partner.

PROGRAM DEVELOPMENT CONSULTANT

Dr. Michael Czarnota, Ph. D. ***Consulting Neuropsychologist***

Dr. Michael Czarnota Ph. D., has assisted Robert Kirwan in the overall development of the ***HOPE FOR TOMORROW*** Student-Athlete Concussion Management Program Development Guide as a Consulting Neuropsychologist.

Dr. Czarnota, who operates a private practice in Detroit, Michigan, is a Credentialed ImPACT consultant. He was trained in the evaluation and treatment of brain injuries. He has had extensive experience with neurocognitive baseline and post-injury testing and is a Credentialed ImPACT Consultant.

Since 1998, Dr. Czarnota has been applying the latest concussion management guidelines and research to help athletes recover as fully and as quickly as possible. In the year 2000, he began applying NHL standards to Major Junior athletes. He is currently the primary Neuropsychology consultant for the O.H.L, the W.H.L., the Q.M.J.H.L., the N.O.J.H.L, Central Hockey League, E.C.H.L. and also works with Hockey Canada, the OWHA and the PHPA. Several high schools and universities, including Northern Michigan University, have also sought his input in identifying and managing sport concussions.

Dr. Czarnota has been asked to be part of numerous educational lectures and presentations to medical personnel, minor hockey organizations and parents due to the strong need and demand for proper information, education and care regarding young concussed athletes.

Dr. Czarnota's main role in the training and development workshops organized by CMP will be to provide information on how the brain is affected by traumatic brain injuries as well as provide details on the administration and assessment of the baseline and post-injury neuropsychological testing of student-athletes. He will also review the signs, symptoms and behaviours consistent with concussions and provide valuable information on how parents, coaches, teachers, school administration, minor sport organization executives and student-athletes themselves can better identify the occurrence of concussions as soon as they happen.

Dr. Czarnota is currently involved in several projects and grants aimed at improving concussion education, awareness and services to young athletes, including work with the Ontario Hockey Federation and the Hockey Concussion Neurotrauma Initiative.

Dr. Czarnota is one of the founders of CMP Concussion Management Partners Inc. and is a Principal Partner in the company.

TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION TO CONCUSSION MANAGEMENT

Sport-related concussions have become the "hot topic in sports" ever since Sidney Crosby; a professional hockey player in the National Hockey League became the public face of this type of injury. Thousands of web sites, articles, news reports and special conferences dealing with the subject have exploded onto the scene. It seems as if everyone has an opinion about how to improve the safety of sport in order to reduce the risk of concussions. Everything from improving equipment to rule changes to government legislation have been suggested.

Yet, despite the tremendous growth in resources designed to create awareness about concussions and to provide people with information about how they should be more concerned about this type of acquired brain injury, it has been a real challenge for school boards, post-secondary institutions and minor sports organizations to develop an effective concussion management program which will truly meet the needs of their student-athletes. The general focus has been on increasing the awareness of the concussion crisis and informing people about the signs, symptoms and behaviours of concussions, but there are very little has been done to actually assist school boards and minor sport administrators in the development of specific action plans which will serve their particular needs at the local level.

MANY CHALLENGES TO OVERCOME

This Program Development Guide has been prepared as a guide for educators and minor sport administrators who are interested in working with their coaches, parents, teachers, doctors, medical professionals, and volunteers to create a student-athlete concussion management program that will include procedures and protocols that will address the preparation, identification and rehabilitation challenges associated with sport-related concussions.

Each chapter of this Guide addresses a specific area of concern with respect to providing a better understanding of how traumatic brain injuries occur and what must be done to ensure the well-being of our youth. The thread which holds everything together in this Guide is a “Partnership Approach” to concussion management which involves a sharing of responsibilities among doctors, parents, coaches, teachers, administrators, and the student-athlete.

Before we go much further, it is important to consider some of the major challenges we will need to overcome in order to accomplish our goals and objectives.

AN UNDERSTANDING OF HOW THE BRAIN WORKS

First of all, it is important to understand what happens to the brain when a person suffers a concussion. Keep in mind that the brain, which has a jelly-like composition, is suspended in fluid inside the skull. It consists of over 100 billion neurons (brain cells). Each neuron has one axon through which it sends out chemicals to up to 10,000 other neurons. Each neuron also has up to 10,000 receptacles protruding from it called dendrites, through which it can be connected to

other neurons. If you could lay all of the axons in your brain end to end, they would extend over 160,000 km, or you could wrap them around the equator four times. All of your day to day functions, physically, cognitively, emotionally, and psychologically, are controlled by communication that occurs between the neurons as a result of the chemicals which travel through the axons and interact with other chemicals in other neurons through their synaptic connections at the dendrites.

We have devoted the entire Chapter Nine of this Guide to provide you with as much medical background information on the brain as possible without getting too technical. The more you know and understand about how the brain works, the more you will appreciate just how serious this kind of injury really is.

When your head changes direction suddenly, such as when your body or your head strikes an object from the front, the back or the side, the force of that change in acceleration or direction may be sufficient to cause the brain to strike the inside of the skull in such a manner so that it becomes temporarily deformed (squashed or twisted). The twisting motion itself may also result in this temporary deformation. When this happens, some of the axons get stretched or broken. This trauma causes the neurons to react with a power surge of electricity that sends out an overload of chemicals. The stretching of the axons along with this power surge create a situation where chemicals that are normally contained within the axons end up outside the axons, while chemicals that are normally outside, end up inside. Communication is temporarily disrupted and it can result in a number of symptoms such as dizziness, blurry vision, headaches, nausea, etc.

Once the initial trauma is over, the brain goes to work immediately to try to restore the chemical balance and repair any damaged axons and neurons. While it is doing this repair, there is a reduction of blood flow to the brain which produces a shortage of energy, so all remaining energy must be diverted to the damaged areas of the brain. The brain therefore becomes extremely vulnerable to further damage and if there is another trauma, it can produce catastrophic consequences.

In some cases, blood vessels inside the brain break and there is internal bleeding. Other times the swelling of the axons and neurons results in increased intracranial pressure because there is only so much space inside the skull. The skull may also be fractured which can cause other serious symptoms inside the brain. Only a medical doctor can identify these type of life-threatening symptoms, which is why we always state that a person with a suspected concussion must first of all seek medical attention.

The best treatment for a concussion is complete physical and cognitive rest in order to reduce the risk of over stimulating the brain while it is in this vulnerable state. The worse thing that can happen is for the brain to suffer a second trauma before it has recovered from the first.

TRUE EXTENT OF THE DAMAGE IS HARD TO DETERMINE

While we often think of concussions being experienced by athletes who participate in sport organizations, studies have pointed out that this is now becoming a huge problem for schools and is having a tremendous impact on student achievement and well-being. It is estimated that by the

end of high school, approximately 60% of student-athletes, participating in all sports, will have received some degree of concussive injury.

All concussions are serious and can have serious life-altering consequences if they are not properly managed and given enough time to heal. Unfortunately, most concussions are unidentified, unreported, or undetected because the people around injured student-athletes are unable to recognize the signs, symptoms and behaviours consistent with concussion. In fact, it has been found that up to 80% of professional athletes who suffer a concussion are unaware that that they have incurred this injury. They just keep on playing. The same can be said with student-athletes at the high school level and this has created a crisis in our schools.

The Province of Ontario is typical of what we expect is happening across Canada and the United States. There are approximately 1 million students enrolled in Grades 7 through 12 in Ontario and there are about 900 publicly funded secondary schools. This is the age group where concussions are most prevalent and where student-athletes are most vulnerable to injury.

During 2011, the Ontario School Boards Insurance Exchange (OSBIE), which provides insurance coverage to most school boards in the province, indicated that there were a total of 84,000 incident reports submitted by their member schools. An incident report must be written up by a teacher or administrator for every type of injury that occurs at school or during a school sanctioned event or activity (including sprains, cuts, bruises, etc.). Of the 84,000 incident reports which include all injuries, only 634 were labelled as concussions or possible concussions and only 60% of those, or approximately 400, were sport-related. The incident reports were from all schools in the province, including JK to Grade 6 students, but for our purposes we will assume that all 400 sport-related concussions came from the Grade 7 through 12 students.

To give you some perspective on how seriously underreported or documented concussions are in Ontario, an article which appeared in the December 2011 edition of Living Safely, a publication of the Canada Safety Council, indicated that it was discovered the actual number of incidents of concussion or suspected concussion in youth hockey is up to 40 times greater than the number that are recorded on official injury reports. They did a survey of elite athletes and found through the survey that most possible concussions are not being reported or diagnosed. If so, there would be at least 40 times more incident reports for sport-related concussions, or in this case at least 16,000 concussions or possible concussions from sports in 2011 in Ontario.

However, the problem may be much more serious than this. For example, St. Michael`s College, a private all-boys school in Toronto, which has one of the best concussion management programs found at any secondary school on the continent, and which detects most incidents of concussion which are experienced by their student-athletes, demonstrates just how underreported this type of injury may be in our schools today.

During one school year recently, St. Michael`s recorded 80 concussions out of the approximately 400 student-athletes who competed during the school year. The College has approximately 800 students, so even if we consider that most schools might experience a rate of concussions or possible concussions at half of that rate, it would mean that out of the 1 million students enrolled in Grades 7 through 12 in the province, we should expect no fewer than 50,000 concussions or

possible concussions during any single school year. This would be more consistent with the research which indicates that up to 60% of all student-athletes will suffer from at least one concussion before the end of high school. Instead, OSBIE indicated that only 400 such incident reports were submitted. What happened to the rest?

And while we focus mostly on sport-related injuries, educators and parents will attest to the fact that free play at recess and at home after school as well as physical education and intramural activities could end up producing just as many concussions. Therefore, there could very well be many more concussions among our school aged children that are going unreported or undetected.

We know that even a minor blow to the body or head of a child may result in a sudden movement of the brain which in turn may cause the components of the brain to stretch or tear and produce biochemical reactions that will make the brain move vulnerable and sensitive to further injury. The best way to reduce the risk of long-lasting symptoms is to follow a program of cognitive and physical rest. However, with so many concussions or suspected concussions going undetected, and with over 60% of high school students suffering from concussion injuries before they graduate, this is a huge concern for teachers and parents.

COLLECTIVE DENIAL

It is hard to argue with the data in the section above. The vast majority of concussions or possible concussions are not being documented, and as such they are likely not being properly treated. There seems to be a "collective denial" among parents, student-athletes and coaches which is affecting the proper documentation and identification of concussions. We cannot possibly be missing that many signs, symptoms and behaviours which are consistent with concussion. If St. Michael's College has developed a program that identifies such a large number of these injuries, then the rest of the schools and sport organizations should be able to do just as good a job. The question is, why they are not.

The answer seems to be related to the fact that most school boards and minor sport organizations are still too busy talking about concussion management and have not yet found a way to break the log-jam of inaction that is so prevalent in sport today. Since concussion symptoms are very similar to a number of other illnesses, it is too easy for parents and coaches to pass off concussion-like symptoms as something else that the student-athlete will get over. And as symptoms subside, they quickly find evidence to support their denial. Hence, we get very few concussions showing up on official reports.

LIFE-LONG CONSEQUENCES

The failure to recognize concussions when they first occur may result in young people suffering from multiple concussions which are never given time to heal during the most important period of their life with respect to their brain development. Dr. Michael Czarnota, the consulting neuropsychologist for CMP Concussion Management Partners Inc., provides an excellent explanation about the consequences of a student-athlete receiving multiple concussions.

Dr. Czarnota stated that it is easiest to think of concussions, which are injuries of the brain, as you would think of a scab on your skin. If you leave the scab alone and allow it to heal, then the wound or bite usually heals properly and the condition of the skin returns to normal. There is likely to be no visible sign that the wound even existed.

However, if you pick at the scab, you make it worse; possibly causing an infection to occur and this can even leave a permanent scar on your skin. We have all dealt with young children who constantly pick at their scab because it is itchy. The scab may get larger, start bleeding, and sometimes leaves a mark that remains for the rest of the person's life.

With a concussion, if you injure your brain, you must allow the body to heal the damaged area properly. If you reinjure it again before the first concussion has healed, it is the same as picking at a scab. You may make matters worse and it will take longer to heal. It may also increase the size of the damaged area, thus impacting on much more of the brain than was the original case.

It may also result in life-long damage that leaves you with permanent symptoms which may affect your quality of life for as long as you live. The brain may have to restructure or reconstruct new connections around the damaged areas and you may never return to normal levels of functioning. For example, you may find that loud noise and bright lights bother you more often that before. You may find that it is harder for you to match faces and names, to remember phone numbers, to do mental arithmetic, to remain alert while reading, etc. These are all symptoms which may be temporary and which may resolve if you allow your original concussion to heal properly, but if you go out and continually injury your brain with more physical and cognitive stimulation, the symptoms may never resolve. This is just like the scab that you pick at and pick at until it leaves a scar for life.

LACK OF COMMUNICATION

If we are going to get control of the epidemic of concussions among our young people today, then we are going to have to come up with a program which reduces the chance of concussions going undetected and then improve the communication network between the school, home and community sports organizations.

Therefore, another major concern for people who are responsible for the well-being of our youth is the poor communication links between the school and the community sports organizations. For example, a student-athlete may be injured while playing for his/her community hockey team. Yet, when he/she returns to school the next day, the student will still take part in physical education classes and will still be required to maintain his/her normal workload in class. Both of these activities could aggravate a concussion and delay or impede recovery. Unfortunately, if a person experiences a second concussion before the original injury has healed, the results can be devastating. But if the teachers are not aware of the first injury, how can they make accommodations that will assist in the rehabilitation of the student? And as we will see, if you already have a concussion, it takes very little contact for a second concussion to be experienced. Therefore, an accidental collision in a basketball game in the gym may have catastrophic consequences and result in a major concussion even though the bump was relatively minor.

The same can be said for the community coach who is unaware that his player has suffered a concussion while at school. An injury that is diagnosed as a concussion while participating in competition may actually have been the second concussion which will occur much more easily if the original damages have not yet healed.

As a result of the inability of student-athletes, coaches, parents and teachers to properly recognize the signs, symptoms and behaviours consistent with concussion, not only are many student-athletes continuing to risk life-altering consequences, but even when concussions are identified, the lack of communication between school and community teams may still place our youth in danger of re-injuring their brains.

PROFESSIONAL STANDARD OF CARE IS NOW AVAILABLE FOR STUDENTS

Despite the fact that I spent 28 years as a classroom teacher and raised three sons who were all heavily involved in every sport you can think of, it wasn't until I was elected in 2010 as a School Board Trustee that I became aware of the need to provide a much higher standard of care for student-athletes in the area of concussion management, particularly with respect to the identification and rehabilitation of concussed students. It was in the summer of 2011 when I met my colleague, Dr. Michael Czarnota that I discovered just how much our youth have been placed in jeopardy when it comes to traumatic brain injury.

Dr. Czarnota Ph. D., is a licensed Neuropsychologist who was trained in the evaluation and treatment of brain injuries. He began applying NHL standards to Major Junior athletes in 2000 and has expanded his work to include athletes at the minor sport levels. When Dr. Czarnota explained his work to me, I immediately saw the need to provide similar levels of care to high school athletes. Eventually, the two of us decided to join forces to put together guidelines for student-athletes and devote our time to assisting school boards in the development of concussion management programs.

Now, it is possible for a school board to develop a very detailed, step-by-step concussion management program that even contains baseline and post-injury neuropsycholocical assessments under the supervision of a licensed neuropsychologist.

IDENTIFICATION OF CONCUSSIONS IS AT HEART OF ANY PROGRAM

No matter how well developed a concussion management program may be, the critical element is still the identification of possible injuries. As mentioned above, despite the fact that we are getting better at identifying concussions, still 40 times or more incidents go unreported or undetected. That means that many of our students are walking around with the consequences of not taking proper care and treatment of concussions when they occur, leaving them at risk of life-altering effects that may impact their chances of success in school and in life.

Despite the fact that high school athletes are better educated about the symptoms of concussion and understand the long-term implications of this type of injury, most student-athletes will readily admit that they would not report symptoms unless they were in significant pain and were unable to continue playing. Many will suffer through minor pain and symptoms in order to

remain in the game and on the team. They know that to admit concussion symptoms might mean they will be sidelined for at couple of weeks at the minimum, so they would rather take the chance that it is not that serious or not concussion-related. This is part of that "collective denial" syndrome that exists in sport today.

Some also admit that they do not want to disappoint their coach who perhaps has been encouraging them to be touch and play through pain. Another problem lies with the nature of the injury in that the symptoms may often be passed off as being caused by a virus or a touch of the flu. They don't want to report these symptoms if there is a chance it may not be a concussion.

Therefore, as you read this Program Development Guide you will see that we encourage the partner approach to concussion management. Under this partner approach it is going to be much more difficult to ignore or miss signs, symptoms and/or behaviours consistent with concussion. Parents and classroom teachers will take on a greater role when it comes to identifying possible concussions and will be authorized to initiate the concussion management protocols. It won't simply be up to the coach and the student-athlete. While it may end up resulting in a greater number of missed games and practices, we feel the future of our youth is too important to place at risk.

LEGAL IMPLICATIONS

There are many moral and ethical reasons why the people who are in charge of school boards, post-secondary institutions and minor sport organizations should do everything possible to take positive steps to reduce the risk of life-altering consequences resulting from sport-related concussions that are experienced by their student-athletes. However, putting all of the obvious arguments aside, one very practical reality is that anyone who is responsible for the safety and well-being of student-athletes should be very much aware of the legal implications of their efforts. We certainly hope that this is not the only or the main reason why people feel the need to develop a concussion management program, but if it is what motivates people into action then we are fine with that.

Many Provinces in Canada have introduced legislation requiring school boards to develop and implement concussion management programs and policies. Many State legislatures have done the same in the United States. However, it is one thing to create a concussion management policy on paper and yet another to verify that the program is indeed sufficient and has been implemented properly.

There are many places in this Program Development Guide where reference is made to protocols and procedures which are designed to provide clear and irrefutable verification that proper steps were taken by administrators to ensure that coaches, student-athletes, parents/guardians, classroom teachers, and medical personnel did what was expected of them to provide the highest quality of care, maintain consistent standards and reduce the risk of serious consequences from sport-related concussions. It is going to be increasingly important to verify your efforts.

CHAPTER TWO

A GUIDE TO PROGRAM DEVELOPMENT

School boards, post-secondary institutions and minor sport organizations are encouraged to approach concussion management in a manner which not only addresses their uniqueness, but which also includes universally accepted principles as the foundation of their program.

The ultimate goal is to identify the elements which are unique to your own situation and then develop a customized concussion management program that includes protocols and procedures which utilize universally accepted principles that will leave everyone confident that the finished program will provide the maximum level of care possible for student-athletes.

This chapter will provide some of the elements of a framework which could serve as a guide for a school board, post-secondary institution or minor sport organization. By following the steps outlined below, one should be able to develop an effective student-athlete concussion management program for any school board or minor sport organization in Canada or the USA.

A NEED FOR CONSISTENCY & COORDINATION

Fundamental to the development of a strong and effective student-athlete concussion management program for school boards, post-secondary institutions and minor sport associations is a recognition and acceptance of the need to adopt a consistent and coordinated approach for all schools or all teams in the school board or organization. You will not accomplish anything if this is something that is provided on a voluntary basis or is something where schools or teams are permitted to "opt out". Every single school in the school board and every team within a particular division operated by a minor sport organization must be totally committed to the concussion management program and must be prepared to follow all of the protocols contained within that program.

This may be the greatest challenge. Leaders of organizations and institutions do not particularly like to force change upon their members. There may be a lot of push-back and a desire to go slowly, not wishing to offend anyone. Unfortunately, the ostrich-like reaction to concussions that has prevailed for so long is putting children at great risk and has in fact altered the life of far too many boys and girls already. It is time for school boards and minor sport organizations to deal with this problem aggressively by developing a system-wide program that "must" be adopted by all and which must go beyond the minimum standards being promoted by government legislators and policy makers. Therefore, if you are the leader of a school board, post-secondary institution or minor sport organization, you must be willing to enforce the provisions of your concussion management program once it has been tested and approved by your organization. You cannot allow anyone to "bend the rules" or "opt-out".

THE PARTNER APPROACH IS THE BEST STRATEGY

It has been far too easy in the past to brush off the problem of concussions by accepting the premise that parents are responsible for the health and welfare of their children. It is also too simple an approach to take the position that all we need is clearance from a doctor in order for a student-athlete to return to play. This has created a great deal of confusion whereby parents can avoid the diagnosis of concussion by staying away from doctors and telling the coach that everything is fine. This is the news that most coaches want to hear, so it is what they go by when putting a student-athlete back into action. It is also one of the weaknesses of a protocol which only requires a doctor to diagnose a concussion. For example, if only a doctor can diagnose a concussion, but the parent decides not to take their child to see a doctor, or is unable to get in to see a doctor, then what happens? What is a coach going to do if a parent tells the coach that their child if fine? A coach may have a hard time refusing to allow the child to play if the parent states that the child is fine and everything appears normal.

This is why we recommend a partner approach to the identification of a concussion. The partners are the coach, the parents/guardians, the classroom teachers, the student-athlete, and the doctor. If any one of the partners "suspect" a concussion, then it must be deemed that a concussion has been identified until "all" of the partners sign clearance forms indicating that there is no further evidence of signs, symptoms or behaviours consistent with concussion. This is an injury that is just too serious to be left up to one individual, even if that individual is a doctor, to identify.

This whole Program Development Guide is based on the premise that your school board, post-secondary institution or minor sport organization is prepared to "walk the talk" and work on the development of a comprehensive "partner approach" to concussion management that will be applied across the entire system as a mandatory requirement. Compliance should not be an option. Once the program is developed, tested and approved, it should apply to everyone.

STEERING COMMITTEE APPROACH

We recommend that school boards, a post-secondary institutions and minor sport associations assign the responsibility for the development of a concussion management program to some form of appointed steering committee which will then submit the finished program for approval to a governing body in order to be authorized for use across the system.

The steps we are providing below are therefore intended for use by the steering committee in the development of the student-athlete concussion management program. It is expected that whatever is required in order to meet the directions from your particular governing body will be adhered to in accordance with existing policies and procedures.

We also recommend this approach even if you already have a concussion management program in place and are simply looking at enhancing or reviewing the procedures. Scientists are constantly finding out more and more about how the human brain functions, and it is critical that we adjust our concussion management protocols in order to be in alignment with the latest research and medical knowledge.

USE OF A FACILITATOR RECOMMENDED

We also recommend the hiring of a consultant to act as facilitator for the steering committee in order to keep everyone on track and focused on the process. While it is definitely possible for the steering committee to do this "in-house" with one of their members acting as chair, we still recommend bringing in an "outside expert" who will be able to provide a different point-of-view and a unique perspective on the whole issue.

Whichever consultant you use should have access to a wealth of information and resources which will facilitate the development of an effective student-athlete concussion management program for any kind and size of organization. Your consultant should be a resource as well as a facilitator.

If your school board or minor sport organization is unable to find another suitable facilitator, CMP Concussion Management Partners Inc. will be able to provide you with someone who can do the job. The CMP Consultant will be well aware of the fundamental principles that should be included in an effective concussion management program and will be a great resource for your committee.

Regardless of who you select to act as facilitator, we believe that your mission will be much easier to accomplish with an outside person coordinating your committee activities.

IDENTIFY YOUR STARTING POINT - KNOW YOUR BASELINE

The first thing you must do is identify what you already have in place with respect to concussion management. What are your current protocols and procedures? How do you handle concussions now? Do you have a formal program in place? Is it written down anywhere? Is it evidence-based? Do you have a training protocol? When was the last time it was revised?

Once you know what you have in place you will be in a position to determine what is needed in order to improve upon your current practice. You will know what is missing as well as what is working and what is not. This starting point becomes your "baseline" upon which you will build your new program. You will hear the term "baseline" often while you read this Program Development Guide. Baseline simply refers to a "starting point" and is an important principle that is fundamental to so many elements of a concussion management program.

IDENTIFY YOUR OVERALL GOALS AND OBJECTIVES

The next thing you should do is identify what it is about your situation that is unique or different. In other words, what are the challenges specific to your institution or organization that you must be aware of while you are developing any kind of concussion management program? Do you have barriers that must be overcome? Do you have geographical challenges that must be addressed? Are you under rigid financial constraints or do you have some flexibility in this regard? Is there anything that may prevent you from implementing any of the recommended procedures? Do you have any positive strengths which will make it easier for you to adopt a strong program?

Each school board, post-secondary institution or minor sport organization will have some elements which will require special attention and which may be different from what would be considered customary. It is important that these things be recognized and addressed as the program is being developed and formulated, so you must be aware of them right from the beginning in order to stay on the right track. It makes no sense to include procedures and protocols that will be impossible to implement or which will frustrate the partners.

It is also far too simple to adopt a generic protocol that has been put out by a provincial or state legislature or by a not-for-profit organization. Always remember that when a political group establishes a policy it must include provisions that all competing parties agree with. Therefore, what you get in the end is a "watered-down" version of a program that contains only those components that everyone could agree with. They may or may not be the best provisions but rather the lowest acceptable standard that could be agreed upon in order to pass the legislation or complete the policy statement.

This is why it is critical that the steering committee examine your existing protocols as well as any other procedures and protocols that have been developed in order to be able to get the best-of-the best provisions in your finished program and to be able to address your unique concerns.

You must then decide if you just want to improve upon certain elements of your current program or if you would like to start from scratch in developing a whole new program, taking into consideration that you will not simply toss out what you are currently doing that works, but you will incorporate those strengths into the new program. We have found that it is at times better to start from scratch rather than amending existing protocols that were created at a time when very little was known about the seriousness of concussions.

Whatever you decide with respect to your goals and objectives, one of the main objectives is for you to end up with a "written" concussion management program that includes clear and precise protocols and procedures for dealing with student-athletes who are injured with a concussion.

Once you know your baseline, or starting point, and you have established your goals and objectives, you will be able to do a gap analysis along the way to see what you have to do to achieve your goals. That will then allow you to consider strategies and options that are available to your group to close the gaps. We feel that most of those options are contained within this Program Development Guide.

UNDERSTAND YOUR LEGAL OBLIGATIONS

While you are going through this process you must be fully aware of the current legislative requirements that need to be addressed with your program. There may be some legal implications, some insurance requirements, ministry guidelines, or existing board policies that must be adhered to within your program. These parameters are important considerations moving forward. These will not be recommendations that you must follow, but rather strict requirements that you must address in order to comply with your legal and moral obligations.

We feel this is something that is so important we have devoted a full chapter to address Concussion Management and The Law. Whether we like it or not, we live in a litigious society where risk management is all about protection from and/or avoidance of potential liability. And the best test is to ask, "Would an impartial judge or jury think we have done what is appropriate in light of what we know about concussions today?"

The greatest challenge going forward for school boards, post-secondary institutions and minor sport organizations is that what may have been acceptable in the past just won't cut it today. We know far more about the nature of concussions than people did when they established legal requirements and parameters in the past. Precedence or past practice may not be much of a defence in front of a judge or jury today.

As well, leaders of school boards and minor sport organizations are expected to know better and to adhere to a much higher standard of care than that which was acceptable in the past. This is something that is going to have to be taken into consideration when it comes to developing a concussion management program. "Wilful blindness" will not be tolerated in the courts.

ESTABLISHMENT OF A LEADERSHIP HEIRARCHY

Somebody must be in charge of the concussion management program.

Therefore, we strongly recommend that each school board, post-secondary institution or minor sport organization decide at the outset the person who will assume responsibility as the overall leader or director of the program. That one person will answer to the governing body and will be the person through whom all communication and policy direction is passed. This governing body will likely be a Board of Trustees or a Board of Directors. We won't get into the governance policies of your particular organization, but for the purposes of the concussion management program, it is important that there be one individual who is the ultimate leader, responsible for ensuring that the concussion management program protocols and procedures are being properly implemented.

We also recommend that a "system" leadership committee be established in order to provide assistance and support to the overall leader.

For school boards, we recommend that the Director of Education be the overall leader and that a number of assistants or supervisory officers form the "system" leadership committee.

At the individual school level, the School Leader should be the Principal. The School Leadership Committee should consist of the Principal, Vice-Principals and the Physical Education Department Head.

Each school team covered by the program should have a designated School Head Coach who is in charge of implementing the concussion management program with that particular team. For clarity, this may or may not be the same person who is acting as the playing head coach. However, we strongly recommend that the School Head Coach be a teacher on staff at the

school. This is not a position that should be designated to a community volunteer coach because of the potential legal and insurance implications.

For post-secondary institutions, we recommend that the Athletic Director be the overall School Leader and each of the actual Head Coaches of the teams covered by the program form the Leadership Committee.

For minor sport organizations, we recommend that President or the executive director be the overall Organization Leader. The leadership committee may be composed of division convenors or members of the Board of Directors. Each team should have a designated Head Team Leader in charge of the implementation of the program at the team level.

Regardless of who is selected to fill the roles outlined above, it is important that you decide at the beginning who is going to be given the responsibility and the authority moving forward. One of the strengths of an effective student-athlete concussion management program is that everyone knows their role and responsibilities and there is a definite protocol that is to be followed when an injury occurs.

THE THREE STAGES OF CONCUSSION MANAGEMENT

There are many different ways of categorizing the basic elements of a concussion management program. For our purposes, we have chosen to divide concussion management into three distinct stages. Every one of the stages implies specific action on the part of each individual member of the concussion management partnership team, including the school or organization leaders, the coach, the parent/guardian, the classroom teacher, the medical doctor, the neuropsychologist and the student-athlete.

The Preparation Stage includes everything that needs to be done before a student-athlete is suspected of having a concussion.

The Identification Stage includes everything that needs to be done once a student-athlete is "suspected" of having a concussion. This is what is done to determine if a student-athlete has suffered a concussion.

The Rehabilitation Stage includes the procedures that should be followed once it is determined that a concussion has occurred. This will include short- and long-term protocols.

The system leaders and/or a steering committee should spend time developing the protocols and procedures that are to be included in each of the three stages. These will form the core elements of the concussion management program that will be implemented across the system.

THE PREPARATION STAGE

There is no particular order of importance to the elements included in this section. We are merely trying to point out everything that should be addressed and in place from the beginning.

1. All of the leaders at the various levels of the organization, including the overall "System Leader" and members of the system leadership committee, should be properly trained and qualified.

   You should have a formal training program in place so that when new leaders are appointed to oversee the program they are prepared to assume their role. Therefore your first task is to decide on the content of the curriculum for this training program.

   What is it that you feel your leaders should be aware of when it comes to concussion management? How will this training be delivered? Will you have some sort of evaluation procedure in order to determine the retention of the information presented or will the mere attendance at the training session be sufficient? Who will be qualified to train your leaders?

   You should also have a way of verifying this training through a central registry or certification process in order to keep track of who has received the training and also who it was that did the training.

2. For school boards, you should have a special administrative training program in place for your School Leaders and the School Leadership Committee members.

   This will include training that will identify certain board-wide protocols and responsibilities with respect to the administration of the program. They must not only understand what their role is within the school, but also how the school fits into the whole system operational structure. The thing to remember is that the members of the School Leadership Committee are likely to end up being transferred to positions of responsibility at other schools several times during the course of their career, so it is important to be aware of the whole scope of the operations.

   Once again, you should also have a way of verifying this training through a central registry or certification process. It is important for you to have evidence that the training has taken place and that the Leaders are qualified for their roles.

   The School Leaders should be trained by qualified "system leaders" in order to reflect the hierarchy and to establish a connection with the people to whom they are responsible for the overall goals and objectives of the program.

   You may even want an outside consultant to come in and train your system leaders and your school leaders. A consulting firm or someone who is recognized by the industry for their consistency and thoroughness is preferred in order to prove that your organization has done everything possible to prepare your system leaders.

CMP Concussion Management Partners Inc. issues a Certificate of Participation to all people who attend one of our Training Workshops. This Certificate of Participation will then become the official verification that the person has taken part in our training program. You may wish to have some sort of "Central Registry" to keep track of individuals who have received training and who are therefore "qualified" to work with your student-athletes.

3. You must have a training program established for your School Head Coaches, the coaching staff members of your teams and for your student-athletes.

   This will include deciding who will be responsible for actually facilitating the training and the steps you will take to ensure that the training is consistent for each team. We recommend that the facilitator should be one of the School Leadership Committee members. It is important that you develop a common curriculum that will be used in all schools and also that you allow for additional elements to be included that are unique to individual schools. The same goes for minor sport organizations. There must be consistency throughout the organization. Everyone must be provided with the same standard of care.

   Once again, you should also have a way of verifying this training through a central registry or certification process. It is important for you to have evidence that the training of your coaches and student-athletes has taken place. This cannot be left to chance. It must be documented and you must be able to verify the training.

   You must also decide on the frequency of the training. Is it only necessary to receive the training once? Should there be refresher courses every couple of years? It is our recommendation that all coaches and student-athletes must have received this training at least once in order to be eligible to coach or play on the team. Will you have different requirements for community volunteer coaches?

4. You must develop Student-Athlete Concussion Management Program Guide booklets and/or brochures which can be published and distributed to Parents/Guardians and to Classroom Teachers. We recommend that you not only make these guides accessible through the internet, but that you also print copies for the parents/guardians and classroom teachers.

   These Guides should contain the fundamental elements that are included in the training curriculum for coaches and student-athletes and should also clearly identify the protocols and procedures that will be followed with respect to the identification and rehabilitation of student-athletes who receive a concussion.

   There should also be a method of verifying the receipt of these Guides by the Parents/Guardians and Classroom Teachers. You want proof that they have at least received the guides. You may even want to give some sort of short quiz for your records.

5. The coaches should be required to provide training to the student-athletes on how to play safe and how to reduce the risk of leaving themselves open to concussions.

   This safe-play training should have an element of consistency and be a requirement for all coaches. There are sport-specific safe-play strategies that can easily be put into a guide for coaches.

   We recommend that each coach be given training in how to develop safe-play strategies into their coaching program. You will need to decide on the content of the training and on who will give the training. Also you need to determine how you will monitor the compliance of each coach in providing the play-safe training.

   This is especially important when it comes to returning a student-athlete back to competition after a concussion. You want to help the student-athlete reduce the risk of subsequent concussions by perhaps changing his/her style of play. It is not enough to give verbal instruction to the coaches in this regard. They must be given concrete directions and they should be required to verify that they have complied.

   We can't simply assume that the student-athletes have been taught to play safe.

6. It is recommended that all student-athletes receive neuropsychological baseline assessment prior to being permitted to participate in try-outs for a designated high risk team.

   This testing should be done every two years for adolescents. Unfortunately, this is an item where budget may be a challenge. We suggest that this is such an important element of the program that it would be acceptable to parents to pay a fee each year to cover the testing.

   However, you must make sure that this standard of care is not dependent on the ability to pay. If a student-athlete cannot afford the fee, there must be another provision that will pay the fee for the student-athlete. Everyone on the team and in the school should be provided the same level of care, regardless of their income level.

   We suggest that it might be possible to find local corporate sponsors willing to underwrite the cost of providing the neuropsychological testing. If so, then we would also suggest that the school board or minor sport organization give excellent recognition of the sponsorship so that the community is aware of what they sponsor is doing to contribute to the safety and well-being of your student-athletes.

7. The school board, post-secondary institution or minor sport association should have a section of its main web site dedicated to the concussion management program. This site can contain general information available to the public and it may also have a password protected section restricted to Leaders and Coaches so that they can communicate administrative directions and can verify training qualifications on the Central Registry.

It should also contain printable forms and information brochures that may be required during the year. Communication is critical to the success of this program.

We feel that once you implement the concussion management program you will find that it actually generates a "culture of safety" that will permeate throughout the entire system.

8. All coaches should be encouraged to develop a "performance baseline" assessment for each of the student-athletes.

   This would require an assessment of the basic sport-related skill level for each player and would also include attitudinal, emotional and behavioural assessments. If a student-athlete suffers a concussion during the season, the coach will be responsible for supervising a step-by-step progressive rehabilitation program designed to return the player to normal and prepare him/her for return to competition. By knowing what the normal skill level was for the player, it will be much easier for the coach to assess the rate of recovery following an injury and also to know which skills must be re-developed or what accommodations must be made to allow for deficiencies.

   Some guidance and direction should be provided for coaches by the appropriate Leadership Committee. More about this can be found in Chapter Ten, Baseline & Post-Injury Assessment.

9. All classroom teachers should be encouraged to create a "baseline" assessment of classroom performance for student-athletes who are participating on high-risk teams.

   The obvious assessment would involve normal testing and would indicate the expectations with respect to grade levels. However, equally important are the learning skills which require observational and subjective assessment, such as frequency of participation in class discussions, ability to focus on seatwork, completion of homework, handwriting, etc. These are all functions that may be affected by a concussion, so knowing exactly what the baseline levels were at the beginning of the year will be helpful if a classroom teacher must get involved with the return-to-learn accommodations for an injured student-athlete.

   More about this can be found in Chapter Ten, Baseline & Post-Injury Assessment.

10. All parent/guardians should be encouraged to create a "baseline" assessment of normal activities that their child is involved with at home.

    This could include things such as taking note of how high the volume is when listening to music or television; how much the child communicates during dinner; the amount of sleep the child gets each night; the time he/she normally goes to bed and gets up in the morning; the time of day he/she does homework; the length of time the child usually sits down to do homework; habits and hobbies, etc.

    All of these things may be affected by a concussion, so if the parent/guardian has a

specific recorded baseline of what the normal level of activity was before the injury, the parent/guardian will have a better idea of how their child is recovering from a concussion.

More about this can be found in Chapter Ten, Baseline & Post-Injury Assessment.

11. We recommend that the School Leader make arrangements with a sport medicine doctor in the area who will agree to examine a student-athlete who is suspected of receiving a concussion.

    It is important that the student-athlete see a medical doctor as soon as possible so if there is a local doctor who has agreed to "squeeze" the student-athlete in for a quick examination to rule out any life-threatening structural damages, it will certainly make it much easier on the parents/guardians and will reduce the number of unreported concussions.

    This is far more important than it might appear, especially when the injury many not seem that severe. By making it more convenient to see a doctor, there is more likelihood that the parents will take the time to bring their child to see the doctor in order to rule out any life-threatening damage from the injury.

    When you consider that an examination by a medical doctor is critical to the safety of a student-athlete who may have received a concussion, having a sport-medicine specialist who is available and accessible the next day is huge. There are sport clinics in every city and we are certain that these clinics will be most cooperative in return for the recognition they will receive through the school system.

If you can ensure that all of the above is in place prior to the beginning of competition, then you can be confident that you have done pretty well as much as you possibly can to be prepared for the eventuality of a concussion. We know that concussions will happen, and when they do, at least you know that everyone will have been properly trained and is knowledgeable of their particular roles and responsibilities.

Up to 80% of all concussions go undetected and unreported. Each of those undetected concussions place the student-athlete in grave danger of suffering subsequent concussions that may produce life-altering symptoms. We recommend that the ultimate goal of your concussion management program is the elimination of all undetected concussions. We also understand that this is a goal that is all but impossible, but we at least want to be doing everything conceivable to achieve that target.

SIGNING OF MANDATORY AGREEMENTS

One of the important elements that should be included in the Preparation Stage is the requirement that all partners sign mandatory agreement forms. We feel this is so very important that we have included it under a separate heading.

In order to avoid any "push back" or "disagreements" from parent/guardians, student-athletes, or team coaches when the protocols must be initiated, you need this mandatory agreement form signed and placed on file. If a parent/guardian claims that he/she will not sign the form, then the student-athlete does not play. You must be willing to hold firm with this requirement or the whole program will come crumbling down like a house of cards.

The program provides an equal standard of care for all student-athletes. No one should be able to voluntarily put themselves or their child at risk. It will also be much easier to point out to a parent/guardian who questions a decision that he/she agreed to this going in.

IT MAKES A DIFFERENCE

Whenever you think that you are fighting such an uphill battle that whatever you do won't make any difference in the overall picture, think about the following story, which is one of my favourites. It is called "The Starfish Thrower"

Once upon a time there was an old man who used to go to the ocean to walk along the beach and enjoy the waves crashing upon the rocks. Early one morning he was walking along the shore by himself. As he looked down the deserted beach, he saw a human figure in the distance. As he got closer to the stranger, he saw that it was a young teenage boy. The boy was reaching down to the sand, picking up something and very gently throwing it into the ocean. As the old man got closer, he yelled out, "Good morning, young fellow. What are you doing?"

The teenager paused, looked up and replied, "Throwing starfish back in the ocean."

"Why on earth are you doing that?" asked the old man.

The boy replied, "Because the sun is up and the tide is going out. If I don't throw them in they'll die."

The old man looked at the teenager in disbelief and said, "But the beach goes on for miles and miles and there are starfish all along it. You can't possibly make a difference."

The young boy listened politely, then bent down, picked up another starfish and threw it into the sea, past the breaking waves and said, "It made a difference for that one." And then the very wise

young boy continued on his way down the beach, bending down and throwing starfish after starfish back into the ocean.

Whenever I feel like I am up against tremendous odds and that my efforts are hopeless in the larger scheme of things, I think about *The Starfish Thrower*. I would advise you to include a copy of this story in all of your guides and your training programs and tell everyone involved in the concussion management program to read it whenever they wonder if it is worth the effort.

We have all been gifted with the ability to make a difference. Remember the quote by Leo Rosten: "The purpose of life is to matter; to count; to stand for something; to have it make some difference that we lived at all".

You may not be able to change the world, and you may not be able to prevent all concussions, but you certainly can make a difference to most of the student-athletes covered by the program if you can somehow prevent them from receiving a second concussion while they are still symptomatic from the first.

With proper preparation, we are confident that it will be very difficult for a student-athlete to receive a concussion without someone spotting one of the signs, symptoms or behaviours consistent with concussion. The preparation stage is one of the most important elements of the whole program. Prepare properly and everything else will fall into place.

THE IDENTIFICATION STAGE

There should be no doubt in anyone's mind that the identification stage of the student-athlete concussion management program is one of the most critical elements of the program. However, successful identification is largely dependent on how good a job you have done during the Preparation Stage. The more thorough you are during the Preparation Stage, the more likely you will be able to properly identify concussions when they occur.

The most important thing when it comes to identifying a concussion is being aware of the signs, symptoms and behaviours that are consistent with concussions. If you have done the proper training with your concussion management partners (coaches, parents/guardians, leaders, teachers and student-athletes) then we are hopeful that none of the signs, symptoms or behaviours will go undetected.

Each of the partners in the program should be given a special guide that deals specifically with their particular role. For example, you should have a Guide for Teachers, a Guide for Parents, a Guide for Student-Athletes, and a Guide for Coaches at the very least. Many of the elements of the guides will be similar, but there are certain responsibilities and duties that apply to each of the individual partners as well.

We have devoted an entire chapter of this Program Development Guide to Signs, Symptoms and Behaviours Consistent with Concussions. It is recommended that you make sure everyone included on your partnership team become very familiar with the contents of that chapter.

IDENTIFICATION PROCEDURES:

1. As soon as "anyone" notices a sign, symptom or behaviour consistent with concussion the "Identification Protocols" should kick into gear and the student-athlete should be removed from further play immediately. This is the fundamental protocol.

   While we do not know the extent of the damage at this point, we do not want to take any chances on making matters worse by continuing to play. "When in doubt, sit them out" has been said loud and clear, over and over again, and it is the only way to react when you suspect a possible concussion. As you will learn in other sections of this Program Development Guide, a student-athlete who suffers a second concussion before the first one heals is in danger of serious long term consequences.

   Do not allow any wining, complaining or arguing to persuade you otherwise. This is not a time to give in because you feel badly for the student-athlete. Think how you will feel if he/she has a concussion and another blow makes it even worse.

   This is why we strongly recommend that everyone who is involved in any way with the student-athlete be required to "sign an agreement" to commit to the concussion management program. It will save any grief once the protocols must be initiated if everyone has already signed on. No one will be able to claim that they were not aware of what would happen if a concussion is suspected.

2. Side-line assessment and/or recording should be done by the Head Coach whenever possible.

   The nature of this assessment will have been established by the school leaders during the Preparation Stage and should be readily available at all practices and games. This is something that is important to have in place ahead of time so there should be an established procedure.

   We must point out that once you remove the student-athlete from the activity because of a suspected concussion, regardless of the results or observations of the side-line assessment, the student-athlete should not – I repeat should not – be permitted to return to play or practice until complying with the entire protocol and obtaining all of the required clearance forms. The student-athlete must not, under any circumstances, be permitted to return to play that same game or day, even if he/she is adamant that there is nothing wrong.

   You may get some "push back" from the student-athlete. You may even get some push back from the parent/guardian. If so, just remind them that they knew what they were getting into when they signed on with the team. They went through the training and they know the protocol. This is not a surprise to them and they know why it is being done. They also know that there are no exceptions to the rule. As a Head Coach or a parent, it is critical that you hold the line on this rule.

Some organizations complete a side-line assessment and then give clearance for the student-athlete to return to action if there are no indications of concussion. We do not recommend this practice, even if there is a medical doctor or health care provider at the game. The majority of research information we have been able to gather about concussions in adolescents indicate that it may take several days for symptoms to present themselves after a trauma to the brain has occurred. It is not unusual for symptoms to be absent immediately following an incident in a game or practice, so while a sideline assessment may be very beneficial in tracking the progression of symptoms, or in determining if there is some form of structural injury such as a fractured skull or neck problem, it should never be the determining factor in identifying a concussion. This is especially true when it comes to children and adolescents for whom it is much more difficult to identify concussions.

When you read Chapter Nine, Understanding The Brain, found elsewhere in this Program Development Guide you will better understand what happens to the brain when it is subject to force that is strong enough to bend and stretch the delicate axons which are used to communicate messages between neurons (brain cells). You will also understand that when a student-athlete receives a blow to the body or head that is cause for concern, there is always going to be some stretching of axons and once that happens the axons become extremely vulnerable to further forces. Therefore, once someone feels that they have witnessed a sign, symptom or behaviour consistent with concussions, or if the student-athlete has received a blow that appeared to be something that might cause a concussion, there is to be no further activity on the part of the student-athlete which might stimulate the brain and cause further damage. This is about risk management and we will always recommend that you err on the side of caution.

3. It is even suggested by some experts in the field that you give serious consideration to instituting a "mandatory rest period" of three to four days.

   By this we mean that when the concussion management identification protocol is initiated, the student-athlete should be required to take at least the next few days to refrain from physical or cognitive activity that may over stimulate the brain. Many student-athletes will be symptom free by the time they go home and will report absolutely no signs, symptoms or behaviours consistent with concussion. And yet, we know that some symptoms take several days before they are noticed. In other cases, the student-athlete is a walking time-bomb, ready to explode with even the slightest of forces.

   We would like you to consider forcing the "automatic three-count", to take a phrase from boxing, in order for the student-athlete to rest, catch his/her breath and to be sure that there is no further danger.

   We want to give a little bit of time for symptoms to present themselves, and knowing that it sometimes takes days for this to happen, we want to make sure. This is why we even suggest that you to wait at least 2 or 3 days after the incident before taking a post-injury neuropsychological assessment. The morning after is too soon to do a proper assessment, and there is some concern that the stress placed upon an injured brain during the test, or

any other test that may be administered in class, may in fact delay the recovery process.

4. The student-athlete must be taken to a doctor that night if symptoms are extremely serious. At the very least a doctor must be seen the following day, even if the student-athlete states that everything is fine. The protocol should definitely make this a mandatory requirement, with no exceptions.

   You can examine the information in Chapter Twelve on Signs, Symptoms and Behaviours to find out more about when you should be going to the doctor. You want to make sure that the student-athlete is seen by a doctor familiar with concussions if possible, but no matter what, make sure you see a doctor in order to determine if thee was any damage that might be life-threatening.

   We wish to emphasize the importance of having the student-athlete examined by a medical doctor as soon as possible in order to determine if the skull has been fractured; if there is any increased level of intracranial pressure caused by swelling of the brain; if there is any internal bleeding caused by ruptured blood vessels in the brain; or if the neck muscles have been damaged.

   That may be all the medical doctor is able to determine when the student-athlete is brought in for the initial examination. It may not be possible for the doctor to arrive at a definitive diagnosis of concussion, nor will the doctor likely be in a position to rule out concussion if it has only been less than a day since the injury was incurred. Concussion symptoms may simply have not yet presented themselves.

   In fact, some doctors have begun referring patients who come in with possible concussion symptoms to other sport medicine specialists who have experience dealing with concussions.

   Therefore, when it comes to the initial examination by the doctor, we recommend that if the doctor can rule out life-threatening structural damage, that is the best we can hope for and at least we know that the student-athlete`s life should not be in immediate danger as we begin the rehabilitation protocols.

5. The parents/guardians will be reminded of the restrictions that should be adhered to by the student-athlete while at home. These should be clearly outlined in the Guide for Parents/Guardians, but the school leaders may also have additional brochures or information to be handed out at the time of injury. All of the relevant information should also be on the internet. No parent/guardian should be able to say that they were not aware of their responsibilities.

6. We are hopeful that all school boards and minor sport organizations will find a way to include some form of neuropsychological assessment as part of their concussion management program. Therefore, if you do have one in place, within 48 to 72 hours, once the initial symptoms have subsided; the student-athlete should be given a post-injury neuropsychological assessment to determine the extent of dysfunction. We recommend

that you should wait until the symptoms have subsided in order to avoid aggravating the symptoms by the test.

Generally, if the student-athlete follows the proper home care accommodations for a couple of days, the symptoms will have resolved. That doesn't mean he/she has recovered. It just means that the brain has been given sufficient rest for the healing to begin. That is a good time to do the first post-injury assessment so your consulting neuropsychologist can evaluate the deficiencies caused by the concussion.

7. Once the symptoms have subsided, the student-athlete may return to school under a modified program with appropriate accommodations. There are many possible accommodations available to the classroom teacher, so it would be a good idea for the parent/guardian, the teacher and the student-athlete to meet briefly so that everyone understands the kinds of activities that are likely to cause symptoms to return.

   We have taken a lot of space in this Program Development Guide to outline some of the most likely accommodations that may be considered. You can find them in the Guide for Classroom Teachers and also in the Guide for Student-Athletes.

8. The parent/guardian will closely observe his/her child during the hours and days following an injury in order to do a post-injury assessment to compare functioning then with the baseline observations that were done prior to the season.

   For example, while you are trying to determine if your child has a concussion, you should compare the volume level while watching television or listening to music to the baseline levels you had recorded. If your child finds the normal level disturbing, this may be a sign of a concussion. If your child is no longer as talkative at dinner; if he/she is having trouble sleeping; changes the time of day for doing homework; has trouble concentrating on homework; or if you notice significant changes in any of your child's other normal routines and behaviours, then these might be signs of concussion. The more objective the baseline measurements, the easier it will be for you to determine the gap when comparing the baseline to the post-injury data.

9. Classroom teachers can also help with the identification process by referring to their baseline evaluation for an injured student-athlete. If there is significant deviation from the baseline, then these changes may be attributed to a concussion.

While we are in the process of identifying a concussion, we will be immediately transitioning into the Rehabilitation Stage. It is actually impossible to determine where the identification stage ends and the rehabilitation stage begins. The two go hand-in-hand. Therefore, as you are trying to find signs, symptoms or behaviours consistent with concussion in order to determine if the student-athlete has suffered a concussion, you must treat the student-athlete as if he/she already has a concussion.

This is not the kind of injury where you can tell the person to go about their normal activities while you are trying to decide if he/she is injured. That can lead to much more, serious damage. Therefore, we take the cautious approach for all suspected concussions.

If after all is said and done, all of the partners involved with the concussion management program indicate that they have not observed any signs, symptoms or behaviours consistent with concussions, then the student-athlete may be cleared to return to play within the normal 7 to 14 days and no harm will be done. Never ever feel sorry for the student-athlete because he/she has to miss practices and a game or two while working through this identification stage. We must not rush the student-athlete back to play, just in case.

Always keep in mind that if we make a mistake and put the student-athlete at risk too soon, we could be setting him/her up for an injury that will change the course of his/her life. We must always err on the side of caution.

COMING SOON – THE HIT COUNT

We would like to conclude this section by bringing to your attention something that is gaining momentum among many experts. It is becoming accepted that a concussion can be caused by a single event that has such extreme force that it results in immediate damage. Or it can be from a series of minor forces that have much less immediate impact, but over time may cause enough accumulated damage that when just enough force is experienced by the brain it reaches a tipping point and the symptoms of a concussion then appear.

In order to protect against arriving at the tipping point, many people are now recommending that we keep track of the number of "hits" a student-athlete receives in practice and competition. Once the student-athlete reaches a certain number of significant hits, the player will be required to enter a rehabilitation period similar to what would have happened if he/she had displayed signs, symptoms or behaviours consistent with concussion. After a mandatory period of rest, and upon verification of the coach, the parent and the teachers that there were no signs, symptoms or behaviours present, the student-athlete would be able to return to play.

This is something that is seriously being considered by school boards and minor sport organizations because of the difficulty it is to actually identify a concussion. All we need to do is assign someone to judge and record the hits experienced by the players during the games and practices. It would then be up to the coach to reduce the number of hits during practices in order to save them for games.

THE REHABILITATION STAGE

There are many components involved with the rehabilitation stage. We expect that the school board, post-secondary institution or minor sport association will develop a comprehensive guide for each of the partners in order to ensure that everyone knows what is involved in rehabilitating someone who has suffered from a concussion. We have tried to assemble some of the information appropriate for these guides in separate chapters for Classroom Teachers, Coaches, Parents/Guardians and Student-Athletes.

There are many accommodations that may be needed both at home and at school. The student-athlete will also have to make adjustments to his/her lifestyle in order to assist in the recovery process. The sport coach will have certain step-by-step guides when it comes to supervising the physical rehabilitation elements of the recovery process. All of these should be included in the overall concussion management program and should be part of the Partner Guides.

Remember that the ultimate goal of rehabilitation is to help the student-athlete return to his/her normal levels of functioning that existed prior to the injury. This is why we strongly recommend that all partners establish "baselines" in order to know when a student-athlete has returned to "normal".

REHABILITATION PROCEDURES

When it comes to deciding on whether a student-athlete should be permitted to return to competition, we recommend the following:

1. A medical doctor must confirm that the student-athlete shows no evidence of structural damages to the skull or the neck muscles; no signs of internal bleeding in the brain; no signs of swelling of the brain or increased intracranial pressure; and no other signs, symptoms or behaviours consistent with concussion that have been admitted or observed by the doctor.

   If the doctor determines that the student-athlete is still suffering from symptoms of a concussion, then the doctor should not issue a clearance to the student-athlete. We want to make it clear that there are to be no "post-dated" clearances issued by any of the partners. None of the partners should be "estimating" a return to play in the future. When the doctor signs the clearance, it will state that he/she is not aware of "any" signs, symptoms or behaviours of concussion and that there are no structural injuries present.

   We wish to point out that we do not necessarily want the doctor to state that the student-athlete has recovered from the concussion. We only want the doctor to state that he/she is not aware of any signs, symptoms or behaviours that are consistent with concussions. The doctor does not know if any of the other partners are observing signs, symptoms or behaviours, so all the doctor can do is state what he/she can conclude from clinical examination of the student-athlete.

   It must be pointed out that this recommendation is in no way an attempt to diminish the importance of the doctor's examination. We feel it has been too easy for coaches and parents/guardians to hand off their responsibilities to a doctor who often is seeing the student-athlete when symptoms have subsided and at a time when the exertion levels on the brain are low. The doctor also has to rely upon self-disclosure by the student-athlete who is only thinking about getting back to play. If the student-athlete takes it easy for a few days and has not experienced any symptoms, then it is easy to think the original symptoms were because of something other than the hit during the game.

Medical doctors are beginning to recognize the complexities with concussions and many are now referring patients to sport medicine specialists when it comes to examining a student-athlete who may have a concussion. The result will be a log jam at sports medicine clinics and delay in getting to see a doctor in the first place.

Therefore, while we are quick to declare that the doctor's examination is critical, so too are the observations by the parent/guardian, the coach and the classroom teachers. They all must take responsibility and the formal concussion management program should reflect this in writing.

2. The parent/guardian must confirm that from their observations, their child shows no further signs, symptoms or behaviours consistent with concussion and that their child has returned to normal baseline levels in their home environment. The parent/guardian declaration form should be one of the most important documents in this entire program since it is the parent/guardian who knows his/her child best and who has an opportunity to observe the child during the evening and while performing normal activities.

3. The classroom teacher should also confirm that from their observations, the student-athlete is showing no further signs, symptoms or behaviours consistent with concussion and has returned to normal baseline performance levels in the classroom.

4. The Head Coach must confirm that while going through a step-by-step progressive training program, the student-athlete is performing non-contact sport-specific skills that are at the pre-injury level and is no longer showing signs, symptoms or behaviours consistent with concussion. Keep in mind that the Head Coach should not have begun this progressive training until the clearance comes back from the doctor indicating that there are no structural damages to the brain that might be exacerbated by physical or cognitive exertion.

5. The post-injury neuropsychological assessment, if one is administered, has returned to baseline levels.

6. The Student-Athlete must declare that he/she is no longer experiencing any signs, symptoms or behaviours consistent with concussions. When asking for this self-declaration, it is recommended that the parent/guardian sit down and make sure that the student-athlete is aware of the risk of attempting to hide symptoms.

7. It is our recommendation that only when the School Leader (or the Minor Sport System Leader) receives all of the above confirmations should a final decision be made with respect to granting permission for the student-athlete to return to full-contact practice and competition, subject to the condition that if any of the signs, symptoms or behaviours consistent with concussion return, the student-athlete is once again removed from play for further assessment.

   We want to recognize that we are not expecting the School Leader to accept any new or unusual responsibilities with respect to granting permission for the student-athlete to

return to play. The School Leader, who should be the Principal, has always been responsible for the safety and well-being of all students in his/her school. Therefore, even in the absence of a concussion management program, the School Leader is still the one responsible for permitting student-athletes to participate on school teams. Nothing has changed with our recommendations except that the Principal will at least be fully aware of the condition of the student-athlete.

We would strongly suggest that the School Leadership Committee meet to examine all of the information and declaration forms and then make a group decision about the return-to-play. This could be something where a unanimous agreement is required. It removes the onus from any one individual and since the School Leadership Committee has been coordinating the entire program at the school, it makes sense that the committee make the final decision. However, it must always be understood that regardless of what the School Leadership Committee decides, the Principal will always have the final say when it comes to granting permission for the student-athlete to return to full contact play.

All we have done is assist the School Leadership Committee by providing clear and definitive evidence, provided by the parent/guardian, a doctor, the Team Head Coach, classroom teachers and the student-athlete him/herself, that the student-athlete is well enough to return to play. This means that the School Leadership Committee is not being asked to make a "blind decision". The School Leadership Committee can make an informed decision and feel confident that the responsibility has been shared by the people who are most involved in the life of the student-athlete. We feel that all Principals should welcome such a program in their school.

8. It is also our recommendation that the School Leadership Committee be given the option of refusing to grant permission to return to competition, if, in their opinion to do so would place the student-athlete at potential risk needlessly. For example, if it is the final game of the season and it is a meaningless game, then the School Leadership Committee may simply choose to have the student-athlete sit the game out and have a longer period of time to recover even more fully. Once again, this is a responsibility that already exists for Principals, but we feel that it should be explained clearly in the program guides so that there is no confusion on the part of any of the partners.

Another important consideration when all is said and done is that the student-athlete may no longer present any further signs, symptoms or behaviours consistent with concussion, but that doesn't mean that he/she will return to 100% pre-injury functionality in all areas. There may be a need for some minor adjustments and accommodations at home, at school or at play in order to allow for certain changes that are long-lasting or permanent.

For example, perhaps the student-athlete may not regain his/her full level of concentration and may need to take more breaks from reading or homework than before. The person may be more sensitive to bright lights from now on and have to wear sunglasses or stay away from the windows to avoid glare from outside. In most situations recovery may be complete, but it is still important to be aware of some deficiencies that may need to be addressed over a long period of time – perhaps even for the rest of the student-athlete's life.

Further, since we know that student-athletes who suffer a concussion are much more susceptible to subsequent concussions, we recommend that coaches work with student-athletes to make some adjustments in their style of play in order to reduce the risk of receiving future concussions. These suggestions are sport-specific and should be part of the Guide for Coaches that is developed by the school board, post-secondary institution or minor sport association.

USE OF VIDEO FOR PRESENTATIONS

We recommend that the school board, post-secondary institution or minor sport association consider the use of videos to ensure that the core material for training programs is delivered consistently across the system.

For example, during a training session the facilitator would be able to play a video presentation by one of the System Leaders or from an expert in a particular field of study as part of the session. This video would contain the core material that is to be included in the training. The facilitator could add to the presentation and could engage the participants in discussions so that the material is better understood, but at least the delivery would be consistent to all groups.

PILOT PROGRAM IN DEMONSTRATION SCHOOLS

We recommend that the final version of the student-athlete concussion management program developed by the steering committee be tested in a "Demonstration School" selected by the board. This allows all other School Leaders to observe the program in action and also enables the steering committee to make any necessary adjustments and revisions which will enhance the program. Once the program has been implemented for a full school year it can be rolled out across the entire system.

The same recommendation is made to a minor sport organization. You can use one team or one division to test out the program and make adjustments during the season.

INTERFACING POLICY BETWEEN SCHOOL & COMMUNITY

This might be the most important element of the entire program, considering that many sport-related concussions are the result of injuries received some place other than in the game where the injury occurred.

For example, it doesn't matter how comprehensive a program a school board implements, if a parent/guardian is going to allow their son/daughter to play on their minor sport team even though they know they have a concussion, the student-athlete is still going to be placed in grave danger. And the unsuspecting minor team coach won't even know that one of his players is playing with a concussion.

Therefore, we strongly recommend that the school board and minor sports organizations in a community establish an agreement that will require notification to be communicated when a student-athlete is injured. If the student-athlete is injured while playing on a minor sport team,

then the coach of the minor sport team must inform the School Leader about the suspected concussion and that should initiate the concussion management protocol at the school.

We take the position that regardless of where the concussion occurs, the program will be initiated by the team that is covered by the program. Once initiated, all of the clearances, accommodations and protocols must be followed through to the end and the student-athlete will not be permitted to participant on "any" of the teams until cleared.

We would hope that the parent/guardian would be the catalyst between the school and the minor sport organization, but we think there should be a formal agreement involving the coaches. That means that as part of the Preparation Stage, the coaches will have to know what other activities the student-athletes on his/her team are involved in.

CONTINUOUS REVIEW AND EVALUATION

Finally, considering the advances being made in the science community with respect to the brain, we take the position that no student-athlete concussion management program will ever be complete. There must be constant review and evaluation followed by necessary adjustments in the training and awareness of protocols and procedures in order to keep up with advances in research being made by the medical profession. Some form of review process must be included in the formal program for any school board, post-secondary institution or minor sport association.

It might be a good idea to bring all of the partners together once a year for a special workshop or seminar to evaluate the program and make any alterations or changes for the following year.

CHAPTER THREE

A PARTNERSHIP APPROACH TO CONCUSSION MANAGEMENT

All school boards, post-secondary institutions and minor sport organizations in Canada and the United States are facing similar challenges when it comes to developing practical and effective concussion management policies for their student-athletes. One of the main hurdles is finding a place to start amid the plethora of information that is available.

While it is true that most school boards and minor sport organizations may already have some form of policy or protocol in place to deal with athletic injuries, including concussions, it is becoming clear that more must be done to better educate leaders, coaches, volunteers, student-athletes, teachers, the medical profession, and parents/guardians in order to reduce the risk of long term consequences that may result from sport-related concussions. This is an injury that deserves to have its own protocol.

We can no longer treat a head injury in the same manner as before. This is not a broken bone or a strained muscle. It is for the most part an invisible injury that could affect a person's entire life if not treated properly.

It has been said that the first step in solving any problem is recognizing that we have a problem in the first place. That being said, it is pretty safe to assume that most people are coming to accept that we have a very serious problem when it comes to the development of preparation, identification and rehabilitation strategies to deal with sports-related concussions. Unless you have been living in a cave, completely isolated from all media sources, you have been exposed to numerous articles, news stories, conferences, workshops, and books on this topic as experts do their best to increase awareness of the signs, symptoms and behaviours consistent with concussion; the latest research about traumatic brain injury; and a wide variety of products and services designed to help reduce the risk of concussions, especially among our youth.

OVERCOMING THE LOG-JAM OF INACTION

Recent developments in the field of brain trauma research have helped everyone become much more aware of the magnitude of the issues associated with concussions, especially among children, teenagers and young adults. This is now recognized as an injury that we cannot afford to take for granted in light of the fact that we are finding conclusive evidence that some people who received multiple sport-related concussions during their teens and early twenties suffer from serious long-term brain deterioration that presents itself in a variety of unpredictable ways when they are much older.

As a result, we are being inundated with an overload of information about concussions from a wide variety of sources. There are so many opinions and recommendations along with

conflicting information from experts and authorities that in many ways it has created a state of confusion, especially among educators, coaches, parents and student-athletes.

Because of the lack of certainty when it comes to the affects of concussions on young people this is actually creating a "log jam of inaction". We believe that this Program Development Guide can be used to help break the log jam by providing the leaders of school boards, post-secondary institutions and minor sport organizations with what they need to develop a very practical, easy-to-implement program that encompasses all of the recommendations that have been forthcoming from experts in the field and addresses the local concerns of parents/guardians, teachers and coaches. It is our opinion if we wait to find the perfect solution, we will be placing our current student-athletes in grave danger. It is time for us to do something positive to address this crisis.

This ***Hope For Tomorrow*** Student-Athlete Concussion Management Program Development Guide contains most of what is required in order to develop a customized comprehensive training program that will be of benefit to administrators, teachers, coaches, parents/guardians, student-athletes and health practitioners alike. It also contains the framework for the creation of important information guides that will be of assistance to school and organization Leaders, Coaches, Student-Athletes, Parents/Guardians and Classroom Teachers.

Our goal is to inform and influence the national and international conversation on concussion management and hopefully engage the people who are in a position to effect change to take appropriate action in order to help us gain control over the epidemic of traumatic brain trauma that has overtaken the sports world.

A PARTNERSHIP APPROACH TO TRAINING

By adopting a partnership approach to concussion management, we feel that we will be able to combine the comprehensive core curriculum of the Program Development Guide with additional components designed to address the unique needs and concerns of a local school board, post-secondary institution or minor sport organization.

The resulting Student-Athlete Concussion Management Program will meet the unique goals and objectives of the school board, post-secondary institution or minor sport organization while maintaining the universally accepted protocols and procedures that have been found to be most effective in other jurisdictions around the world.

The Program Development Guide includes the fundamental principles that would be appropriate for any school board, post-secondary institution or minor sport organization. A steering committee may then be able to determine which of the recommended procedures are most appropriate for their particular situation as they create a customized student-athlete concussion management program that is well-suited for their student-athletes.

The Program Development Guide also contains recommendations that are designed to ensure that the content and the actual training presentations made to Leaders, coaches, classroom teachers, professors, student-athletes and parents/guardians will remain consistent no matter where it is being delivered or who is doing the presentation.

SCHOOL BOARDS & POST-SECONDARY INSTITUTIONS

As mentioned earlier, the Program Development Guide includes the fundamental principles that would be appropriate for any school board, post-secondary institution or minor sport organization. In this section of the Guide we are going to focus on the institutions of the education sector with particular emphasis on the secondary schools operated by school boards.

It is our position that because each minor sport organization deals with a specific sport, it will be much more difficult to establish a consistent approach in dealing with concussions if an attempt is made to coordinate the efforts of all of the different organizational structures. However, one very important consideration is that no matter how many minor sport organizations to which a student-athlete belongs, he/she is usually enrolled in local school. The schools are therefore the common bonding element in any community when it comes to sports.

That being the case, once a school board has established an effective and comprehensive concussion management program, it will by extension cover the activities of its student-athletes while they are playing on their minor sport organization teams. This will make it much easier for school boards to offer their assistance in helping minor sport organizations adapt their own policies and protocols to be consistent with the schools.

In the meantime, if the leaders of minor sport organizations wish to develop their own concussion management program, most of the principles recommended for the school boards are also applicable and appropriate for their use. The preparation, identification and rehabilitation protocols are all transferable to minor sport organizations.

Therefore, while the following section will focus on school boards and post-secondary institutions, keep in mind that minor sport organizations could easily be accommodated as well.

TRAINING TO BE FACILITATED BY LICENSED/CERTIFIED TEACHERS

One of the strengths of Student-Athlete Concussion Management Programs at the school board level is that all instructors who will be responsible for presenting the training material to coaches and student-athletes at the secondary school level should be licensed/certified professional teachers who are highly skilled at what they do. While post-secondary institutions may not be able to guarantee that the facilitators are licensed teachers, the coaches and athletic directors at this level are extremely well qualified at what they do and will certainly be able to provide the same level of expertise and skill when it comes to delivering the program to their coaches and student-athletes.

The School Leadership Committee for secondary schools in a school board should consist of the Principal, Vice-Principal and Phys. Ed. Department Head. These administrators should be responsible for providing the training to all School Teacher/Coaches as well as to any Community volunteer coaches who may be involved with teams at the school. School Coaches on secondary school teams who are licensed teachers on staff at the school, should then be delegated the responsibility for training student-athletes once they themselves take part in a

training session facilitated by one of the members of the School Leadership Committee. The Principal will be the official School Leader.

The School Leadership Committee for a post-secondary institution should consist of the Athletic Director plus at least two designated executive assistants. They will be responsible for training the Varsity Team Coaching staff members, who in turn will be responsible for training the student-athletes and implementing the program with their respective teams. The Athletic Director should be the official School Leader. It is possible that the Varsity Coaches will be members of the School Leadership Committee at the post-secondary level, which will mean that they will have been properly trained and qualified.

COMPREHENSIVE PARTNER GUIDES

Besides a solid training component, it is imperative that Student-Athlete Concussion Management Programs include comprehensive guides for all people who will be involved in the identification of sport-related concussions and the rehabilitation of student-athletes.

To this end we are suggesting special individual guides for Coaches, Student-Athletes, Parents/Guardians and Classroom Teachers. These guides will be extremely helpful while presenting the training course material and will be easy to access references for all partners involved in the Student-Athlete Concussion Management Program. We have devoted separate chapters in this Program Development Guide to provide an overview of the material that we feel would be appropriate for inclusion within these guides.

FRAMEWORK FOR FORMAL TRAINING PROGRAM

The basic curriculum and support material for your Student-Athlete Concussion Management Program is extremely important. You must make sure to include "enough" information so everyone understands the seriousness of concussions and is motivated to be fully cooperative in the implementation of the procedures and protocols that will be called into action if a student-athlete is suspected to have suffered a concussion. This Program Development Guide contains a wealth of information that we have gathered from sources around the world. We are confident that the steering committee should be able to find just about everything that they could possibly need in the Program Development Guide.

COMMON CURRICULUM FOR COACHES AND STUDENT-ATHLETES

We recommend that the same training curriculum be used for both coaches and student-athletes alike. It is our strong belief that in order for anyone to be effective in their own role they must be aware of where they fit in the total program. With everyone involved having the same training and baseline knowledge it should be much easier to adopt a true partnership approach to concussion management.

A steering committee working on the development of the local concussion management program will certainly consider minor additions to each presentation that may be more relevant to coaches and therefore should be included in the training for coaches but not necessarily for student-

athletes. The "common curriculum" recommendation deals mainly with what we feel are "fundamental principles" that should be delivered to both groups. Those fundamental principles will become obvious as we explore the full scope of this Program Development Guide.

VALIDATION OF TRAINING

Since school boards, post-secondary institutions and minor sport organizations are held legally accountable for their actions; we suggest that it is important to adopt several evidence-based provisions with respect to the training of the key people involved in the relevant sports programs. Therefore, one of our main recommendations is that anyone who wishes to participate as a coach or student-athlete on one of the designated teams should be required to attend a live presentation conducted by a qualified facilitator/instructor at the school. While some like to provide their training programs online in order to make it easier and more convenient for people, we recommend that it be a strict requirement that all initial training presentations be delivered in a live setting where the workshop leader is able to determine whether or not the material is being understood.

Furthermore, there is no real need for participants to be required to complete a question and answer test to qualify, although this is something that may be required by individual school boards. Nonetheless, let me state again that we strongly recommend that school leaders, coaches and student-athletes be required to be physically present during a training session in order to have the training "validated and witnessed" by a qualified facilitator.

The steering committee responsible for developing the student-athlete concussion management program should establish a process for training its school leaders. Once those school leaders are trained, they will be qualified to facilitate the training for coaches and student-athletes at their school.

Therefore, participation in a training workshop conducted by a School Leader or another designated member of the School Leadership Committee should be mandatory for School Coaches and Community Volunteer Coaches who participate on designated school teams where there is a high risk of concussions. You will find that the Program Development Guide recommends that this training should be mandatory for all members of the coaching staff.

Participation in a training workshop conducted by a School Coach should be mandatory for Student-Athletes who participate on designated school teams where there is a high risk of concussions.

Once a person has taken the training, we recommend that the person's name and relevant information be added to a Local Registry that is maintained centrally by the School Board. The Athletic Department can take on this responsibility for a post-secondary institution. Each person taking the training should also receive a certificate that will be signed by the facilitator who presented the training. This certificate can be used in the future to verify training. We recommend that it is only necessary to complete this formal training once.

Registration on the Registry will be the official confirmation of when and where the training took place as well as the name of the facilitator who verified participation in the training workshop. We know that people will have much more confidence in the training process knowing that this wasn't just a self-administered computer-generated certification that could be obtained online. So, if a person's name is on the Local Registry it means that a qualified facilitator was witness to the completion of the course. This goes for both coaches and student-athletes. Both groups will be included on the Registry.

By following this practice, the school board and/or the athletic department will have clear and definite evidence that they have indeed provided the same training to all coaches and student-athletes and will be able to verify when the training took place and who did the training. The School Leaders will have met the highest of expectations with respect to the Student-Athlete Concussion Management Program and will have proof that it took place.

CONCLUSION

The Partner Approach which is a fundamental element of the Student-Athlete Concussion Management Program Development Guide is an example of creative innovation which simply requires a willingness to think differently about the things we already know. There is nothing new in what we have presented in this Program Development Guide, but we feel we have designed a model which will facilitate healthy discussion and collaboration among steering committee members in arriving at a student-athlete concussion management program which will meet the needs of all school boards, post-secondary institutions and minor sport organizations in Canada and the United States and will provide a standard of care which will ensure the well-being of all student-athletes.

Most concussion management programs require a medical practitioner's clearance before a student-athlete is permitted to return to competition following a concussion. Further, most programs indicate that it is only a health-care provider who can identify a concussion, which is why a health-care provider must provide a signed statement declaring that a person has recovered from the concussion before returning to play.

Unfortunately, more and more doctors are choosing to refer patients who come to them with concussion-like symptoms, to sport medical specialists who have experience dealing with concussions. Some doctors now realize that the nature of concussions makes it difficult for them to know exactly when it is safe for a student-athlete to return to play. If this trend continues, it is going to become extremely difficult for a student-athlete to find an available medical practitioner to provide him/her with the clearance needed in order to return to play. There just are not enough sports medicine specialists available. If student-athletes have trouble getting in to see a doctor, we will soon find coaches and parents/guardians choosing to avoid even attempting to see a doctor except for the most severe of cases. In most instances, the student-athlete does not even feel symptoms by the time he/she gets home from the game or practice and in other cases, the brain damage continues to grow over the days and weeks following the injury, often well after a doctor has provided the clearance to return to play.

The Partnership Approach to concussion management recognizes the fact that a medical practitioner is very limited in what he/she can identify when it comes to a possible concussion. A doctor can diagnose the physical and structural damages such as a fractured skull, swelling of the brain tissue, internal bleeding in the brain from broken blood vessels, and damage to the neck muscles, to name a few, by using MRI and CT scans or by physical examination of the patient. But a doctor is unable to observe the sleep patterns of the patient, or the cognitive deficiencies in the classroom, or the emotional difficulties that have arisen since the injury. When examined by a doctor, a student-athlete may answer a series of questions about how he/she is feeling, but relying upon self admission of symptoms has been found to be very unreliable when it comes to concussions because up to 80% of all concussion victims are not even fully aware of their symptoms.

Therefore, in order to properly identify a concussion we feel it is incumbent upon everyone around a student-athlete to be constantly on the look out for signs, symptoms and behaviours consistent with concussion if there is any reason to believe that the student-athlete suffered a blow to the body or head that may have transferred enough force to the brain to cause a concussion. If we really want to protect our youth against potential life-altering consequences from concussion, we must spread the responsibility among all of the partners who have an interest in the student-athlete.

That includes the parent/guardian, the coach, the classroom teacher, the school principal, the health care professional, the medical doctor, the neuropsychologist, and most importantly, the student-athlete him/herself. Each has a role to play in both the identification and rehabilitation process. We can no longer ignore our individual responsibilities and simply place the onus on the medical doctor. A doctor can only do so much because he/she is not able to observe the patient on a continuous basis. A parent/guardian is in a much better position to notice changes in their child. A classroom teacher is in a much better position to notice emotional and cognitive deficiencies in the student-athlete. A coach is in a much better position to notice sport specific symptoms during a progressive return to play training procedure.

And since the school principal is ultimately responsible for the well-being of the students enrolled at the school, the school principal should reserve permission to return to play until he/she has evidence from the doctor, the parent/guardian, the classroom teachers, the coaches, the neuropsychologist, and the student-athlete that symptoms have subsided and are no longer being generated by physical or cognitive exertion. Only then should the School Leadership Committee (Principal, Vice-Principals and Phys. Ed. Department Head) be prepared to make a decision about giving a student-athlete permission to return to play.

The position we are taking is also one of the statements contained in the **Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012.** The experts who contributed to that report stated that "when assessing a child or adolescent athlete with a concussion, the clinical evaluation by the healthcare professional may need to include both patient and parent input, and possibly teacher and school input where appropriate." We were very pleased to see that there is growing recognition of the fact that parents and teachers can have a great deal to add when it comes to the identification and rehabilitation of student-athletes with concussions.

CHAPTER FOUR

ELEMENTS OF AN EFFECTIVE TRAINING PROGRAM

PREPARATION, IDENTIFICATION & REHABILITATION

INTRODUCTION

Our mission at CMP Concussion Management Partners Inc. is to empower School Boards, Post-Secondary Institutions and Minor Sport Organizations in Canada and the United States to develop a Concussion Management Program that includes the establishment of common standards in the areas of training and certification of coaches and student-athletes as well as effective protocols for concussion identification and rehabilitation. The accomplishment of that mission will help us achieve our vision which is to become recognized as one of the world's foremost resources on concussion management.

We have developed the Hope For Tomorrow Student-Athlete Concussion Management Program Development Guide after extensive research which included an examination of the concerns and challenges which have been expressed by coaches, players, parents, and experts from around the world. We concluded that the main elements that were required in any concussion management program should include but not be limited to the following components:

1. A formal written training program for School Board and/or Organization Leaders;
2. Mandatory video-directed live training of coaches and student-athletes by a qualified leader;
3. Specific Return-to-Learn accommodation guidelines for classroom teachers and student-athletes;
4. Comprehensive Return-to-Play guidelines for coaches and student-athletes;
5. Home Care accommodation guidelines for parents/guardians;
6. Baseline neuropsychological assessment every two years for all student-athletes involved in high-risk sports;
7. Baseline and Post-Injury neuropsychological assessment supervised by a licensed Neuropsychologist;
8. Immediate removal from play upon exhibiting any evidence of universally accepted signs, symptoms or behaviours consistent with concussion;
9. Mandatory examination by a medical practitioner as soon after the incident as possible;
10. Post-Injury neuropsychological test to be administered once initial symptoms have subsided;
11. A Student-athlete should only be permitted to return to competition when the absence of signs, symptoms or behaviours consistent with concussion is confirmed by the

treating medical physician; the student-athlete's parent/guardian; classroom teachers; the coach who is supervising the return-to-play progression; the student-athlete him/herself; the School or Team Leader responsible for the student-athlete; and when the post-injury neuropsychological assessments have returned to baseline levels.

We are pleased to say that the Program Development Guide includes the above as well as numerous other provisions that will ensure that coaches and parents/guardians will be well prepared and qualified to provide a high standard of consistent care with respect to concussion management of student-athletes in school boards, post-secondary institutions and minor sport organizations throughout Canada and the United States.

INTRODUCTION TO THE PARTNER APPROACH

The Student-Athlete Concussion Management Program that is being presented as part of the Program Development Guide is a partnership approach to concussion management that will enable student-athletes to enjoy the benefits of participating in their favourite sports activities knowing that if they happen to suffer an unfortunate injury to their brain, there is a protocol in place which will manage their injury in the most complete manner possible to promote the greatest level of recovery.

There are fundamental elements being presented in the Program Development Guide that are designed to help school boards, post-secondary institutions and minor sport organizations ensure that everyone who has any kind of interaction with student-athletes, before, during or after a traumatic brain injury, will understand their roles and responsibilities and will be able to follow a clear protocol to which all partners will have agreed upon in advance. This partnership approach will provide everyone with access to a level of protection that was once thought only available to professional teams.

THE PARTNERSHIP TEAM

We acknowledge that when it comes to the well-being of student-athletes, there are a number of people who each play a significant role. No one person is any more important than another when dealing with the safety concerns of a student-athlete and if any one of the partners fails to fulfil their responsibilities that failure may have life-altering consequences on a student-athlete who suffers from a concussion.

This training program development guide has been written to provide you with an overview of the general roles and responsibilities of each of the partners in the Student-Athlete Concussion Management Program. Bear in mind that there may be several partners involved at the post-secondary level who may not be involved at the secondary school level in school boards. Also, there are going to be obvious alterations to some of the suggestions in order to accommodate minor sports organizations. Nevertheless, we are going to examine "all" potential partners as if they could be involved in any of the possible situations.

For example, while parents/guardians may not play as significant a role in the identification of concussions that are experienced by their young adult children in post-secondary schools, many of these student-athletes attend university or college while still living at home, or while living at home when school is not in session. They are still, therefore, dependents of their parents. While parents/guardians may not be present to witness the actual injury, they may be very much involved in the rehabilitation process.

Similarly with team physicians and other health care providers such as certified athletic trainers. This level of health support is usually found when it comes to post-secondary athletics, but not so much when dealing with secondary school varsity teams or minor sport organizations. However, more and more school boards are requiring some form of health care professional to be at competitive events, so we will soon see this kind of support along the sidelines of high school games. Many high school games now require the presence of certified athletic therapists.

Therefore, for the purposes of the Program Development Guide, we will address our comments and recommendations accordingly and leave it up to the individual school boards, post-secondary institutions and minor sport organizations to decide on the level of involvement of the various partners we have identified as being included in the partnership approach that is being endorsed at this time.

As mentioned in previously, the focus of the following is going to be on the education sector, but the principles are applicable to minor sport organizations and an appropriate concussion management program can be developed using the majority of the recommendations that follow.

THE SCHOOL LEADER

It is clear from the outset that the School Leaders will have the ultimate responsibility for bringing this program to life within their school. School Leaders will provide direction with respect to administration, record keeping and monitoring of the program at their school. They will not be required to perform all of the tasks, but they will be responsible for delegating authority and responsibilities to appropriate members of their staff.

The official School Leader of a secondary school should be the Principal, who is already the person ultimately responsible for everything that goes on at the school and is therefore the person who is legally responsible for student well-being and achievement.

The School Leadership Committee at a secondary school should consist of the Principal, Vice-Principal and Physical Department Head of the school. Together they will be responsible for overseeing the implementation of the Student-Athlete Concussion Management Program at the school. School Leaders will set the tone for the program at their school and will provide the supervision and support that is necessary for all coaches, student-athletes and teachers.

The Principal will have the option of appointing additional members to the School Leadership Committee if he/she feels more assistance is required or that other individuals may add a certain degree of expertise to the Leadership Committee.

The official School Leader of a post-secondary institution should be the Athletic Director, who is already the person who is responsible for everything that goes on in the Athletic Department. The School Leadership Committee at a post-secondary school will consist of the Athletic Director plus two or more persons who will be appointed by the Athletic Director to assist him/her in the administration of the Student-Athlete Concussion Management Program. School Leaders will set the tone for the program at their school and will provide the supervision and support that is necessary for all coaches, student-athletes and other relevant support personnel. We recommend that the Athletic Director select two or more assistants who are also full or part time employees so that they will all be accessible and also due to the fact that they are therefore accountable to the Athletic Director to begin with.

The official leader of a minor sport organization should be the Executive Director of the association. The Leadership Committee could be two other senior staff members or two members of the Board of Directors. A minor sport organization often has a number of different divisions for various age groups and levels of competition, so the structure of this leadership committee is something that requires a great deal of thought and consideration. For example, the leadership committee may be rather large, but the executive sub-committee may be the small group that is given responsibility for the program.

TRAINING OF SCHOOL LEADERS

With respect to school boards, it is recommended that all School Leaders be invited to attend a special inaugural workshop which will be conducted by a qualified person who will present the entire Student-Athlete Concussion Management Program that has been officially adopted by the school board. This is a good way to launch the program and will ensure that all School Leaders start off with the same baseline introduction.

Members of the School Board Steering Committee should be involved in the delivery of this initial presentation, especially when it comes to providing direction with respect to administrative requirements and procedures. Upon completion of this workshop, the School Leaders will then be deemed qualified to implement the School Board Student-Athlete Concussion Management Program and to train School Coaches, Student-Athletes, teachers and parents/guardians at their respective schools.

When it comes to training School Leaders who were not able to attend the inaugural workshop, or when new Principals, Vice-Principals and/or Phys. Ed. Department Heads are appointed to the school, the School Board will make arrangements for subsequent workshops to be conducted by a supervisory officer or one of the senior School Leaders in the school board. It is also expected that many of the new School Leaders who are appointed to positions of responsibility at a school will already have received their training and qualifications as School Coaches; therefore, they will already be trained.

With respect to post-secondary institutions, whereas the Athletic Director and the rest of the members of the School Leadership Committee should have already been part of the Steering Committee, they will have received their training as part of the development of the program for their school.

THE SCHOOL COACH

For secondary schools operated by the school board, all members of the coaching staff for each of the designated teams, including community volunteer coaches, should participate in a special inaugural training workshop facilitated by one of the School Leaders. Our preference is for the School Principal to conduct this first workshop, but it would be most appropriate for the entire School Leadership Committee to be involved to some extent in the presentation in order to demonstrate their combined leadership responsibilities. The ideal time for this inaugural presentation would be during a professional activity day held at the beginning of the school year.

Everyone who takes part in this session will be deemed certified and qualified to work in any coaching capacity on any one of the designated teams. A person will only be required to attend a workshop once; however, it is up to the School Leader to determine if refresher sessions may be required every couple of years.

Anyone taking the training who has a valid teaching certificate will be designated as a qualified/certified "School Coach". Anyone who does not have a teaching certificate will be designated as a "Community Coach" or a "Community Volunteer Coach" and will be qualified to assume any of the responsibilities on the coaching staff such as coach, assistant coach, general manager, trainer, etc. A Community Coach may be a volunteer from the community or he/she may also be a non-teaching employee of the school board. The main distinction between a Community Coach and a School Coach is the holding of a valid license/certification as a professional teacher.

A School Coach will be qualified to facilitate training courses for student-athletes. A School Coach will also be deemed qualified to administer the baseline and post-injury ImPACT neuropsychological test to student-athletes if this is included in your program.

The School Leader will appoint one School Coach associated with the team to act as Head Coach with respect to the Student-Athlete Concussion Management Program only, and will be called the School Head Coach. This person may not necessarily be the "Head Coach" in charge of the overall operation of the team, but merely for the concussion management component. There must be someone on the team who answers to the School Leader when it comes to the concussion management program.

Please note that a Community Volunteer Coach should not be deemed qualified to be appointed as the School Head Coach. Because of the fact that these are school-sanctioned activities, and since there is a major academic element to this concussion management program, we feel that a staff member with teaching credentials should be responsible for overseeing the Student-Athlete Concussion Management Program for the team.

With no disrespect to the level of commitment, experience or dedication of community volunteers, a Community Coach **should not** be authorized to facilitate the Concussion Management Training Courses or administer the ImPACT test to student-athletes. These responsibilities should be assigned to the School Head Coach or one of the School Coaches.

For post-secondary institutions, we recommend that all members of the coaching staff and any other person who may be involved with any of the designated teams be invited to attend a special inaugural training workshop which will be conducted by the Athletic Director and the other members of the School Leadership Committee. The timing of this session may be most appropriate at the beginning of the school year.

Everyone who takes part in this session will be deemed certified and qualified to work in any capacity on one of the designated teams. A person will only be required to attend a workshop once; however, it is up to the Athletic Director to determine if refresher sessions will be required every couple of years.

It is our recommendation that at the post-secondary level all training of student-athletes, as well as the administration of all baseline and post-injury ImPACT testing be done by members of the School Leadership Committee. This is in no way reflective of the abilities of the members of the coaching staff for each team, but merely addresses the nature of the contractual relationships that usually exist between the Athletic Department and the Head Coach for post-secondary level varsity teams. We would like to remove any doubt about integrity of the training and/or testing, so by removing this responsibility from the team coaching staff, there can be no possibility for accusations coming forward about whether the coaches interfered with the test results to keep players in the game.

The Athletic Director should appoint one person associated with the team to act as School Head Coach with respect to the Student-Athlete Concussion Management Program only. This person may not necessarily be the Head Coach in charge of the overall operation of the team, but merely for the concussion management component.

It will be up to the Athletic Director to make sure that all new members of the coaching staff for each of the designated teams receive the training as soon after joining the team as possible. A policy will have to be developed which will indicate which members of the coaching staff require the training "prior" to assuming their responsibilities.

For minor sport organizations, the issue of who will be authorized to do the training and administration of computerized testing is one that must be addressed. There should be some consistency in order to ensure that the standards are being met throughout the system.

THE STUDENT-ATHLETE

All student-athletes who wish to participate on a designated school team where there is an inherent risk of concussion (which includes just about all teams or activities) should be required to successfully complete the Training Course at least once. It is our recommendation that this be a strict requirement for both the secondary and post-secondary levels. For example, the training should take place once at the secondary level, and then if the student-athlete wishes to play on a post-secondary school level the training should be required again. This recognizes the fact that the student-athlete concussion management program at the two levels may be somewhat different in certain aspects.

It is understood that individual School Head Coaches may require student-athletes on their team to attend a refresher session prior to the beginning of training camp. We actually encourage School Head Coaches to conduct such a meeting in order to emphasize the importance of concussion management and reinforce the need for safe play to reduce the risk of concussions.

In addition, it is recommended that the student-athlete must have completed a valid ImPACT Baseline evaluation that will be no older than two years by the end of the up-coming sports season. This two-year recommendation is for both secondary and post-secondary levels. We feel that if the neuropsychological assessment is going to be included in the student-athlete concussion management program it should be administered every two years to allow for the changes in brain development that occur during this period of life.

THE PARENTS/GUARDIANS

Once again, we acknowledge that the situation will be somewhat different when it comes to student-athletes attending post-secondary institutions, but nonetheless, parents/guardians will play a very important role when it comes to the concussion identification and post-injury rehabilitation protocol of the Student-Athlete Concussion Management Program. In fact, it is our position that the parent/guardian perhaps plays the most important of all roles in the program, especially at the secondary school level. After all, it is the parent/guardian who knows his/her child best and should be the first to notice signs and symptoms of brain injury.

While we do not recommend making it mandatory for the parents/guardians to physically attend a training session, we do suggest that parents/guardians be asked to sign a declaration form that indicates that they are aware of the elements of the Student-Athlete Concussion Management Program and encourage them to read the information that is found on the school board web site. The Steering Committee should develop a self-directed program plan that will provide Parents/Guardians with the full benefit of the concussion management curriculum. The only thing missing will be the facilitator who will be able to witness and verify the parent/guardian's participation.

We also recommend that School Leaders hold at least one Parents/Guardians information session each school year where they will go over the elements of the Student-Athlete Concussion Management Program and raise the awareness level of the seriousness of concussions, especially among young people. This may be a special session that is sponsored by the Parent Council of the school.

With respect to post-secondary schools, we will encourage the development of a Parents/Guardians Guide that can be distributed to the parents/guardians of prospective varsity athletes. This is something that can be part of a "recruiting package" that is provided to secondary schools when the post-secondary institution is conducting its visits to promote their school programs. Most student-athletes select their post-secondary institution while they are still "minors" attending secondary school, so this might be a factor that parents/guardians would find positive in approving the choice of their child.

Training of parents/guardians involved with a minor sport organization may be easier to accomplish since parents/guardians often accompany their children to the sporting events, games and practices.

CLASSROOM TEACHERS

The Student-Athlete Concussion Management Program recognizes that during the rehabilitation process a student-athlete will still be expected to meet certain responsibilities as a student. Because of this, we recommend preparing a comprehensive guide for classroom teachers that will help them make necessary accommodations and adjustments for student-athletes with sport-related concussions. This is an injury that affects brain function; therefore we feel that a classroom teacher, especially at the secondary school level where class sizes are smaller, will be in a good position to recognize signs of lingering symptoms and/or behaviours that must be considered before allowing a student-athlete to return to physical training and competition. It may be more difficult for professors at the post-secondary school level where class sizes are larger, but nevertheless, it is relevant for teaching assistants who may work with smaller groups in lab settings.

The School Leader at the secondary school level should also be responsible for consulting with the student-athlete's classroom teachers and/or guidance counselors before the School Leadership Committee gives their final School Clearance to Resume Physical Training and Competition. If Classroom Teachers indicate that the student-athlete is still presenting signs, symptoms or behaviours consistent with concussion and has not yet reached his/her pre-injury levels academically, then the School Leader should not sign the school clearance to return to physical activity.

We also recommend that School Leaders at the secondary school level hold a workshop training session during a professional activity day once every year or two in order to help classroom teachers become better prepared to meet the challenges of working with student-athletes following a concussion.

SPORT MEDICINE SPECIALISTS

When it comes to post-secondary school varsity sports, we understand that most teams will have their own team sport medicine doctor and/or certified athletic therapist or trainer. Therefore, much of what follows will be more applicable to secondary schools being operated by school boards. However, it is possible that some post-secondary institutions do not have their own "team doctor" and may be relying on a trainer or therapist as their primary on-site medical professional.

In any case, we recommend that each school, at either level implementing the Student-Athlete Concussion Management Program should make arrangements with one or more local sports medicine specialists in the community who have experience in dealing with sport-related concussions. The arrangement should allow for any student-athlete who is suspected of suffering a concussion to receive priority appointments upon request for a thorough examination to determine if there are any structural damages caused by the brain trauma.

Our goal here is to provide student-athletes with immediate access to a qualified medical practitioner who will determine if there are any serious structural injuries such as a fractured skull, swollen brain tissue, or internal bleeding. These are the kinds of damages that can be fatal if not treated quickly. Once we rule out any serious structural damages, we can then focus on the rest of the protocols and procedures in order to engage the student-athlete in a rehabilitation plan that is appropriate.

A Sport Medicine Specialist who is associated with the school should agree to see the student-athlete the morning after the injury, even if the student-athlete saw an emergency department doctor the night before. This becomes very important since there will be times during the rehabilitation process when a student-athlete will be required to be seen by a doctor in order to move to the next step, or if symptoms return following exertion. If it is a challenge to get in to see a doctor, the rehabilitation will be unnecessarily delayed and worse, some of the steps may be skipped or symptoms hidden by the student-athlete in order to get back in the game more quickly. We must try to remove as many barriers as possible.

The School Leader should provide the Sport Medicine Specialist with a copy of the school board Student-Athlete Concussion Management Program Guide so that the doctor has an opportunity to go through the guide and become familiar with the elements of the program. It would be very beneficial if the Sport Medicine Specialist could attend one of the Training Sessions. The Sport Medicine Specialists would then be in a better position to understand the scope of the training that is being provided to School Coaches and Student-Athletes and would also be able to provide some expert insight into the nature of concussions.

The post-secondary institutions may also have the benefit of services from physiotherapists and personal fitness trainers. These are people who can provide valuable services when it comes to the rehabilitation protocols and will certainly be included in the development of any program at the post-secondary level if they are available.

CONSULTING NEUROPSYCHOLOGIST

Any school board or post-secondary institution that makes arrangements with CMP Concussion Management Partners Inc. to provide our consulting services in helping manage a Student-Athlete Concussion Management Program which includes the ImPACT evaluation component will have access to the services of Dr. Michael Czarnota, Ph. D., our CMP Consulting Neuropsychologist, who will supervise and oversee the assessment of neurocognitive tests that are completed by student-athletes. We believe that the inclusion of a neuropsychological baseline and post-injury assessment is critical to helping in the identification of a concussion and then to monitor the recovery progress during the rehabilitation period, and we also believe that these assessments should be done under the supervision of a licensed neuropsychologist.

If a school board or post-secondary institution is going to include neuropsychological assessment, then we recommend that the school board find a local neuropsychologist who is familiar with that particular form of testing. This is the type of injury that requires the attention of a specialist who is familiar with the workings of the brain.

PREPARATION & SAFETY

When it comes to the area of preparation and safety, we must first of all accept the reality that it is going to be impossible to eliminate all incidents of concussions from sport, especially from high contact sports such as football, hockey, soccer and basketball. The best we can hope to accomplish is to make sure that we have done everything possible to reduce the risk of concussions, but regardless of what we do, the element of risk will still exist to some extent.

What we would like to do now is provide you with an overview of the responsibilities that must be assumed by the partners in the preparation and safety component of the program.

THE ROLE OF SCHOOL LEADERS

While much of the actual direct involvement with the student-athletes will be delegated to School Coaches, the School Leader is accountable for what goes on in his/her school and will therefore be expected to oversee and monitor all activities. This is where the School Leadership Committee may divide up responsibilities in order to share the workload, but nonetheless, the School Principal or the Athletic Director will still be held accountable because of the position of responsibility they occupy with their respective institutions.

The School Leaders will work in consultation with School Coaches to designate sports that have a high risk of concussion. These will be the sports that will then be covered under the umbrella of the Student-Athlete Concussion Management Program and as such will receive the required attention that they deserve. At the very least, student-athletes and coaches who participate in designated sports will be required to attend at least one training workshop and the athletes will be required to have a valid baseline ImPACT test done every two years.

School Boards and post-secondary institutions are already responsible for ensuring that student-athletes use appropriate and safe equipment and also for ensuring that the playing facilities are in proper condition. These two things go without saying. If equipment is below standard and playing facilities are dangerous, then it really doesn't matter much what else we do to address safety concerns.

School Leaders should also make sure that the School Coaches and Community Volunteer Coaches are not only trained and qualified with respect to the concussion management program, but that they are also properly trained and qualified to coach and supervise their particular sport. For example, if you are going to be part of the coaching staff for the hockey team, then there should be some minimum expectations with respect to your experience and abilities in this sport. We would recommend that all members of the team coaching staff be required to meet the minimum training & certification requirements that community sport organizations are obliged to honour through their governing bodies. Post-secondary school teams have the added advantage that most of the Head Coaches are under some form of contract with the Athletic Department and come with very high credentials in their respective sports. Unfortunately at the secondary school level, it is sometimes difficult to find people to coach school teams so the qualifications may not be quite as high.

School Leaders should also provide opportunities for classroom teachers as well as parents/guardians to attend information workshops and seminars each year in order to make them more aware of the elements of the student-athlete concussion management program and to better understand their particular roles in the program. These sessions will provide the opportunity to address the "prevention and safety" policies that are being adopted by the institution.

THE ROLE OF THE SCHOOL HEAD COACH

The School Head Coach will make sure that the student-athletes wishing to try out for the team have attended a student-athlete concussion management program training workshop at least once and also that they have had a baseline neuropsychological test within the previous two years. If not, then a School Head Coach will arrange for the student-athletes to attend a workshop and/or take a new baseline test. The School Head Coach will also make sure that each student-athlete wishing to try out for a secondary school level team has brought in a Permission To Play form signed by his/her parents/guardians. This must all be done prior to try-outs and/or training camp.

As for preparing the student-athletes for the season, the School Coaching staff is expected to make sure that the players are physically fit for the type of sport in which they will be participating. This includes making sure that they have a chance to learn & develop the proper sport-specific skills that will be needed.

We recommend that the coaching staff do a "baseline skill level" assessment with each student-athlete. This would involve coming up with some basic drills which are measurable and which involve reaction speed, balance and vision. Student-athletes who are unfortunate enough to suffer a concussion during the season could then measure their rehabilitation progress against the pre-season baseline levels. The coach would be satisfied that the student-athlete is ready to return to physical contact only once the basic skill baselines have been achieved.

The School Coaching staff should ensure that student-athletes are competing at their own level and that they will not be expected to "play out of their league" where their opponents will always be much bigger and stronger. This means that in areas where there are two divisions, a School Coach must make sure that the calibre of his/her players is suitable for the division in which they are entered. It may be prestigious for the school to be in the top division, but if the team is not talented enough to be competitive, then the School Coach must do what he/she can to have the team compete at the lower level. This goes for entering tournaments as well.

As for individual players on the team, if a player is going to be put in danger because of his/her lack of ability or size, then the School Coach must avoid giving this student-athlete a position on the team simply to fill the roster. It is better for a player to be cut from the team because of lack of ability rather than be sidelined for the season and suffer life-long consequences because of a concussion. The School Coach should always make sure that players meet minimum performance requirements with respect to playing ability and if it means playing short-handed, then so be it. This is far better than putting an individual player into a situation where he/she may get seriously hurt just because you have an extra sweater.

Above all, it will be up to the School Coach to show student-athletes how to "play safe" and avoid putting themselves at risk of injury. There are specific techniques and strategies that can be encouraged so that student-athletes are not playing recklessly or at risk of being "blind-sided" in ways that may put them in danger of receiving concussion injuries.

Whereas many concussions occur, or begin during practice sessions, we recommend that student-athletes practice without body contact as much as possible. There is often no need to subject student-athletes to pounding after pounding during practice to toughen them up. If we can reduce the number of hits during a season it will go a long way to reducing the number of concussions.

In addition, School Coaches may have a role to play in making sure that well qualified referees and game officials are available for games involving their student-athletes. This is where their influence will come into play during meetings with athletic associations in that they can encourage proper training programs are in place for officials. They can encourage special training and development programs for officials and get involved in making sure that the officials are qualified to do their jobs.

Finally, School Coaches must ensure that all student-athletes have the proper safety equipment and that this equipment is being worn or used as intended.

THE ROLE OF THE STUDENT-ATHLETE

The Student-Athlete must also share some of the responsibility for being properly prepared for the season. Besides participating in the training workshop and having a valid neurocognitive baseline assessment, the student-athlete should be well-aware of the level of conditioning that is required to perform at his/her peak.

Therefore, remaining healthy and taking part in pre-season training is critical; so too is making sure to eat well and get the proper amount of sleep. Many injuries are the result of fatigue and/or lack of conditioning. These are things that can help prevent concussions from occurring needlessly and they are things that the student-athlete can do for him/herself.

The student-athlete must also show respect for his/her own safety when playing or practicing. There is a difference between playing aggressively and playing recklessly. Little things like being aware of where your opponents are; avoiding turning your back on an opponent when you know you might be hit from behind; developing and sharpening the skills needed for your sport; and avoiding taking part in sports where you know you just don't have the talent or ability to compete safely. All of these things are important for your own self-protection.

You must also avoid taking unfair advantage of opponents during competition and/or your own team mates during practice. Many concussions are caused during practice by players who think it would be funny to play practical jokes on team mates. Often these jokes result in accidents that cause concussions, but in many cases the injured player doesn't say anything for fear of losing respect of his team mates. The first time the player is hit in the next game or practice may result in a repeat concussion which as you will find out later on in this program, can have severe long-lasting consequences. You should also "ease up" during practice and refrain from using contact

force that is more appropriate for game situations. These are your team mates so you should avoid hitting them so hard that you may cause injuries such as concussions.

Finally, taking care of your protective equipment and wearing you helmet properly is critical. Your equipment must fit properly and be in good condition if it is going to protect you as intended. If there is something wrong with your equipment, then you must inform your School Coach or parent/guardian. You must not play with sub-standard equipment just to avoid being forced to miss some action.

THE ROLE OF PARENTS/GUARDIANS

The Parents/Guardians are expected to be aware of their responsibilities. Parents must sign a declaration form that indicates they are aware of the elements of the Student-Athlete Concussion Management Program and give their permission for their child to participate on the school teams, so it is important for them to make sure that it is going to be safe for them to do so.

This means encouraging their children to train properly for the sport and to make sure that their child has proper nutrition and rest while participating on the team. The Parents/Guardians must take on the role of "personal coach and trainer" for their children and understand that the preparations they are responsible for will play a large part in the overall success of the team. Parents/Guardians should show an active interest in their child by attending practices and games whenever possible. They should also check out the facilities and equipment to be confident that their child will be protected and will be playing in a safe environment. If necessary, they should purchase proper equipment if it is not being provided by the school. You may not feel that you should be required to put out this money, but this is your child's future. If it means buying proper equipment to reduce the risk of injury, then it is a small investment to make.

Above all, Parents/Guardians should talk to their children about how the practices and games are going. Find out how they are enjoying the experience and see if there is anything you can do to make it that much more enjoyable. It is important for sport to be a positive benefit for your child, but there are so many demands being made upon student-athletes that he/she may be finding it very stressful and challenging to meet the demands being made upon him/her as both a student and an athlete. Some parents/guardians are able to provide their children with tutors to help them keep up with their academic demands while they are playing sports. Some parents/guardians may also be able to help alleviate concerns that are causing mental and emotional stress and therefore impacting other areas of their child's life.

We also recommend that parents/guardians take a "baseline" assessment of their children in a number of areas around the home that may be affected as a result of a concussion. Some of these assessments may be measurable, while others may be done through observation. For example, take note of the normal volume level that your child uses while watching television or listening to music. A concussion often affects hearing and you may notice that your child is much more sensitive to noise after an injury. The amount of lighting that your child uses while doing homework; the length of time that your child can spend concentrating on homework before getting up; the ability of your child to balance while performing normal everyday activities; the reaction time your child needs to respond to questions and conversation; and anything else that

you as a parent observe as normal activities. After an injury or an identified concussion, you will be in a better position to determine the rate of recovery by assessing your child's post-injury levels of functioning around the home. If your child has not returned to pre-injury levels, then you know that the child has not yet recovered. This baseline may be just as important as the neuropsychological cognitive assessment when it comes to identification and rehabilitation of a concussion.

THE ROLE OF CLASSROOM TEACHERS

While this may be easier said than done at the post-secondary school level, classroom teachers should be aware of who the student-athletes in their classroom are and of the sports in which they are participating.

Student-athletes often require special attention and motivation in order to keep them focused on their school work and academic demands. It is estimated that at least 50% of student-athletes will have received at least one concussion by the end of high school, so by the time they are finished playing at the post-secondary school level, this figure may be upwards of 75% or more. This rate is often higher in sports such as hockey and football. By knowing who the student-athletes are in your class, you will be in a position to perhaps identify subtle changes from the norm which may be a sign of a concussion that has been missed by others.

We would recommend that classroom teachers make a note of baseline levels of performance in their student-athletes. For example, recording the normal amount of time a student is able to concentrate on his seatwork before getting up or being distracted; how often the student answers questions during discussions; how far away the student holds reading material away from his/her eyes; how often the student forgets to bring materials to class; the length of time a student is able to read, or the speed of reading orally; homework completion; grade levels; discipline patterns; etc. There are some very simple assessments that can be made which involve classroom functions that may be affected by a concussion. Once again, during rehabilitation, until the student returns to the baseline levels of functioning, then it may be reasonable to conclude that recovery has not been completed. In fact, it is possible that a classroom teacher may be the first person to recognize signs, symptoms or behaviours consistent with concussion simply by being aware of the "baseline" levels of the student-athlete's classroom functioning.

We cannot overemphasize the above points. It is a proven fact that student-athletes who have suffered one concussion are at least four times more likely to suffer a second and/or a third. Therefore, as a classroom teacher at the secondary or post-secondary level, knowing that at least 60% of the student-athletes in your class have suffered at least one concussion should give you cause for concern. This is the kind of injury where it is quite possible that a classroom teacher may be the first person to notice that a student-athlete has a possible concussion. If so, you have an obligation to notify the School Leader and/or the Parents/Guardians of the student-athlete so that appropriate action can be initiated.

By showing an interest in the progress of school teams and demonstrating sincere pride in the contributions their student-athletes are making to the school community, classroom teachers will receive much more respect and appreciation which will result in student-athletes being more

successful with their studies. Student-athletes will also be more willing to confide in classroom teachers who show an interest in their athletic endeavours. This means that they will open up to their teacher and come to them for help rather than remaining distant. It makes for a much better classroom atmosphere and the student-athlete may admit to some hidden symptoms that should be given attention.

UNDERSTANDING WHAT HAPPENS TO THE BRAIN

We feel it is critical for everyone involved with the Student-Athlete Concussion Management Program to have a good understanding of how the brain functions. You don't need to know all of the scientific terms, but we are convinced that when a player, coach, parent or teacher has a bit of basic knowledge it is easier to appreciate what happens when the brain is injured with a concussion.

To begin with, most of the literature you can find about concussions and concussion management includes all kinds of advice on what to do if you have a concussion, and some of the protocols that should be followed. Most indicate that this is an injury for which there is little knowledge, but research has proven that it is something that we should take seriously. Yet during our research in developing this program, we could find very little information provided on exactly what happens to the brain when it is injured. And the information that you do stumble upon is either too vague or else too complicated to understand.

We feel strongly that when it comes to concussions, what you don't know can hurt you. Therefore, we have put together a special video presentation that will provide you with a brief, easy to understand overview of how the brain is affected when a student-athlete suffers a concussion. It is our opinion that all of the concussion management partners should have some basic knowledge of how the brain reacts to this kind of trauma. We are confident that once you are aware of how the brain works under normal conditions and how it is affected when it suffers a traumatic injury, you will never ignore concussion signs and symptoms again.

Even though we have much more to examine in our Program Development Guide, we think now is a good time to read Chapter Nine – Understanding The Brain. The information in that chapter will give you a better appreciation of the importance of your role as a Partner in the Concussion Management Program.

LEARNING GUIDE…

Therefore, before we go any further, we would ask you to watch the following video: *Understanding The Brain*
The video can be found by going to www.concussionmanagementpartners.com and going to the video section where you will find the three videos that form part of this training program. Once you have completed watching the video you should read over the entire content of Chapter Nine: Understanding The Brain

IDENTIFICATION & REHABILITATION

We are now going to provide a general overview of the protocols and procedures that we recommend should be included in the student-athlete concussion management program for both secondary and post-secondary schools.

If you have had a chance to watch the video and look over the chapter on "Understanding The Brain", you will now appreciate the urgency of all of the partners being "called to action" and a number of protocols initiated at the earliest possible time when it appears as if a student-athlete may have suffered from a concussion. By the time you have completed this module, you should have a clear understanding of what should be done in order to provide student-athletes with the best possible care.

IDENTIFICATION IS NOT ALWAYS EASY

The first thing we should all be able to agree on is that a concussion is a form of traumatic brain injury which is a reaction by the brain to a significant force that occurs not only to the head area, but to any part of the body. The impact of the force is transmitted to the head, resulting in the brain moving back and forth or twisting rapidly, and most often includes the striking of the brain against the inside of the skull.

In most cases, the initial symptoms of a concussion are temporary and resolve over a short period of time. Generally speaking, 80 to 90% of concussions resolve within 7 to 10 days, although children and adolescents tend to take a bit longer, which is why we are more cautious with younger athletes. However, in some cases the symptoms can last for weeks or longer and may not even present themselves for hours or days after the incident. It is quite possible for the symptoms to be so brief that the student-athlete may actually appear fine immediately after the incident and feel that there was no concussion at all.

One of the things that is most dangerous about concussions is that the brain may begin the recovery phase without the knowledge of the student-athlete and without any visible signs or symptoms. This is an incredibly terrifying injury because of this one fact. As partners in the concussion management program, we may know full well what we have to do once a concussion is identified, but if a concussion can occur without any obvious signs or symptoms, how can we take the necessary steps to start rehabilitation when we don't even know an injury has occurred?

What makes this even more of a concern is that the immediate emergency measures that the brain engages in to begin the recovery process whenever an injury occurs leaves it in an extremely vulnerable state. We also know that adolescents and young adults are more susceptible to concussions and may take longer than adults to fully recover in the first place.

Therefore, if we are unaware that an injury has occurred which has triggered a response inside the skull, it means that the student-athlete is in danger of permanent damage if he/she is re-injured while in this state. Because of this it is absolutely imperative that we do everything we possibly can to reduce the chances of a concussion going unidentified.

We acknowledge that there may be some student-athletes who will be forced to go through the entire identification and rehabilitation process even though it may eventually be concluded that they did not have a concussion in the first place. This is unfortunate, but we must make it perfectly clear that a basic principle of any good concussion management program is that we would rather remove a player from play needlessly for a short period of time rather than risk allowing a player who is injured to play prematurely and end up with permanent brain damage because we missed the signs. We simply cannot allow this to happen.

In defence of this conservative approach, we must keep in mind that some recent studies out of the University of Michigan indicates that when dealing with concussions, the lack of symptoms may not necessarily be an indication that all is well inside the brain. In fact, there is growing evidence that a concussion is not the result of a single trauma, but rather an accumulation of damage to the brain that builds up over time to the point where signs, symptoms and behaviours that are consistent with concussion emerge.

In one study at the University of Rochester, nine athletes who played football and hockey were part of a group that included six others who did not play sports. Only one of the nine athletes was "officially" diagnosed with a sports-related concussion during the study period, but when post-season scans were done on all of the members of the group, six of the other athletes showed results that were closer to the person with the concussion than to the normal brains of the six who did not play sports. This means that although the six athletes did not receive an "identified" concussion during the season, their brains were in fact damaged and were approaching concussion levels.

In fact, there is growing acceptance within the medical profession and among researchers that there is a cumulative effect when it comes to concussions. There is no way of really knowing how many concussions or sub-concussions a person has had in his/her life, sport-related and otherwise, and it is possible that at some point serious symptoms may emerge that are permanent because of this build up of damage.

DIFICULTY SEPARATING IDENTIFICATION FROM REHABILITATION

Therefore, we must proceed with caution when it comes to concussions since it is very difficult to separate identification and rehabilitation protocols. This is due in large part to the fact that traumatic brain injury is a "hidden injury" that may take some time to identify. Signs and symptoms may not present themselves for hours or days following an incident. However, while we wait for signs and symptoms to be evident, the brain is undergoing an internal repair process that leaves the student-athlete extremely vulnerable to long-lasting consequences from further injury.

Therefore, we take the position that the "identification & rehabilitation" protocols are to be dealt with together. We include the identification of a concussion as the first stage of rehabilitation. The mere suspicion of a concussion is enough to initiate the protocols.

At the same time, during the rehabilitation or recovery period, we are continually attempting to identify signs, symptoms and behaviour that are consistent with concussion as a way of

measuring the progress of the recovery. Rehabilitation consists of physical and cognitive rest or at the very least making accommodations at home and at school that will reduce the level of physical and cognitive exertion that may cause symptoms to return or intensify. Our job as partners is to attempt to identify signs, symptoms and behaviours consistent with concussion at all times which is why it is hard to separate identification and rehabilitation. When we are finally unable to identify any further signs or symptoms, we may then be able to say that recovery is as complete as one can expect with brain injury. Unfortunately, even at this point, it may just be that the damages have recovered to the level where signs, symptoms and behaviours consistent with concussion have subsided and are no longer detectable. However, any little blow might change everything and cause even more damage than with the original injury.

ALWAYS ASSUME AN INJURY HAS OCCURED

Once a concussion has been "suspected", whether from signs, symptoms or behaviours that have been observed by partners; from the self-disclosure of symptoms from the student-athlete; or even simply because the student-athlete has received a significant blow to the head or body, we should take the position that a concussion has been "identified" until we can prove otherwise. The suspicion is all we should need to justify initiating our rehabilitation protocols as if the concussion has been identified.

This is the opposite of "innocent until proven guilty". When dealing with brain injury, we must assume the principle of "guilty until proven innocent". In other words, if we think a person may have a concussion, we must assume the person has a concussion until we have sufficient proof otherwise. If we think the worst there is less likelihood of us placing the student-athlete at risk of re-injury and life-altering consequences.

This is an important point! We simply cannot wait until we have done all of the steps necessary to identify an injury to the brain before beginning the rehabilitation process. If we "suspect" the "possibility" of a concussion, then we must begin the rehabilitation procedures and immediately take precautionary steps "just in case" our suspicions prove accurate. That means immediate removal from any further activity until we are sure the student-athlete can return to play safely.

If we wait for the moment of absolute certainty before implementing appropriate protocols, we may end up putting an injured athlete at risk of permanent damage. If we happen to begin the rehabilitation process and eventually find out in a few days that there is no positive evidence of a concussion, then what damage have we done? Nothing!

INITIATING THE PROCESS

If a student-athlete receives a blow to the body or head during practice or competition that in the opinion of any one or more of the School Coaches, the Community Volunteer Coaches, a Parent/Guardian, a health care professional, or a School Leader, may have been sufficient enough to have caused a concussion, then the player "must" be observed extremely closely in the period immediately following the incident. Everybody must go on alert!

This period of "watchful waiting" for signs and symptoms to present themselves is extremely important. We want to avoid "jumping to a diagnosis" every time a student-athlete experiences a blow to the body or head, but the moments immediately following a blow to the body is a very critical period and things may happen quickly. Therefore, we do not want to miss out on any of the obvious or subtle signs of concussion.

If any of the universally accepted signs, symptoms or behaviours of concussion are evident, then the player should be removed from further play and the Student-Athlete Concussion Identification & Rehabilitation Protocol will be initiated immediately.

PARTNER APPROACH TAKES OVER

Keep in mind that everyone must be on the look out for the following signs when a student-athlete suffers a serious blow to the head or body. We will once again acknowledge that not all hard hits will result in a concussion. In fact most physical contact during competition and/or practice will be fine and players will simply continue to enjoy the game.

Therefore, as mentioned previously, we are not suggesting that every time forceful contact is made with a student-athlete we should be pulling the player from the game. However, knowing what we know about concussions, and especially when we are now aware of the fact that upwards of 80% of all concussions go unreported when they first occur, it is critical that all Partners be on the lookout for tell-tale signs of concussion after a significant blow to the body or head has occurred. The student-athlete may not even be aware of the signs him/herself. However, there are enough other people around who know what to look for so someone should spot any problem.

We should also keep in mind that the signs we are looking for will either be cognitive or physical, or a combination of both.

LOSS OF CONSCIOUSNESS IS AUTOMATIC

It goes without saying that if the student-athlete loses consciousness, even for a few seconds, there is to be no further observation. We will automatically assume that the person has suffered a concussion and will immediately initiate the protocols.

Furthermore, if the student-athlete does lose consciousness, you must look closely to see if he/she has a possible fractured skull, blood draining from an ear, or clear fluid from the nostrils. In that case you should call for an ambulance immediately and not take any chances. Otherwise, you should recommend that the parent/guardian or some other responsible adult take their child to the hospital for immediate medical attention. We do not fool around with loss of consciousness.

Other than loss of consciousness, if any of the following are observed, we should assume that a concussion has occurred until we have evidence to the contrary. These signs may not be all that obvious to all partners. For example, a coach may not have seen how hard the player was hit, or may have to deal with other matters on the bench. However, with so many coaches, assistant

coaches, trainers and parents/guardians or teachers usually in attendance at the game, someone should be able to spot the danger signals.

SIGNS TO LOOK FOR

We should never ignore any change in the mental status of a student-athlete. Headaches, dizziness, blurred vision, disorientation, fatique, memory loss, or confusion are classic signs and symptomsof the following signs. Whether it is during a game, after the game, or at home, if a coach, parent/guardian or teacher becomes aware of the following, then we should suspect that a concussion may have occurred and initiate the protocols that will be described later on in this chapter.

If the student-athlete:

- appears to be dazed or stunned immediately after the incident, even if only for a few seconds;
- seems to be confused about his position or assignment during the game or on the bench;
- is not sure of the score, the period, the opponent, the time, etc. when questioned by coaches;
- seems to move clumsily on the field/ice or around the bench/dressing room, displaying balance issues;
- responds to questions with a bit of hesitation or not at all, demonstrating a delay in processing information;
- seems irritable or displays uncharacteristic mood/personality changes which are out of the ordinary;
- can’t recall the play where he got injured, even if he says he is fine;
- can’t recall what happened after he got injured;
- seems easily distracted with poor concentration;
- has a vacant stare or seems to have glassy eyes;
- is slurring his speech;
- seems to be having minor convulsions or seizures;
- seems fatigued or says he/she feels like sleeping;

Once again, we remind you that these signs may not present themselves right away. Therefore, if you are speaking with your child at home and he/she cannot recall the score of the game or the

play where he/she got injured, or if any of the above signs described above show up, then you should suspect a concussion and be extremely watchful for further signs. You should also let the coach know immediately if you feel that protocols should be initiated.

SYMPTOMS TO LOOK FOR

Besides the "signs" that may be evident, if the student-athlete reports any of the following symptoms, the School Coach or the Community Volunteer Coach must remove the player from further play. Symptoms will usually be identified by the student-athlete but he/she may not articulate the symptom clearly. We must be able to "read' the student-athlete.

The following self-admitted symptoms are absolutely serious enough to assume a concussion has occurred and the Concussion Identification Protocol should immediately be put into action. We remind coaches, parent/guardians and teachers that you may have to prompt these responses with questions to the student-athlete.

If the student-athlete:

- complains of headache or pressure inside the head, even if it is only a slight pain;
- complains of dizziness or trouble keeping his balance;
- is feeling nauseous or feels like vomiting;
- complains of vision problems;
- states that he is unusually sensitive to light or noise;
- complains about feeling sluggish, foggy or groggy;
- says he/she is feeling confused;
- says he/she is just not feeling right;
- says he/she is seeing stars;
- complains about a ringing in his/her ears;
- is unable to recognize people or places;
- complains of a weakness or numbing in the arms or legs;
- complains of having a metallic taste in his mouth;

Once again, we remind everyone that these symptoms may not present themselves right away. It may be minutes, hours or days before the symptoms occur. It is also possible that a parent/guardian may not even be aware that their child was injured in the game if he/she was not

in the stands. However, because your child participates in a sport where the risk of concussion is high, if he/she suddenly begins to complain about feeling confused, or there is a sudden change in the child, you really should not pass it off as nothing. You should communicate your findings to the appropriate authorities so that the rehabilitation process can be initiated. Remember that it is always better to be safe than sorry.

HIDDEN SYMPTOMS

The greatest challenge when it comes to identifying a concussion is that so few symptoms are visible to the casual observer. Many times the symptoms of a concussion may not be identified until there is increased exertion which causes symptoms to worsen. It may be something as simple as the ringing of a bell to change classes or the ringing of a phone that triggers a symptom.

Studies have shown that as many as 4 out of 5 professional athletes do not even know that they have been concussed so imagine how difficult it is for an adolescent or young adult to be able to understand what is going on in his/her brain?

This is why one of our goals is to make sure that all adults who are involved in any way with student-athletes are as prepared as possible to look for the signs of concussion and then take appropriate action to remove the player from further play to avoid the possibility of further damage. We must all become "concussion detectives" when dealing with student-athletes.

We recommend that even if there are no apparent signs and the student-athlete reports no symptoms, if a School Coach, the parent/guardian and/or the School Leader has a strong suspicion that a particularly hard blow to the body or head area may be cause for concern, then it is at the discretion of any one or more of them to initiate the protocol and request that the School Coach remove the player from further action. This may not always sit well with the student-athlete who feels fine after the hit and argues that he/she is all right. It may even be seen as over reacting, but this is something that all partners must agree with and understand right from the beginning.

We will always err on the side of caution. Even if it means going through the steps of the rehabilitation protocol to find out that there is no evidence of concussion, it is worth the inconvenience for a week to be sure that there is little risk of long-term damage to the student-athlete.

We will never be upset with a person who initiates the protocol. It will be clearly understood that you are acting out of care and concern for the student-athlete and if it turns out to be a false alarm, we won't be upset. We will be happy that there is no damage.

There is, however, no excuse for ignoring obvious signs and symptoms. We feel that with so many "partners" looking out for the safety of the student-athlete, someone will see a sign or recognize a symptom if it comes up. The last thing we want anyone to say is that they "should have noticed" or "should have paid attention" to signs and symptoms. Concussions are brain

injuries. Your brain controls everything that goes on in your body and your mind. Permanent damage will change your life forever, so we won't take any chances.

SIGNIFICANT CHALLENGES WITH STUDENT-ATHLETES

When it comes to identifying concussion in student-athletes, we run into several other significant challenges, some of which we have already described:

1. ***Student-athletes may have sustained a concussion and may actually not be aware of it at the time.*** As has been mentioned, many symptoms may not appear for hours or days after the incident. This is why it is so difficult to identify a concussion, but the School Head Coach and his/her coaching staff must do everything they can to spot the tell-tale signs. We have a lot of eyes on our student-athletes, at the game, at home and in the classroom. It should be pretty hard for signs to go undetected. However, the student-athlete may not be the most reliable person when it comes to self-declaring an injury.

2. ***Student-athletes may think there is something wrong but haven't told anyone about how they feel in order to remain playing.*** Teenagers and young adults are natural risk-takers and they get a "chemical rush" in their brains from playing sports. They may even try to hide symptoms for a while, but a careful observer should be able to spot some signs that would indicate trouble. The student-athlete has also agreed to abide by the Student-Athlete Concussion Management Protocols in order to be on the team, so just remind him/her of this commitment if there is any arguing about being pulled from the game.

3. ***Student-athletes may think there is something wrong but haven't told anyone about how they feel because they are unable to articulate their symptoms.*** Once again, careful observations by our partners after a significant blow to the head or body should be able to identify subtle signs of concussion. It is also why we ask Coaches to "talk" to the student-athlete when he/she comes to the sidelines. All the person needs to tell you is that he/she doesn't feel right and that is enough to initiate the protocol. Again, please make sure that student-athletes must let their coach or parent know when something just doesn't feel right.

FUNDAMENTAL PRINCIPLES OF REHABILITATION

BOTH PHYSICAL AND COGNITIVE REST

At the present time the accepted treatment for concussion consists of both physical and cognitive rest until all symptoms have subsided. Most people can understand the physical rest requirement, but experts point out that cognitive or brain rest is just as critical, especially during the first several hours and days.

We have already discussed how the brain may continue to deteriorate following an injury, and since the conditions in and around the brain after an injury are not all that conducive to healing,

considering the decreased blood flow to the brain after an injury, it is absolutely imperative that we reduce as much as possible any unnecessary activity that will cause the brain cells to experience any form of stress, no matter how trivial it may seem.

This means that when an injured student athlete goes home after the injury, there should be no television or radio, no use of the computer, no cell phones or text messaging, no reading, no MP3 players, and no playing of video games. You must also keep your conversations to a minimum in order to give your brain complete rest and allow healing to take place.

Any stimulation in the first 24 hours could seriously jeopardize the rehabilitation process. The student-athlete should go home and get some rest, in a quiet, dark room. This is the case even if the student-athlete says that he/she is no longer feeling any symptoms by the time he/she arrives home. And by all means, if symptoms seem to get worse or more intense as the evening goes on, the parents/guardians must bring their child to the hospital for an immediate check-up. Time is of the essence when you are dealing with serious brain injuries.

This restricted activity is easier to enforce at the secondary school level where the child will usually live with his/her parents/guardians. For post-secondary school student-athletes, it might be advisable to designate a "significant partner" who will accept responsibility for "reminding" the student-athlete to take it easy.

The student-athlete must avoid any physical activity that requires exertion. Slow, short walks would be fine, but there should be no running or activity that results in an increased heart rate which would increase head pressure. That is why weight training or doing anything that causes strain on the muscles must be avoided. Also you must get plenty of sleep and be prepared to take frequent naps or rest periods during the day. The student-athlete should take it easy for a full day before even thinking of going back to school.

MEDICAL EXAMINATION

Every student-athlete who suffers a traumatic brain injury that may have resulted in a concussion must be seen by a medical practitioner before returning to any form of physical activity which will involve exertion. The severity of the injury and the signs and symptoms that present themselves immediately following the incident will determine the urgency of this visit to the doctor.

For example, if the student-athlete lost consciousness, he/she should be taken to the emergency room right away that evening. If the symptoms are not too severe and they do not appear to be getting worse as the time goes on, you can wait until you are able to see your family doctor or the school sports medicine specialist the next day or two. Nevertheless, it is always necessary to be examined by a doctor who will be able to check for structural damages such as a fractured skull, internal bleeding or swelling of the brain, all of which could be extremely dangerous if not treated properly. The doctor may also perform several other examination procedures in order to confirm the concussion, but it is the structural damage that he/she will be able to diagnose immediately.

Whereas a concussion is more about functional impairment, physical and cognitive rest is the best rehabilitation treatment. We just want to make sure that there is no structural damage. You cannot skip the examination by a doctor of medicine.

Far too many student-athletes have mistakenly assumed that a lack of symptoms meant that the brain has returned to normal, when in actual fact the blow they took in the first place merely raised the pressure inside the skull to a dangerous level but not fatal. Those student-athletes were walking time bombs, just waiting for another minor jolt to the head or body that would push the pressure beyond the point of no return. We don't want that to happen, which is why it is so important to see a medical practitioner to make sure that there is no abnormal internal pressure in the brain.

RISK FACTORS THAT MAY AFFECT RECOVERY

In addition to everything else, it is important for everyone to be aware of any factors that may put the student-athlete at higher risk and thus prolong the recovery or have an impact on the rehabilitation program.

These risk factors include:

- any previous history of concussions as well as the date of the most recent one if known, especially if it is possible that the student-athlete was still recovering from a recent concussion;
- any history of learning disabilities or developmental disorders;
- any personal or family history of headaches, especially migraine headaches;
- any history of depression, anxiety or mood disorders.

Parents/Guardians are reminded that if symptoms worsen or show no indication of getting better after seven days, then it may be wise to have the student-athlete see a specialist in traumatic brain injury. Our rehabilitation protocols are designed to keep the student-athlete at rest in order for symptoms to resolve themselves and healing to take place inside the brain. However, if the symptoms begin to get worse and you cannot see how the student-athlete is doing anything to aggravate the symptoms, then it may be wise to see a specialist.

THE MOST IMPORTANT PERSON IN THE PROCESS

The student-athlete will be advised to adhere to some or all of the following suggestions which may address their real needs and challenges while suffering from the symptoms of a concussion. There are a lot of elements to a successful rehabilitation process, but the most important person in this whole program is the student-athlete. Who knows more about the progress of the treatment program than the student-athlete him/herself?

This is why we always recommend that the student-athlete can help him/herself on the road to recovery by simply making a few lifestyle alterations.

Most student-athletes will feel a bit sad or even angry about having to limit their physical activities or even about having difficulties keeping up with their school work. They should be constantly reassured that everything possible is being done to get them back to full physical and cognitive activity as soon as possible while avoiding activities that may prolong their recovery period. The more student-athletes know about what is happening in their brain during this period, the easier it will be for them to understand the importance of following the program.

RECOMMENDED PROTOCOL

IMMEDIATE REMOVAL FROM PLAY

Once it is suspected that the student-athlete may have suffered a concussion and he/she is removed from play, a responsible adult must remain with the student-athlete at all times. It is preferable that the student-athlete be taken away from the actual playing area and brought into a quiet area such as the dressing room.

STUDENT-ATHLETE MUST GO HOME WITH AN ADULT

It is very important to remember that a Student-Athlete who is injured and has a suspected concussion must always be taken home by a responsible adult. If the parent/guardian is not at the game or practice, then you must try to contact them and see if they can come and pick up their child. If not, then it is important that another adult take responsibility for bringing the child home and making sure that he/she is not left alone.

Under no circumstances should the student-athlete drive him/herself home or be left home alone.

GO TO HOSPITAL IF CONDITIONS CHANGE

It is not always necessary to go to the hospital the night of the injury. However, if the student-athlete lost consciousness for even a brief period of time, you must get the student to the hospital to be checked for structural damages.

Also, once the athlete is brought home, if symptoms worsen during the evening, then it is strongly advised that the child be brought immediately to the hospital. We never want to take chances when symptoms begin to get worse. And, once at home, the child should never be left along during that first night.

INJURY PACKAGE FOR PARENT/GUARDIAN

At the secondary school level, it is recommended that the School Head Coach fill out an injury assessment notice and will provide the parent/guardian with an Injury Package that contains a number of clearance forms that will be needed in the coming days and weeks as the student-athlete goes through the rehabilitation process.

The injury assessment note should describe the nature of the injury and inform the parent/guardian that the Concussion Management protocol has been initiated for their son or daughter.

Some school boards, post-secondary institutions and minor sports organizations may recommend giving the injured student-athlete a sideline concussion assessment such as a SCAT2 test if the Coach has been trained in how to administer such a test or if there is a health care professional in attendance at the game. This can provide useful information on the condition of the student-athlete immediately after the injury.

Nevertheless, all that is needed is a bit of information about the incident that took place causing the injury and whatever details can be provided to outline the signs and/or symptoms that were observed or admitted which resulted in the protocols being initiated.

The Injury Assessment Notice should also contain instructions for the parent/guardian with information about the clearances and conditions that are necessary in order for the student-athlete to be permitted to return to play. If the parent/guardian is at the game or comes to pick up their child, then the package can be given directly to the parent/guardian along with a verbal explanation of what must take place as the rehabilitation process unfolds. The Parent/Guardian should be aware of his/her responsibilities, but this notice will serve as a reminder.

The documents included in the Injury Package may include the following:

An Injury Assessment Notice
A medical clearance form to be signed by a doctor;
A parent/guardian clearance form;
A student-athlete declaration form;
Notification to Classroom Teachers.

RECORD KEEPING IS CRITICAL

At the earliest opportunity, the School Head Coach will provide the School Leader or designate with full details about the injury. A copy of the Injury Assessment Notice will be sufficient if there was time to make a copy at the game. The School Leader may also have some other administrative accident report form that is preferred.

The School Leader or one of his/her assistants will begin a special file for the student-athlete in order to gather all of the relevant documents, clearance forms and reports that may be forthcoming as a result of the initiating of the concussion management protocol.

It is important that we document all steps in the process and we keep accurate and complete records. We have a responsibility for the well-being of every student enrolled at the school and we must always be certain that we have done everything possible to fulfill our responsibilities. The student-athlete file is something that we can turn to in the future when making decisions that are in the best interests of the student. For example, it may be noted that a particular student has suffered several concussions in the previous year or two. That may have a tremendous influence in the School Leader's final decision on whether or not to give the student-athlete clearance to play for the school team.

NEUROPSYCHOLOGICAL ASSESSMENT

One of the cornerstones of many programs today is the use of the ImPACT neuropsychological test. ImPACT (Immediate Post-Concussion Assessment and Cognitive Testing) is a computer-based battery of tests developed specifically for assessing sport-related concussion. The computer program measures multiple aspects of cognitive functioning, including attention span, working memory, sustained and selective attention time, response variability, and several facets of verbal/visual memory. This will register a "baseline" record of abilities of student-athlete with which to test against should they suffer a possible brain injury during the season.

LEARNING GUIDE…

If you haven't already done so, in order to learn more about this test, you should read Chapter Ten: Baseline & Post-Injury Assessment. This will give you a good overview of the ImPACT assessment, which is something that you student-athletes should have done every two years as part of the concussion management program. This baseline data is critical to have if a concussion occurs during the season. When you have finished reading Chapter Ten, you will continue reading the rest of this Chapter.

POST-INJURY ImPACT TEST

If the school board has asked CMP Concussion Management Partners Inc. to manage its concussion management program, then the following procedures will be followed with respect to the post-injury ImPACT assessment.

At the secondary school level, the Parent/Guardian will be advised to contact the School Head Coach within 24 to 72 hours to arrange for a post-injury ImPACT test to be given to the student-athlete at the school. At the post-secondary school level, the School Head Coach will contact the student-athlete directly and arrange for this test to be completed.

When the parent/guardian brings in his/her child for the post-injury ImPACT test, it critical that that this test be done in a quiet place without distractions. The student-athlete will already be feeling pressure to perform well on the test or face a lengthy rehabilitation process which may keep him out of action for the rest of the season. Conditions must be perfect so that the student-athlete can do the test in as relaxed a state as possible.

The School Leader or designate will notify CMP (Dr. Czarnota will give the School Leader a contact email and/or phone number) that a post-injury ImPACT test has been submitted and will provide all of the necessary details about the incident and the student-athlete involved. This information will normally be sent by email and the School Leader or designate must make sure that he/she receives confirmation that the message has been received. Follow up if confirmation does not come within a reasonable amount of time.

If the results of the post-injury ImPACT test show evidence of diminished functioning as compared to the student-athlete's baseline score, CMP will advise the School Leader or designate that clearance to return to physical training should be delayed until another test can be performed at a date that will be recommended by CMP.

The School Head Coach should then notify all of the student-athlete's classroom teachers about the incident and remind teachers about the Guide for Teachers which is an important part of this document. This goes for both secondary school and post-secondary school situations.

The School Leader or designate will administer subsequent post-injury ImPACT tests as directed by the CMP Consulting Neuropsychologist or the local sport medicine specialist. Once the test results have returned to baseline levels, the CMP Consulting Neuropsychologist will so advise the School Leader or designate of the return to baseline.

Please note that the CMP Consulting Neuropsychologist will not be giving an official "clearance to return to physical training" because there is so much that we do not know about the student-athlete. The responsibility that has been taken on by our Consulting Neuropsychologist, Dr. Michael Czarnota, is to examine the post-injury test results and let the school know when the student-athlete's scores have returned to baseline levels. This would be a sign that the cognitive functioning in the areas covered by the ImPACT test has been restored to pre-injury levels according to the test results.

This is an important thing to keep in mind. Just because the ImPACT test results have returned to baseline levels, one must not automatically assume that the student-athlete has recovered sufficiently to resume physical exertion. It is a good sign, but it is not an absolute sign.

Nevertheless, the return of the ImPACT results to baseline levels is a significant sign that cognitive functioning has been restored to baseline levels. Until then, it should be assumed that there are still problems going on in the brain and the student-athlete should limit his/her physical and/or cognitive stress levels.

RESUMPTION OF PHYSICAL TRAINING

For school boards, we are recommending that as well as the notice that the ImPACT test results have returned to baseline levels, the School Leader should have received all of the clearance forms before allowing the student-athlete to resume supervised physical training which will involve significant exertion leading to contact and competition.

It is expected that the School Head Coach will make sure that these forms are collected and brought to the School Leader. It will be the responsibility of the Student-Athlete's parent/guardian to bring the forms he/she received in the Injury Package back to the school.

If after receiving all of the above forms, and after talking to the student-athlete him/herself, the School Leader or designate is completely satisfied him/herself that the student-athlete has recovered sufficiently from the concussion; the School Leader may then issue a School Clearance to Resume Physical Training and give this clearance form to the School Head Coach.

At the post-secondary level, it is expected that there will be some sort of physical education training centre on campus and that the student-athlete will have access to the services of a personal trainer who is assigned to work with the team. That being the case, we feel that the student-athlete may be able to begin some low-level physical activity such as walking, riding the stationary bike with no resistance, etc. Until the proper clearances are received, this should be all that the student-athlete is allowed to do and only if supervised by a personal trainer.

STEP-BY-STEP RESUMPTION OF TRAINING SUPERVISED BY COACH

You will most likely hear a lot about something called a Six-Step Progressive Return-To-Play Guide. Don't get too hung up on how many steps you include in your concussion management program, but you should ensure that you don't miss any of the critical steps.

Obviously, the first step when you experience a concussion, or a "suspected concussion", is to cease all activity of any kind. This means avoiding physical or cognitive activity that will stimulate your brain and bring back or worsen symptoms. This does not mean living in a "dark room" under a bubble, but it does mean that you need to severely limit school work or anything else that requires you to concentrate, such as playing video games, texting, watching television, etc. You should also see a doctor as part of this first step so that you can rule out structural damages that may become serious.

Once your doctor has indicated that there is no structural damage, and there are no further symptoms present while at rest, you will be cleared to begin light exercises such as walking or using the stationary bike (without any resistance). You can do this at home or on your own, gradually increasing the duration and frequency to stimulate your blood flow and assist in the healing process. Remember that if symptoms return, you must go back to complete rest until the symptoms have subsided.

You can then begin training under the supervision of a coach or athletic therapist who is familiar with the concussion management program. This should begin with light aerobic exercises such as walking or stationary cycling that gradually increases in length "and resistance".

If there is no recurrence of symptoms, then this will progress into the next step which will include sport-specific training, such as skating in hockey; running in soccer, throwing the ball in football, etc. At this stage the student-athlete should be working on the specific skills that will be needed in the particular sport to which he/she is going to return. At this stage there should still be an avoidance of any accidental contact or blows to the body or head. You cannot be jolting your

brain yet by doing high speed stops and starts, changing direction quickly, or hitting the ball or puck with any kind of force (no batting practice and no slapshots in hockey).

It must be noted that in each of the progressive steps stated thus far, if the activity causes any symptoms to return, then you must revert back to the previous step for at least a full day to allow the brain to settle down again. If, however, the symptoms do not subside, then you must immediately see a doctor to see what is going on.

If no symptoms return while performing the sport-specific skills, the student-athlete will progress into non-contact training drills. This can be done with team mates who understand that under no circumstances is there to be any contact, whether that contact is accidental or deliberate. This is extremely important for the team to know and accept. Some players wear a special coloured sweater to remind team mates not to hit.

If the School Head Coach, the Parent/Guardian, the supervising trainer, and the student-athlete are satisfied that the step-by-step progression has been successful and there has been no return of concussion-like symptoms during the non-contact training, and if the doctor has issued a medical clearance for the student-athlete to return to competition, the School Head Coach will meet with the School Leader to recommend that the student-athlete is ready to return to full contact practice and subsequent competition. If the School Leader accepts the recommendation, he/she will issue a School Clearance to Resume Athletic Competition and the student-athlete will be permitted to return to full contact practice and then to game competition when the coach feels he/she is ready.

The Parent/Guardian will play a role in this physical training program and will monitor the student-athlete for any signs that symptoms are returning. Home observation is critical at this point because the student-athlete may actually be reluctant to report any return of symptoms to the coach and thus be forced to sit out longer.

The School Coach will then be even more observant of the student-athlete who returns to play following a concussion. It is well documented that once a person receives a concussion, it takes much less force to suffer a subsequent concussions. Therefore, the School Coach must work with the player to help him/her play safer and be constantly on the look-out for symptoms that may return. We don't want student-athletes to play scared, but the reality is that once concussed, you are more likely to be concussed again.

There will be a number of places where student-athletes will be asked to get clearance from a doctor to progress to the next level. We know full well that it is difficult to see a doctor who is familiar with concussions. We do, however, feel that before the school or minor sport organization gets involved in any of the "supervised" progressive steps, the doctor must have issued a clearance to do so. We know that the doctor will only issue that clearance if there are no observable signs of structural damage. It is not that we feel the functional damage done to the brain is any less significant, but we want to make sure that there are no life-threatening conditions present when we begin the progressive steps to returning the athlete to play.

The most important thing to remember is that before "any contact" practices are attempted, we must make sure that the parents/guardians, the classroom teachers, the consulting

neuropsychologist (if part of the program), the supervising trainer/coach and the student-athlete are all satisfied that there are no further signs, symptoms or behaviours consistent with concussion following the completion of all of the steps leading up to the point where the student-athlete seems ready to engage in contact and competition. If the medical doctor can be seen for a final confirmation, then that would be wonderful and is definitely recommended. However, we do understand the reality that the medical doctor may not be readily available, but if he has already cleared the student-athlete to return to play based on his initial examination, then as long as symptoms have disappeared, This becomes a judgement call. The doctor is not going to be able to as much about the condition of the student-athlete as the other partners who have been working with and closely observing the child during the time following the injury. If the School Leader is satisfied that all other partners have provided their clearances and assurances that the student-athlete no longer displays signs, symptoms or behaviours consistent with concussion, then we feel that the School Leader should be the one who makes the final decision about whether to allow the student-athlete to begin full contact practices and competition.

The reason we are recommending that the School Leader, namely the Principal of the school, be the one to make the final decision is because this is consistent with the current responsibilities of the Principal under legislation. The Principal is responsible for the safety and well-being of all students. Therefore, if the Principal feels that it is not in the best interests of the student-athlete to permit him/her to return to competition, perhaps because it is the final game of the season or the game is against a particularly rough team, then that is the prerogative of the Principal.

SCHOOL ACCOMMODATIONS & THE ROLE OF THE CLASSROOM TEACHERS

A major component of the rehabilitation program deals with a successful return to school. In fact experts say that this should be done before any return to play progression is attempted. This requires a lot of coordination between the parents/guardians and the classroom teachers. As you know from what you have learned so far about concussions, cognitive stress can cause just as much damage to injured areas of the brain as physical stress. In fact, classroom teachers may be the ones who are in the best position to notice functional deficiencies and changes in their students following an injury.

Once a student-athlete is suspected of having a concussion, the classroom teacher becomes a very important partner in the process. In order to determine if there is any cognitive deficiency caused by the brain trauma, it is necessary to compare the conditions before and after the injury. Classroom teachers know their students and should be very helpful in identifying areas where the student-athlete may be below norm after the injury.

Classroom teachers will also be able to make accommodations that will reduce the stress that is felt by a student-athlete who is trying to cope with his/her injury while attempting to keep up with his/her academic studies. The accommodations that may be necessary are well documented in Chapter Six: A Guide for Classroom Teachers.

The School Leader will consult with classroom teachers to determine whether or not the student-athlete has returned to pre-injury levels academically as one of the ways which indicate that recovery has been successfully achieved. The cognitive demands of the classroom will often

cause symptoms to return, so as long as the symptoms present themselves to classroom teachers it will be an indication that the recovery process is still ongoing and the student-athlete will not receive clearance to return to physical activity.

Finally, the classroom teacher should spend a considerable amount of time counselling the student-athlete in order to provide encouragement and support so the student doesn't feel the pressure of keeping up his/her grades or the risk of failing the year. The emotional changes may be significant, so by reaching out and providing effective guidance and support, the classroom teacher will be helping to reduce the stress levels and enabling the student to better cope with all of the emotions that he/she is feeling as a result of the injury. Teachers will also communicate with each other as well as the guidance counsellors to provide the student-athlete with the support of an academic team to help him/her get through this challenging time.

The importance of establishing and maintaining a strong relationship with the student-athlete cannot be understated. The teacher or guidance counsellor may be able to identify post-injury emotional disturbances that will put the student-athlete at risk of further injuries if allowed to return-to-play. This may be observed just from simple conversations with the student. It must be noted that student-athletes may not report emotional disturbances if they do not think what they are feeling is related to the original injury. They may also have the attitude that they should be playing despite being injured because that is what tough team players do. This attitude has a lot to do with the level of under-reporting and denial of symptoms that is prevalent among teenagers in particular. Classroom teachers must be on the lookout for signs of these emotional disturbances in order to avoid recommending return-to-play too soon.

It will be necessary to communicate with the parents/guardians during this rehabilitation period in order to be aware of any difficulties that may be evident to parents/guardians but which may not be as obvious to the classroom teacher.

LEARNING GUIDE…

There are a lot of things to consider with respect to accommodations that are needed in order to facilitate a successful return to school following a concussion. Rather than duplicate the information here, it is strongly suggested that you read Chapter Five: A Guide for Classroom Teachers when you have some time.

HOME CARE & THE ROLE OF PARENTS/GUARDIANS

We must never forget that the brain may continue to deteriorate in the hours and days following an injury. The conditions in and around the brain after an injury are not all that conducive to healing which is why it is absolutely imperative that we reduce as much as possible any unnecessary activity that will cause the brain cells to experience any form of stress, no matter how trivial it may seem. Therefore, parents/guardians must make sure that their child gets total physical and mental rest immediately following an injury.

Parents/Guardians know their children. They know what is normal and they know when something is not right. Therefore, when your child is participating in a sport that has a high risk of concussion, you must always be observant of any signs, symptoms or behaviours that are consistent with traumatic brain injury.

If you do notice any of the signs, symptoms or behaviours, then it is imperative that you notify the school coach immediately. You may notice the signs while your child is playing the game. If so, you must go down to the bench and inform the coach who will immediately remove your child from play and initiate the protocols. You may notice the signs while your child is driving home with you after the game or at home later on that night. If so, you must initiate appropriate home care provisions and inform the coach at the earliest opportunity. Under no circumstances should you to allow your child to participate in any physical activity until he/she sees a doctor and takes a post-injury ImPACT test.

From what you have learned about what happens to the brain when it is injured, you should appreciate how important it is for your child to cease all physical and cognitive activity that might aggravate any potential brain damage until you are certain that recovery is complete.

From time to time the parents/guardians will have to sit down with their child and discuss the injury; reassuring him/her that if the proper protocols are followed recovery should happen much faster and then things will get back to normal. Your child may be impatient and want to rush things along. This is your child's future, so you must be firm in your commitment to the program and you must do whatever you can to avoid any stress or exertion, both physical and cognitive, while at the same time trying to reduce the stress and anxiety that your child may be experiencing if recovery is slow.

The parents/guardians will also be responsible for collecting a clearance to play form from the medical practitioner. In addition, the parents/guardians will be required to fill out their own clearance to play forms indicating that there are no further symptoms evident at home. Perhaps the most important form will be done by the student-athlete who will be required to sit down with his/her parents/guardians and declare that he/she is no longer aware of any remaining symptoms.

Parents/guardians will also work closely with classroom teachers to discuss accommodations that must be made in the class to allow their child to return to a modified academic routine.

LEARNING GUIDE…

CMP
Concussion Management Partners Inc.

There are a lot of things to consider with respect to accommodations that are needed in order to facilitate a successful return to school following a concussion. A comprehensive guide has been provided in Chapter Eight: A Guide for Parents/Guardians.

FINAL THOUGHTS ON THE PARTNER APPROACH

A Student-Athlete Concussion Management Program will only be effective if School Leaders, Coaches, Classroom Teachers, Parents/Guardians and Student-Athletes truly believe in the Partnership Approach. This applies to school boards, post-secondary institutions and minor sport organizations alike.

A concussion is one of the most complex, least understood injuries that student-athletes will every have to deal with. Therefore, it is not fair, nor does it make sense, to expect a medical practitioner, even one who has experience with concussions, to conclusively diagnose a concussion and then to take full responsibility for determining when a student-athlete should be ready to return to competition. And yet, most concussion management programs that are in existence today state clearly that only a doctor can diagnose a concussion and only a doctor can determine when a player has recovered sufficiently to return to play.

We admit that a doctor should be the first person to examine a student-athlete who has a suspected concussion in order to determine if there is a fractured skull, internal bleeding in the brain, increased intracranial pressure, damage to the neck muscles or any other structural injuries that can be identified by observation or through imaging technology. This should be the first and primary requirement of any concussion management protocol.

However, the responsibility for identifying a concussion and then for determining an appropriate rehabilitation program, must be shared by parents/guardians, classroom teachers, school coaches, school leaders, guidance counsellors, a consulting neuropsychologist, any health care providers such as athletic trainers and therapists, and the student-athlete him/herself. The doctor is one of the partners and makes an extremely valuable contribution to the process. Nevertheless, all of the other partners are in an excellent position themselves to determine if the student-athlete has any functional deficiencies compared to his/her pre-injury baseline. A doctor cannot observe the signs and symptoms that present themselves over the days that follow the injury. Nor can a parent/guardian identify internal bleeding or pressure inside the brain. The partnership approach is all about people knowing and following through with their own responsibilities.

We all owe student-athletes a duty to take reasonable care not to put them in situations where they may be injured or suffer life-altering consequences that will damage their future. The Student-Athlete Concussion Management Program should have put in place such a comprehensive framework that it would be virtually impossible for anyone to claim that the school was negligent in caring for a student-athlete who has suffered a concussion.

By following the identification and rehabilitation protocols we have put in place, there is very little risk of returning an injured student-athlete to play prematurely. That doesn't mean that he/she will never get a repeat concussion, but it certainly won't be because of the negligence on the part of the coach or any of the partners involved in the program.

CHAPTER FIVE

A GUIDE FOR CLASSROOM TEACHERS

A TEACHERS' GUIDE TO ACCOMMODATING STUDENT-ATHLETES SUFFERING FROM CONCUSSION

The Student-Athlete Concussion Management Program acknowledges that during the rehabilitation process a student-athlete will still be expected to meet certain responsibilities as a student.

While it may take several weeks or longer before a student-athlete is clear of concussion symptoms and subsequently granted permission to return to physical training, we know it is simply not realistic to keep the student out of class for that length of time and expect the student to successfully complete his/her course requirements.

Because of this, we have prepared this special Guide for Classroom Teachers that will help you choose appropriate accommodations and adjustments for student-athletes in your care who are suffering from concussion symptoms or who are suspected of having a concussion. This

particular guide may be more relevant for secondary school teachers; however, the basic principles would apply to post-secondary instructors as well.

We are going to divide the Classroom Teachers' Guide into two main sections. The first section will provide you with some background information that will give you a better understanding of some of the important concepts, challenges and principles of concussion management of student-athletes at the secondary and post-secondary levels. The section half will deal with accommodations that may be considered in the classroom to help student-athletes with the rehabilitation process. We feel it is important for you to read both sections in order to be better prepared to provide for the needs of a concussed student-athlete.

At the outset it is important to point out that the vast majority of concussions experienced by student-athletes are unreported to the classroom teacher. This is why we feel it is so very important for a school board to implement a formal concussion management program which has clear, well delineated protocols and procedures. Depending on the data you examine, it has been found that as few as 1 out of every 40 or 50 concussions may actually be reported. This is frightening to even comprehend and it is this "collective denial" that is making traumatic brain injury such a dangerous epidemic. And as you will read in the rest of this chapter, most students who are suffering from concussion will requires some form of accommodation in the classroom in order to cope with the functional deficiencies that go with this type of injury.

PUTTING THINGS IN PERSPECTIVE FOR CLASSROOM TEACHERS

BEFORE YOU BEGIN…

Before you begin reading through this chapter you should first of all complete reading Chapter Four: Elements of an Effective Training Program - Preparation, Identification & Rehabilitation.

IMPORTANT ROLE TO PLAY

Whereas a concussion is an injury that results in physical, cognitive, psychological and emotional symptoms and dysfunction, we feel that a classroom teacher is in an excellent position to recognize signs of lingering symptoms. That is why we feel that before allowing a student-athlete to return to physical training, clearance should be received from the classroom teacher indicating that there are no longer any remaining noticeable symptoms of concussion.

We have recommended that the School Leader consult with the student-athlete's classroom teachers and/or guidance counsellors before giving a final School Clearance to Resume Physical Training or to Resume Athletic Competition. This means that your expertise and the knowledge you have of your students will be recognized and your input will be very important to the future of the injured student-athlete.

As a classroom Teacher, you and the student-athlete's parents/guardians may very well become the most important people in the rehabilitation process. You know what your student was like before the injury. You know what his/her "functional baseline" was with respect to his/her performance level in the classroom. Therefore, you will be able to readily spot differences in cognitive and emotional function far better than anyone else. After all, the student-athlete spends six hours a day, five days a week at school. He/she spends the same amount of time at home not counting the time spent sleeping. Therefore, who is in a better position to be able to determine if the student-athlete is functioning differently after the injury? Who is in a better position to be able to conclude when everything appears back to normal? Of course the answer includes both classroom teachers and parents/guardians.

There is no doubt that health care professionals also play an important part in the identification and rehabilitation process, but doctors who only see the student-athlete for a brief clinical visit may only be able to determine if the injury resulted in structural damage such as a fractured skull, swelling of the brain, internal bleeding, or damaged neck muscles. Doctors and other health care professionals may not be able to spend enough time with a patient to observe the kinds of signs and symptoms that clearly indicate brain dysfunction.

A teacher can tell if there are academic deficiencies. A parent can tell if there are emotional deficiencies or sleep problems. A health care professional will not be able to diagnose these symptoms on his/her own.

DO NO HARM

This Guide for Classroom Teachers will help ensure that you "do no harm" to your students while they are gradually returning to normal classroom functions. It will also help you determine which accommodations and adjustments may be necessary in order to help your student cope with his/her difficulties and challenges while avoiding any chance of inadvertently causing stress on the student's brain that may delay or impede rehabilitation.

In fact, many studies and testimonials confirm that concussion symptoms can be greatly exacerbated by the daily stress and anxiety caused from normal, everyday classroom activities. The increased electrical impulses and chemicals that are produced as the student-athlete strives to keep pace with the rest of the class can cause just as much damage as further physical contact in competition. Therefore we strongly recommend taking special precautions to make sure that classroom teachers are fully aware of students in their care who may be experiencing a concussion.

UP TO 20% OF PARTICIPANTS WILL BE CONCUSSED EACH YEAR

It should also be noted that for most designated contact sports activities, an average of at least 10% of the participants are expected to suffer some degree of head trauma resulting in concussion symptoms during any given season. The rate increases to as high as 20% or more for some of the more physical sports such as football, soccer, rugby, and hockey.

Those statistics imply that with physical sports such as hockey and football, where the rate of concussion among participants can be as high as 20% per year, there is a good chance that most student-athletes who take part in these sports for a period of more than six (6) years will be at risk of suffering at least one concussion. Some experts predict that at least 50% of the participants in these sports will have experienced at least one concussion by the end of high school, but many others feel that the rate will be much higher based on what we are finding out about concussions. Student-athletes who continue to play at the post-secondary level will likely be 75% likely to suffer at least one concussion.

Further, from what we are learning about concussions, it is quite likely that most if not all participants will also have suffered a number of subconcussions during the same period. In fact, many experts are taking the position that concussions may be the result of an accumulation of hits to the head or body over time that eventually produce universally accepted symptoms of concussion. If that is the case, then rehabilitation is merely allowing the brain to heal to the point where there are no further symptoms, but the prior accumulated damage still exists and further trauma may lead to more concussions or what we now refer to as post-concussion symptoms. We expect to hear more on this theory in the coming years.

The implications for the classroom are significant for secondary school student-athletes since many of them will have been playing their sport of choice for at least eight or more years. They may be extremely vulnerable to life-altering consequences of ineffective rehabilitation procedures, so the classroom teacher can actually have an extremely positive impact on the student-athlete's entire future simply by making a few simple adjustments in the classroom.

We will continue to reinforce the message that the incidence of concussions at the high school level is very high. If you have 1000 students in a high school, and if 100 of those students are receiving a concussion every year, then chances are that there are going to be approximately 200 to 250 students enrolled in the school who either are suffering from a concussion that they received that year or at some time during their high school years. It means that as many as 4 out of every 10 of your Grade 12 students may have had at least one concussion and may have academic difficulties that are ongoing as a result of those injuries. That has a tremendous impact on their ability to maximize their true potential in the classroom. It may help to explain why some students are having difficulty learning and it means that perhaps some simple accommodations may make all the difference in the world.

A CONCUSSION IS A CONCUSSION

We should also indicate that there is no difference between a sport-related concussion and a concussion that is caused from a fall or an accident. The information in this Classroom Teachers' Guide is appropriate for all students that you encounter in your classroom who are exhibiting symptoms of concussion. Statistics will show that concussions are the most common injury for teens and young adults. In fact, many of the concussion injuries in society occur among teens and young adults, and these groups take longer to recover than other age groups. You can expect a lot of sport-related concussions, but you should also expect a significant number of non-sport related concussions.

Therefore, if you find out how many of your students are participating in sport activities during the year, you will have some idea of the number of students who may eventually be in need of some sort of accommodation because of their brain trauma injuries. If you find out how many students have been playing their contact sport for more than six years, you will also have a pretty good idea of how many of them may have already had at least one concussion during their life and may actually be showing post-concussion symptoms without anyone even being aware of them. These post-concussion symptoms may be permanent and may have simply become part of who the person has become - for better or for worse. The thing that is important for teachers to remember is that no matter how the injury occurred, a student with a concussion may require some significant accommodations and adjustments in the classroom for some period of time.

FOCUS ON RECOVERY AND REHABILITATION

Keep in mind that while we accept that there will be some non-sport related concussions to deal with during the year; this Teachers' Guide has been developed to assist classroom teachers in addressing the accommodations and adjustments that may be needed for student-athletes who are recovering from sports-related brain trauma. This is where the communication seems to be breaking down when it comes to teachers being informed about students who have acquired brain injuries.

During the rehabilitation period a student-athlete will be doing whatever he/she can to recover for athletic purposes, but he/she is still faced with the challenges of meeting normal expectations for class participation and homework completion. You should remind the student-athlete that he/she is in "training" to return to his/her "cognitive game" as well.

Until all symptoms of their concussion have cleared up and their neuropsychological functions have returned to normal (as evidenced by the post-injury ImPACT results among other observations by parents, teachers, coaches, etc.), many young athletes may have difficulty not only with their academic work but also with their interpersonal interactions with peers, parents and teachers. You may have to intervene at times to deal with these interpersonal conflicts in order to reduce the "stress load" on the student-athlete's brain. You may also have to counsel your student so that he/she realizes that out-of-character behaviour may simply be another symptom of the concussion that will go away in time.

Sleep disruption may cause fatigue leaving the student-athlete with very little mental energy to participate in a full day of classes followed by hours of homework. That is why homework should be limited or eliminated, at least for the first while.

Some student-athletes will try to hide their symptoms for fear of appearing weak to their team mates or peers, but the cognitive deficits still remain and they will struggle to keep up despite their efforts. Classroom teachers will have no difficulty recognizing this. Classroom teachers who know their students will be able to spot the changes that persist and will recognize symptoms that remain.

PHYSICAL AND COGNITIVE REST ARE BOTH IMPORTANT

The most important point we make with teachers and parents/guardians is that the student-athlete will always recover more quickly and completely with both physical and cognitive rest. You can't put more priority on one or the other. They both work together.

This type of injury is not like a sprained ankle where you can focus on physical rest while continuing to maintain the regular academic demands of being a student. To complicate the situation the symptoms of a concussion may linger on for weeks or longer, so it is not easy to catch up on work by putting in more time at home. This stress and added pressure of having to catch up once the injury clears up may actually worsen some of the symptoms and delay recovery. For that reason, we strongly recommend that during the rehabilitation period a student-athlete avoid homework or any assignment that might overstimulate the brain. It is also important for the classroom Teachers to make sure that the student-athlete understands that he/she is not going to be required to make up for lost time and will not be expected to catch up on all of the missing notes and assignments.

The main goal, therefore, is to give sufficient support to the student-athlete so that he/she can keep up with classroom responsibilities as well as possible in a way which will not overstress cognitive functions. A temporary individualized education plan (IEP) that incorporates specific accommodations which can gradually be removed as the student-athlete progresses in his/her recovery is an ideal way to handle this situation. These accommodations need not be extensive and/or expensive and can usually be handled quite easily by the classroom teachers.

UNDERSTANDING WHAT HAPPENS TO THE BRAIN IS IMPORTANT

Brain researchers are still searching for answers to help us better understand the full impact of concussions, but what we do know from a number of studies is that student-athletes who suffer two or more concussions report long-term mental problems at much higher rates than normal. These problems include headaches, dizziness, blurry vision, fatigue, inability to concentrate, and sleep issues. The scientific term for these symptoms is "neural precursors" which are signs that something has gone wrong with the functioning of the brain. Classroom teachers must be on the look out for these neural precursors since they are signs that the brain injury has not completely healed.

A study that was done in 2004 found that football players with multiple concussions were up to eight (8) times more likely to experience a significant drop in memory performance and even three months after the injury they continued to experience difficulty with the processing of visual stimuli. These problems will have a negative impact on a student-athlete's academic performance and may end up denying him/her of the marks necessary to enter into the university program of his/her choice.

A better understanding of what really happens when the brain suffers a trauma that leads to a concussion is necessary in order for a classroom teacher to fully appreciate the importance of adopting strategies and accommodations that will avoid causing further damage to the student. We strongly recommend that you read Chapter Ten: Understanding The Brain, and watch the

accompanying video to get a better idea of what exactly takes place inside the brain of a concussed student-athlete.

TRAUMA PRODUCES POWER SURGE

Basically, during the milliseconds that follow a trauma of significant force to the head or body, there is a tremendous and rapid release of neurotransmitters as billions of brain cells turn themselves on at the same time. This causes a power surge of electricity in the brain that ends up with chemicals flowing in and out of axons and a host of other results that are not good for the brain.

As soon as this power surge is over, the neurons try to restore the equilibrium in the brain and get back to normal. In some cases this process can take hours. In other cases it can take days, weeks or the damage can be permanent. We do know that most student-athletes with concussions need at least between 10 and 14 days to recover. During this recovery period the student-athlete may suffer from a wide range of symptoms of various intensity and duration and any further physical and/or cognitive stress or trauma may make matters worse and delay recovery. The symptoms are the brain's way of telling the student-athlete to take it easy so that the neurons can continue to focus on recovery of the damaged cells and neural infrastructure. When you have an injury to the muscles in your leg, if the muscles have not healed properly, every time you take a step you will feel pain. That is the body’s way of telling you that the injury hasn’t healed. The same for injuries of the brain. They recurrence of symptoms tell you that the recovery is not complete.

The important thing to remember is the healing process that goes on inside the brain must be continuous and without interruption. That is why second concussions are so common among student-athletes who return to play too soon or who place too much cognitive stress on themselves by trying to fulfill their normal classroom responsibilities and go on with their day to day life as if nothing has changed. A lot has changed!

The neurons are still experiencing an energy crisis as they are trying to recover. So if the brain experiences another trauma, even if it seems minor in intensity to the first one, the damage may be much more severe. Another "power surge", even if minor or limited to a smaller portion of the brain can destroy recovering brain cells causing a massive loss of neurons that is permanent. This power surge can be caused by over-stimulation in the classroom. It is not necessary for a blow to the body to have occurred.

NOTIFICATION OF TEACHERS

Of course, a teacher can't do much if he/she isn't aware of an injury in the first place. Therefore, one of the responsibilities of a School Head Coach and the parent/guardian of the child is to make sure that all of the classroom teachers who work with the student are notified of the injury.

The child's parent/guardian should be sending you a special signed Notification To Teachers form that will contain some important information, most of which will be addressed in this guide, but it will at least notify you of the injury and the need to consider making some temporary accommodations for the child.

This notification should also be given even if the symptoms seem to be very mild. As we will see elsewhere in this Guide, there are many things in the classroom that can make concussion symptoms worse and it is possible that serious consequences can result from seemingly simple activities in the classroom that may aggravate the recovery process the brain is undergoing. So even if the symptoms seem mild to the parent/guardian, it is still important that the teacher be aware of the injury in case the demands being made on the student-athlete actually cause further damage. It would be a shame if the "second" concussion came as a result of a "cognitive stimulation" being felt by the brain and not from a "physical trauma". As strange as it sounds, it could happen.

And if a student-athlete shares some concerns about symptoms that he/she is aware of, don't automatically assume that he/she has shared this information with his/her parent/guardian or School Coach. You should take the initiative to check with the parent/guardian and the school coach to see if indeed they are aware of the symptoms. Once they do become aware of the symptoms, the Student-Athlete Concussion Management Program will be initiated and you will be able to follow the identification protocols that will help us get to the bottom of the situation.

AVOID PLACING STRESS ON DAMAGED AREA OF THE BRAIN

You may find it easier to understand what is happening to the brain during this recovery period if you compare the injured brain to a sprained ankle. For example, there are varying degrees of ankle sprains. Some are mild and some require a cast and crutches. However, the best treatment for any ankle sprain is to rest and avoid using the ankle more than necessary. Eventually the pain will subside and the damaged area will heal. However, even once the pain seems to have gone, the ankle is still extremely vulnerable to being reinjured. Therefore, if a person returns to activity too soon, it is quite possible that the ankle will be sprained again, only this time the damage may be much more severe because of the original injury making that area of the body more susceptible to injury.

The exact same thing is happening to the brain. The concern in this case is that the brain is attempting to heal an "electrical circuit" that was damaged in some physical trauma. So, while the brain is devoting energy to repairing or reconstructing the damaged area, it needs to avoid any further electrical or chemical aggravation.

When a person suffers from a concussion we all understand the need to avoid physical activity that may result in further physical damage to the brain. However, we may not fully comprehend the damage that can be caused by simple things we take for granted, such as completing assignments and homework, studying for tests, playing video games, etc. All of these activities require a tremendous amount of electrical and chemical reactions among the millions of neural connections involved in the activity. This energy demand will diminish the energy required by the brain to repair the damaged areas that were experienced by the original brain trauma.

Further, the activities may cause increased stimulation of the damaged areas. This produces the same result as running on a sprained ankle before it is completely healed and returned to full strength through exercise. If the damaged area suffers another physical or cognitive trauma

before it has healed and allowed to strengthen again, the damage may be even more severe than the original injury.

STRESS HAS NEGATIVE EFFECT ON ADOLESCENT BRAIN

We know that stress has a negative effect on brain development and secondary schools are a hot-bed of stress to begin with for adolescents. We also know that even though the brain becomes hardwired as information and skills are repeated to form memory, its built-in neuroplasticity makes the brain susceptible to significant change as well if there is enough stress or trauma in the case of concussions. Mental health issues have long been held to be a consequence of sport-related concussions so whatever the cause, whether it be from damage to the brain or from the student's psychological reaction to being unable to compete, classroom teachers and parents must consider this when developing concussion management accommodations at school and at home.

Therefore if an injury occurs to "strong" neural connections, symptoms may be more pronounced and last longer since the brain will have come to rely upon the first route or automatic pathway. It may take much longer for the brain to build new connections that will enable functionality to return to near baseline levels. Even though it may take longer, that may be an easier way for the brain to recover than trying to heal the once strong connections that were damaged by the brain trauma. As scientists continue with their research we should know more about this in the coming years, but for now this is a reasonable theory.

As for the student-athlete going through rehabilitation as a result of a concussion, frustration tends to set in quickly if you have difficulty performing tasks that were easy and automatic before the injury. This causes a great deal of stress and anxiety which may prolong the recovery period and lead to even more stress and anxiety. That is why we simply cannot emphasize enough the need for both physical and cognitive rest in order to allow the brain to repair the damaged connections. If the student-athlete is allowed to return to play too soon or if he/she is pressured to return to pre-injury levels of learning in the classroom, then stress and additional emotional problems will result in the brain releasing chemicals that will prolong the recovery and cause further damage to the neuronal connections.

The part of the brain that is responsible for emotions will, in all likelihood, be affected by the concussion since it is connected to just about all other areas of the brain. It may not be the area where the brunt of the damage occurred, but it is common for it to be impacted in some way. This means that the student-athlete's ability to control his/her impulses will also be impaired.

As a result, you may find that the student-athletes in your classroom become frustrated more easily and extremely upset when things are not going right. It is therefore critical for teachers and parents to allow the student-athlete to recover at his/her own pace. Do not put pressure on them to return to play or improve their learning skills. This will just cause more stress which will interfere with the brain's ability to develop new neuronal connections to repair the deficiencies.

RECOVERY PROCESS IN ADOLESCENTS

If there is one thing we are all learning from latest research into the brain, it is that not knowing what you are doing when it comes to concussion management can change who you are and who you could have become.

This is not turning out to be as temporary a dysfunction as we previously were lead to believe. Many men and women in their 40's and 50's are now discovering that the multiple concussions and subconcussions they may have passed off as insignificant when they were younger are now showing up in symptoms such as depression, anxiety, mood disorders, memory loss, early onset dementia, suicidal thoughts, relationship problems, irritability, and the list goes on and on. Those persistent headaches that keep coming back when you attempt a particular activity; the dizzy spells that come now and then; the personality change you went through during adolescence; all of these things may have something to do with brain trauma you experienced over the years.

Furthermore, with all of the attention being given to concussion management, we are seeing evidence that after an athlete has been deemed to have recovered from a concussion, he/she may not always return to the same level of functioning in all areas of his/her life. For example, once declared healthy following a rehabilitation program, many professional athletes are never able to regain quite the same level of performance they enjoyed prior to the original injury. Their reaction time may have changed, ever so slightly, but just enough to have an impact. They may not be quite as fearless as they once were, or they may be more reckless, thus putting themselves at greater risk of injury. There is often some kind of permanent change, even if it is only slight.

COMPLETE HEALING MAY NEVER OCCUR

This leads us to the conclusion that the injuries sustained by the brain when one is concussed may not ever completely heal. In fact, during the rehabilitation process it is possible that the synaptic architecture within the brain is reconstructed and that this reconstruction may not completely replace the original architecture. More will be said about this later on in this section, but rehabilitation may in fact be better thought of as the re-learning of skills. This re-learning may be accomplished more rapidly than when the skills were originally developed because not all of the neural connections were lost or damaged as a result of the concussion. There may be enough left so that the skills can be brought back "close" to the pre-injury level, but just not exactly the same. The trouble is that the functioning of the person is so close to pre-injury levels that we mistakenly “think” that a full recovery has taken place. At times this leads to a premature return to play or learning in the classroom.

SERIOUS IMPLICATIONS FOR ADOLESCENTS

With respect to adolescents (children from the age of 13 to 19) we should be prepared to accept that a concussion is indeed a type of traumatic brain injury that actually changes the way the brain functions. To add further confusion to the mix, there are now two schools of thought emerging on the impact of concussions on young brains.

ON THE ONE HAND…

First of all, research has found that teenagers who suffer sports-related brain trauma have more widespread injury and prolonged brain swelling than adults. This may be related to the fact that the developing brain in a teenager has double the number of neural connections than that of an adult, so an injury will impact a much larger region of the brain.

We also know that the immature brain is approximately 60 times more sensitive to the chemical substances that are produced following an injury. And since an injury to the brain creates a massive power surge of electrical energy that produces a cavalcade of chemicals released into the brain in areas where the chemicals may not normally be found, this increased sensitivity may very well have serious consequences on a young adolescent brain.

Therefore, many experts feel that high-school athletes might well be expected to have a slower recovery than older adults and to be more susceptible to severe neurological deficits should they be re-injured during recovery. Because of the increased sensitivity to the chemical changes following an injury, coupled with the inadequate blood flow to help with the repair process, complete physical and mental rest is absolutely critical to prevent further damage. This is why we spend a great deal of time and energy emphasizing the importance of all partners being completely satisfied that all signs and symptoms have been resolved before even beginning to return to physical activity. We must always remember that the symptoms of a concussion will disappear in advance of complete healing. For example, the part of the brain that is injured may cause headaches as a symptom. As the healing process is taking place, the damaged area may stop producing headaches. This does not mean that the injury has healed. It just means that it has healed enough to stop the pain. The damaged area may still be very vulnerable and susceptible to further injury. Therefore, there is great danger in assuming that just because the headache is gone the concussion has healed.

ON THE OTHER HAND…

Some experts argue that teenage student-athletes should have a greater potential for recovery after a concussion because of their greater capacity for reorganization of the neural connections in the brain compared with adults. The fact that the developing brain has double the neural connections of an adult means that the excess connections should allow for easier neural rerouting during the recovery period.

This means that if the usual communication pathway has been damaged or blocked because of a concussion, the brain may be more easily able to find another route to restore the communication to normal functionality. This leads some experts to conclude that this functional plasticity may in fact mean that teenage athletes never completely recover from their original injury, but that they actually reacquire near normal functionality because of the reorganization of the communication network through new pathways that are closely related to the original. In other words, the teenage brain discovers a new way of accomplishing approximately the same results.

What is not completely understood is whether or not the reorganization and rerouting can ever accomplish the same results because of the widespread impact of the original injury on so many

other regions of the brain. To better picture this, think of what happens when you are trying to draw a straight line between two points. If you are slightly off line at the beginning, by the time you get to your destination point you will have missed by a lot. The original error magnifies over time, so this is what many people think happens to the brain during recovery. The place where the original damage occurred may be repaired to a state that is "close" to normal, but by the time you proceed to the millions of neurons in the communication pathway leading from that damaged area you may end up changing the functioning of so many other parts of the brain.

Another concern is that there may be areas of the brain that are not reconstructed simply because they involve functions that may not be commonly drawn upon by the student-athlete. This may explain changes in behaviour or personality that occur following a brain injury. The new behaviour is what is being reinforced and strengthened, replacing the old behaviour. Therefore, when a coach is beginning to rehabilitate an athlete through training that will rebuild the skills of the player, he/she must also pay attention to the motivation and reviving of attitude and passion to the game so that both areas are brought back to pre-injury levels.

Therefore, the general consensus that teenagers take longer to recover from brain injuries may simply be due to the fact that teenagers who don't allow sufficient time for the original injury to heal may in fact never recover from their injury, but rather they may develop new connections that may give them almost the same functionality as they had pre-injury. This means that it is even more critical that student-athletes take more time to ensure that their concussion has had enough time to heal so that they do not end up generating a rerouting or reorganization that may be life-altering.

Another fact to consider is that the reconfiguring that takes place in the brain during a controlled rehabilitation period may be able to "recover" most of the functionality that was impaired as a result of the injury, but the affected areas of the brain may remain weaker and vulnerable to future injury with less intense trauma. Think once again of an athlete who receives a bad ankle sprain for the first time. Even after the sprain has healed, the athlete may find that he now has a "weak ankle" and is much more easily injured, thus suffering the inconvenience of future ankle sprains from less intense trauma to the ankle. The same may be found for injuries to the brain. Once you get your first concussion, you are much more vulnerable to getting future concussions, possibly because you now have a weak area of the brain that is more easily injured from less intense trauma.

ADOLESCENT MAY BE OWN WORSE ENEMY

Unfortunately adolescents may end up inadvertently prolonging their recovery simply because of the way the brain develops during this stage of life. For example, teenagers are prone to taking risks and being impatient. Yet when recovering from a concussion, patience is critical. Frustration and anger may set in when an adolescent finds it difficult to perform cognitive functions that were strong before the injury. The lack of quick recovery will then create a significant level of stress in the student-athlete. The tendency is to accede to the pressure of the student-athlete to return to play and therefore in many instances the player is allowed to return to play perhaps too soon. Another concussion will further aggravate the original injury and will increase the level of stress and anxiety in the athlete. Stress releases a chemical into the brain

called cortisol that triggers further concussion symptoms which may not present themselves for days or weeks following the injury. The fact that these symptoms keep coming up, especially if they are new symptoms, causes the student-athlete to be increasingly frustrated, angry or depressed, thus releasing more chemicals that prolong recovery. It is a vicious cycle!

UNIVERSITY OF TORONTO STUDY SHOWS THE IMPACT OF NON-HEAD INJURIES ON COGNITIVE FUNCTIONING

Researchers at the University of Toronto released a report in November 2011 that has serious implications for teachers who have student-athletes in their classroom who have suffered from a non-head (orthopaedic) injury. They may exhibit some of the same cognitive deficiencies as student-athletes with concussions, although the functional problems may not be quite as severe.

The study was done to discover the effects that orthopedic injuries, such as broken legs or torn ligaments might have on the brain. They tested a total of 72 varsity athletes, most of whom played football or hockey. A total of 18 suffered concussions, 18 suffered non-head injuries, and the remaining 36 did not suffer any form of injury. All were given neuropsychological tests three days after their injuries.

What they found was that the concussed athletes showed slower reaction times and worse results on memory tests than the players who had muscle and ligament injuries. But what was interesting is that the players who had muscle and ligament injuries performed more poorly than uninjured athletes.

The researchers speculated that the athletes with non-head injuries may have performed on the test at a level in between the concussed and the uninjured athletes because of psychological factors which would include emotional responses of frustration and anger about being unable to perform and anxiety over how long it would take for their injury to heal.

It is evident that an athlete with a concussion will perform more poorly on the neuropsychological testing which is evidence that the cognitive functioning level has deteriorated because of the brain trauma. However, there may also be a relationship between the biochemical impact in the brain that a non-brain trauma to another part of the body will trigger since the neurons in the brain are connected to the sensory neurons throughout the body.

For example, a broken leg or a torn ligament will immediately generate a tremendous power surge to the brain creating its own cavalcade of events including the release of neurotransmitters and chemicals into the area of the brain receiving the "painful messages" from the damaged area of the body. This could result in a more contained damage to the brain, but the interconnectivity of the neurons in the brain may still have some effect on other functions, which in turn would lead to a student-athlete doing more poorly on the tests than an uninjured athlete. He/she will have "some" of the symptoms of concussion that would have been caused in the exact same way if the athlete suffered a brain trauma.

Another possible conclusion from the U of T study is that no matter where an injury occurs or whether it is an injury to the brain, muscles, bones, etc., this trauma to the body has a direct

effect on brain functions and will result in a certain amount of functional deficiency. The symptoms will present themselves in certain ways that may or may not be noticeable or detectable. However, when an athlete suffers a direct trauma to the brain, the intensity of the injury and the amount of deficiency and dysfunction is greatly magnified because the brain trauma is much broader in scope and elicits a much greater cavalcade of electrical and bio-chemical reactions.

What the University of Toronto study does confirm, in any event, is that there is a need to pay attention to the emotional and mental health of a student-athlete who is concussed in order to reduce the stress levels and reduce the production of negative chemicals that will delay recovery. Classroom teachers can play a huge role in this area, as we will explore in more detail in the Guide for Teachers found elsewhere on this site.

PERSONAL PROBLEMS MAY AFFECT RECOVERY

Family problems involving finances, parental conflicts, work schedule or loss of employment by parents, part-time job commitments, fear of losing your place on the team, the feeling of hurting your team mates chances of being successful, the loss of a potential scholarship, appearing weak to the opposite sex or to your friends, the loss of a source of self-esteem - these all wear heavily on the mind of an injured student-athlete. This stress makes it difficult for the brain to repair the damaged neural connections and adds to the chemical imbalance. The brain is your most important, complex and vulnerable organ. When it suffers an injury, it can affect your entire way of life.

Classroom Teachers are often aware of the personal problems being experienced by their students. Therefore, it is extremely important for Classroom Teachers to recognize symptoms that may indicate brain trauma and which could require accommodations in the classroom. Most of those accommodations will be explained in the second half of this chapter.

AN INVISIBLE INJURY COMPOUNDED BY SUB-CONCUSSIONS

A report published in the May 16, 2012 online issue of Neurology, the medical journal of the American Academy of Neurology, has indicated that there is now research that may be evidence of the impact of sub-concussions on the level of cognitive functioning of student-athletes.

The study included athletes in contact sports such as football and hockey, non-contact sports such as track and nordic skiing. The contact sport athletes wore special helmets that recorded the acceleration speed and other data at the time of head impact. It was found that contact sport athletes experienced an average of 469 head impacts during the season. However, athletes who were diagnosed with a concussion were not included in the study.

The whole study of sub-concussions is fascinating and should produce some interesting results in the not-so-distant future. For example, there is now a question about whether or not it is even possible to identify when a concussion has occurred. This may be better to understand if we think about cancer. No one can identify when a person contacted cancer. No one can determine when a person came down with this disease. Cancer cells may have been growing in one's body

for years before any symptoms present themselves. The evidence of signs or symptoms of cancer often come too late for doctors to cure the patient.

The same may be said about sub-concussions. A "concussion" may be the result of a significant "brain trauma" that causes an area of the brain that has been weakened by years of sub-concussions to finally reach the "breaking point". We know that a concussion is a "process", so it is likely that this process began with a number of small, sub-concussions that were not bad enough to produce signs and symptoms, but over time the damages have accumulated to the point where they reach a breaking-point. This means that the longer a person plays contact sports, the more likely that a full "concussion" is going to occur at some point in the future. It is the same thing as saying that the longer a person smokes cigarettes, the more likely it is that he/she may get lung cancer at some point in the future.

With the study we are speaking of in this section, it is important to note that all of the athletes took neurocognitive tests both before and after the season.

Something of interest to teachers and parents is that when the researchers tested the athletes on a measure of new learning that occurred during the season, a higher percentage of the contact sport athletes had lower scores than the non-contact sport athletes. The data showed that 22% of the contact sport athletes performed worse on the tests compared to 4% of the non-contact sport athletes.

Therefore, the study suggests that there may now be evidence that repetitive head impacts may have a negative impact on some student-athletes, even if there is no diagnosis of a concussion. This means that as a classroom teacher you should be aware of all of the student-athletes in your classroom and should expect to see some signs of cognitive deficiencies not only in students who have suffered a concussion, but also in up to 20% or more of the other student-athletes who do not suffer obvious injuries. Necessary accommodations should be made for these students to get over their short term difficulties once they are identified in the classroom.

This research also confirms the belief that some student-athletes may be more genetically sensitive to head impacts. We don't have time to get more deeply into this concept right now, but it is indeed important. We all know people who smoked cigarettes all their life and never got cancer. We also know people who have played contact sports all their life and never suffered from a diagnosed concussion. It just means that some people may be more inclined to this kind of injury than others.

PERHAPS WE ARE DEALING WITH A SPECTRUM DISORDER

Some studies on concussions are beginning to show evidence that we may be dealing with a spectrum disorder when we examine the cognitive deficiencies of traumatic brain injury. For example, let's consider that at the lower end of the spectrum a person has absolutely no brain damage from brain trauma, while at the higher end a person has a maximum amount of damage and has serious life-threatening symptoms.

Every time the brain receives a force of low intensity which causes minor damage that produces no symptoms of concussion, the "needle" moves a little further from the absolute lower end of the spectrum. Over time the "needle" will move up or down the spectrum, depending on the number of sub-concussive blows received and also on the rest periods in between injuries which would then allow some healing to take place. However, after the accumulation of a number of sub-concussions, the needle will move into the "tipping point" area, causing signs, symptoms or behaviours consistent with concussion to emerge. When that happens, we say that the student-athlete has suffered a "concussion" and must rest until he/she recovers to the point where they symptoms have disappeared. In a short period of time the symptoms will subside and the student-athlete will be said to have recovered from the concussion.

However, studies are now starting to raise the question of whether the concussion has really healed. In fact, it could be that the "needle" has moved far enough towards the lower end of the spectrum so that the symptoms no longer present themselves. Nevertheless, any further trauma to the brain will produce signs, symptoms and behaviours consistent with concussion much more quickly and with much less force because the "needle" has been pushed from a new starting point that is much further along on the spectrum to begin with. It helps to explain why student-athletes who suffer a concussion are much more likely to suffer subsequent concussions from much less force to the body or head than with the first concussion. And if the blow is severe enough, it pushes the "needle" so far that it takes much longer for the symptoms to subside. Eventually, the "needle" will move so far along the spectrum that the symptoms may never disappear and the student-athlete will suffer for the rest of his/her life.

While science has not gone so far as to substantiate the above theory, it would appear as if this may be the likely conclusion at some point in the future. If it is true, then classroom teachers must be aware of the situation and must be prepared to make the necessary accommodations in order to ensure that student-athletes achieve success in their studies.

COGNITIVE DEFICIENCIES MAY BE PROLONGED

Research is being done at the University of California, San Francisco by Dr. Mukherjee using advanced imaging techniques with patients who have suffered a concussion. He is scanning their brain right after the injury, a couple of weeks later, a month later, then a year later and has found some interesting results. For example, he has found some patients with bruises on the brain which affect the cortex, or the gray matter, which is consistent with the functional injuries that the brain has undergone. He has also found small haemorrhaging within the white matter of the brain which indicate that there has been some structural injury.

He has found evidence that early after an injury the areas of the brain that are responsible for memory and attention are different and less active from what one would find in a normal person. But then he finds that six months to a year after the injury, those very same areas may become more active and in fact, hyperactive compared to a normal person.

This has lead him to conclude that there are some definite changes that occur in the brain after a concussion. He is continuing with his research to see if he might be able to discover more about

the underlying science of how the brain works and what really happens when the networks in the brain are disrupted by a concussion.

While the research that is being done by Dr. Mukherjee may not answer all of our questions about concussions, it may shed some light on how to treat student-athletes who suffer from prolonged post-concussion symptoms.

PRE-MATURE AGING OF THE BRAIN A POSSIBLE CONSEQUENCE

There have been recent studies that have discovered that some middle-aged adults who suffered concussions during their high school and college years had slightly less volume in the area of the brain associated with memory and learning than those who had never been concussed while younger. These adults had more difficulty remembering words and names and were less able to recall events than those who had never been injured.

The researchers concluded that the differences indicated abnormal aging of the brain so that the 50 year olds who suffered concussions had brains that were structurally and metabolically similar to those of uninjured 60 year olds.

Steven P. Broglio, a professor of kinesiology with the Michigan Neurosport program at the University of Michigan, who has extensively studied concussions in college students, has seen declines in the ability of some college students when it comes to being able to concentrate and focus on the presentation of information. He has also noticed problems in their balance and body control several years after they received a concussion.

"It seems possible, according to our data and that from other labs," that concussions "may accelerate some of the normal deterioration in cognitive and motor function that we'd expect with aging," he says.

Dr. Broglio also indicated that he doesn't think we should be overly concerned at this point that a concussion will result in the premature aging of the brain in all student-athletes. Most of the older people he has studied with accelerated aging were still functioning perfectly well in their daily lives. But he does recommend that student-athletes who have had concussions, and even those who do not, do a lot of "brain training" in order to give your brain the kind of work out that it needs to stay strong and vibrant.

BEST REHABILITATION IS THROUGH CONTROLLED STIMULATION

When it comes to post-concussion treatment strategies, it has been widely accepted that there is no one strategy or method that will work for all injuries. In fact, we are finding that each injured student-athlete must be treated individually, even though there are certain parameters that seem to be a framework within which to operate.

The most popular treatment of concussion is simply to rest the brain by ceasing all non-essential physical and cognitive activities. This is still a wise course of action take initially, but it is

becoming apparent from some studies and reports that student-athletes who still have symptoms after a few days may be more at risk for prolonged recovery if they remain at complete rest.

The carefully controlled and steady introduction of everyday stimulation shortly after an injury seems to help the brain rehabilitate as it rebuilds its ability to handle the stimulation of a normal environment. The key here is to make sure that there are adjustments put in place to help the student-athlete “gradually” ease back into a normal routine. You must not over-stimulate and risk the return of symptoms.

This is why we recommend light exercising such as walking and a return to school with very specific accommodations for the student-athlete. Over time the symptoms will resolve and the brain will rebuild if you increase the stimulation gradually and steadily without reactivating symptoms.

This is why classroom teachers can play such an important role in the rehabilitation of student-athletes by carefully monitoring the "return-to-learn" program within the classroom.

CAREFUL MONITORING IS RECOMMENDED

First of all, in most cases a concussion may not initially appear to have a significant impact on a student's participation in class. You may get the impression that the student has no symptoms at all. However, you should still be monitoring the student carefully during the first few days to see if there are some difficulties that present themselves which are out of character. In some cases, the student him or herself won't even be aware of the symptoms, but you may observe some distinct signs that may require accommodations in the classroom.

You may also notice that with some students the classroom activities that require concentration, problem-solving, or learning new skills and concepts may actually cause some symptoms to get worse or reappear as time goes on. The student who seems to have recovered right from the beginning may actually regress during the first week or so and then frustration and depression may trigger further symptoms.

It is therefore wise to "assume" that a student-athlete in your classroom who has suffered a concussion will have some degree of difficulty with at least some of the normal learning tasks. Most students with a concussion will have some difficulty with their communication and concentration skills. Some of those difficulties will be expanded below and we will provide you with a bit of guidance that may be of help as you work with your student.

EXPECT THE UNEXPECTED

Before we get into the specific accommodations below, the first thing we would like to warn classroom teachers about is to expect the unexpected. The effects of brain injury are certainly unpredictable at best. The more severe injuries will require long-term accommodations. The "minor" injuries, and I caution that we hesitate to use the word "minor" when describing brain injuries, may seem to resolve within a couple of weeks.

Nonetheless, a brain injury will have some impact on a student-athlete's basic cognitive abilities such as memory, learning, attention and concentration, word finding, and visual perception. It may also have a negative impact on other skills necessary for academic success, including reading, arithmetic reasoning, vocabulary, writing, and spelling. Pressure will come from parents, teachers and student-athletes themselves who worry about the affect on successfully completing the course requirements and perhaps being forced to repeat grades or programs or not being able to graduate on time or enter a university program of choice.

Some students need to study much longer than usual and find that they do worse than before. Others complain about having to read things over several times and still can't remember what they have read. You will hear student-athletes complain about studying for tests and then "freezing" when it comes time to write the answers. One complaint that is common is that writing simple essays or short stories takes forever to get started. This is especially stressful when one is forced to do the writing within a time constraint. It is difficult for student-athletes suffering from a concussion to pay attention to lectures for any length of time before their mind begins to wander, despite their efforts to remain focused. And they will be totally exhausted at the end of the day, and unable to find the energy to do any homework.

IMPACT OF A CONCUSSION ON EXECUTIVE FUNCTIONS

Whereas teachers spend more time with a student-athlete than most other key adults, we felt that it was important to spend a bit of time going over the implications of a concussion on a student-athlete's executive functions.

The frontal cortex of the brain, which is located in the forehead area, has been accepted as the region of the brain that is most involved in behaviour, personality, and decision making. This is what we call executive function, or a set of mental processes that helps one connect past experiences to perform activities such as organizing, planning, remembering details, and managing your time and space. It allows one to differentiate between good and bad, better and best, same and different, consequences of actions, goal-setting, predictions of outcomes and expectations and perhaps most importantly for classroom teachers, the ability to suppress socially unacceptable urges that could lead to negative consequences.

The neurons in the frontal cortex extend throughout all areas of the brain, so if one suffers a brain trauma it is quite likely that there will be areas of the frontal cortex that will be affected. Even if the actual damage is found in some other part of the brain, the communication between those directly affected functions and the frontal cortex will be disturbed.

While a student-athlete is going through the rehabilitation process following a concussion, teachers may find that the problems with executive function aggravate the symptoms and result in all sorts of behavioural and personality disorders. For example, common everyday things might just be more difficult to do. Working memory may be seriously affected and it might be difficult for the student-athlete to do what once came natural.

NORMAL EXECUTIVE FUNCTION

It is important to remember that the executive functions of a teenager or young adult are still in the developmental stage. This is the part of the brain that helps one regulate behaviour and make sense of the world by helping us to:

- Make short-term and long-term plans
- Keep track of time and complete assignments when due
- Keep track of several different things at once - multi-tasking
- Draw upon previous knowledge when talking to someone or answering questions
- Evaluate ideas and think about the work we have done
- Change our minds and make mid-course corrections while thinking, reading, and writing
- Ask for help or seek more information when we need it
- Engage in group discussions and projects
- Resist the urge to shout out answers in class or interrupt

SIGNS OF EXECUTIVE FUNCTION PROBLEMS

A student-athlete who is recovering from a concussion may have difficulty:

- Planning projects
- Determining how much time a project will take to complete
- Communicating orally or in writing in an organized, sequential manner
- Memorizing and retrieving information from memory
- Initiating activities or tasks, or generating ideas independently
- Remembering information that is used in a conversation, even while speaking
- Remembering the phone number or email address while dialing or texting

OVERVIEW OF STRATEGIES FOR CLASSROOM TEACHERS

As a classroom Teacher, you will likely have many strategies that you have found work well when trying to develop executive functioning in your students, but the following are examples of some of the strategies that have achieved success. Some will be expanded upon in the section that follows:

General Strategies

- Take things one step at a time. Students experiencing symptoms of a concussion have trouble focusing on more than one thing at once and need to proceed slowly.
- Use visual aids and concrete materials whenever possible. It is difficult for an injured student to recall abstract memories. Also, this may over stimulate the brain and cause symptoms to return.
- Use timers or electronic equipment with alarms to help keep track of time.
- Display clear and specific schedules and review them several times a day. Once again, this has to do with the fact that an injured student may not be able to focus or concentrate or organize his/her time and/or schedule. Having it available and reviewing it often will help build up this skill over time without causing too much stress.
- Provide both written and oral directions and ask the person to repeat them back to you. This again is necessary in order to help the student begin to reconstruct the communication network in his/her brain in order to get back to normal. It is also easier on the brain to review the written directions instead of straining to try to recall the oral directions.
- Allow for longer time to shift from one activity to another. This is especially true when it comes to changing classes or shifting from one topic to another. It may take longer to put books away, bring out other books, etc. Don’t expect him/her to move as quickly as the rest of the class.

Managing Time

- Create checklists and "to do" lists, estimating how long tasks will take. This is an example of how you will be able to help the student redevelop these skills that may have been lost.
- Break long assignments into chunks and assign time frames for completing each chunk. It is important for a recovering student to experience success, so short chunks will work well and will rebuild self-confidence.
- Use visual calendars at to keep track of long term assignments, due dates, chores, and activities. Reminders are important and will reinforce the memory and recall skills that may have been damaged from the concussion.
- Be sure to write the due date on top of each assignment.

Managing Space and Materials

- Make sure that the student-athlete's desk or work space is clean and organized. A cluttered workspace will not be helpful for the student athlete who may be confused to begin with.
- Consider having separate work areas with complete sets of supplies for different activities. While this may not be very practical at home, it might be possible at school and should be considered in order to help the student athlete stay focused and on task.
- Schedule a weekly time to clean and organize the work space. This is good advice for all students, but it is especially important for those who are recovering from a concussion.

Direct Instruction Strategies

- Select a meaningful goal or skill the student will need to learn and present it at the level of the student;
- Provide a simple rationale to help the student understand the relevance of the skill;
- Give clearly stated task directions (limit the number of steps) and ask the student to repeat or paraphrase the directions to ensure understanding;
- Break tasks into small steps and demonstrate each step so that the student can see how it is supposed to be done.
- Provide opportunities for student response and practice at an appropriate pace;
- Provide immediate feedback and error correction when necessary—feedback should be positive and systematic; and
- Use verbal praise and encouragement frequently.

Precision Commands

- Use a direct statement telling the student to start (rather than stop) a behavior;
- Look directly at the student as you give the request, move close, and use a soft, calm voice; speak clearly, slowly and concisely—do not shout.
- Limit requests to only two or three at a time and give requests that the student is capable of following;
- Allow enough time for the student to follow through; and
- Recognize their effort with verbal praise and encouragement.

Cognitive Difficulties You May Notice:

- Trouble paying attention
- Difficulty remaining on task
- Slowed responses and or processing of information
- Difficulty shifting attention from task to task
- Organization challenges
- Reduced academic performance

Social Behavior Difficulties You May Notice:

- Impulsive behaviors
- Initiation difficulties (trouble starting things)
- Changes in mood
- Depression
- Defiance
- Fatigue
- Confusion

Physical Difficulties You May Notice:

- Headaches
- Blurred vision
- Changes in taste or smell

Therefore, when you discover that one of your students has had a concussion, rest assured that he/she is going to be affected in the classroom.

CLASSROOM ACCOMMODATIONS FOR CONSIDERATION

It should be noted that no two concussions are the same and each student-athlete who is recovering from this type of injury will display different symptoms and behaviours. While some may need major accommodations in the classroom for a long period of time, others will need very little in the form of assistance and adjustments. The following recommendations are offered for your consideration along with some explanatory notes. As a classroom teacher you must use your own professional judgement to meet the needs of the student-athlete, but we would also recommend that the student's parents and the student him/herself be included in the planning and in designing the accommodations.

DO NOT SEND WORK HOME

Teachers are advised that until the student is brought back to school it is not recommended that any work or notes be sent home in order for the student to keep up. The parent/guardian has been advised to keep his child from any reading or other activity that will result in cognitive stimulation levels. Homework that is sent to the student would not get done anyway. The student-athlete may not have the ability to focus or concentrate on the work and will tire easily and quickly. Neither will he/she be able to handle new skills or concepts through independent study. The brain is just not capable of these kinds of functions while it is dealing with the immediate repair of the damaged area of the brain. This will just cause stress in the student-athlete and will further delay recovery. The parent/guardian has an obligation to make sure that their child does not jeopardize the early rehabilitation by causing further stress on the child's brain.

FIRST DAY BACK

The first day back should be a very light day for the student-athlete. Teachers should spend some one-on-one time with the student to assess the situation and assure the student that he/she can determine his/her own pace for returning to learn at pre-injury levels. It would be a great idea if you could also reassure the student-athlete that his/her school year is not in jeopardy and that you will be working with him/her to successfully complete the course, despite the injury or the set-back.

This last point is far more important and critical than it sounds. The human brain is often unable to discern between anxiety and fear and it has been found that fear cuts off up to 1400 upper brain functions such as logic, reasoning, planning, problem-solving, control of emotions, etc. These are the executive functions of the brain that are still not developed fully in an adolescent and is one of the reasons why the teen years are so volatile to begin with. Therefore, anxiety from a lack of understanding about what is happening to him/her as a result of the brain injury cuts off the frontal cortex functions and actually releases chemicals into the brain that are counter productive to the healing process that is taking place. By providing assurance that the support is going to be provided and that no matter what happens the student-athlete will not need to worry about successfully completing the course, you will be stimulating the production of helpful chemicals instead of damaging ones.

It is also advisable for the parent/guardian and the student-athlete to meet with the School Leader, the guidance counsellor and the classroom teachers to go over the procedures involved in the Student-Athlete Concussion Management Program. We want everyone to be "on the same page" in order to make sure that the rehabilitation goes well on both the physical and cognitive sides of the equation. In these cases, “being on the same chapter” is not enough. Everyone must be on the “same page”.

While we realize that it may be difficult to arrange for this kind of meeting, we would encourage everyone to maintain some communication with each other so that you are all aware of the changing status of the student-athlete. You are encouraged to invite the student-athlete to feel free to communicate by email with classroom teachers at this time in order to give the student-athlete a better sense of support.

Teachers and parents must also be aware that symptoms may worsen during the first few days back at school. This might have an impact on the emotional state of the student-athlete who just wants to get better so that he/she can return to playing on the team. The harder the student-athlete tries, the more stress is put on the brain to concentrate on learning and engage in academic activities. This may produce negative results. The student-athlete must also be constantly encouraged to share his/her feelings of frustration and also to let everyone know if symptoms are returning or getting worse. This is not the time to “suck it in” and hide symptoms.

PRE- AND POST-INJURY EMOTIONAL STATE

If at the time of the brain injury a student-athlete has a history of concussions, is experiencing medical problems, or already has a learning disability, it may take much longer to recover from the concussion.

Another consideration is the amount of stress that the student-athlete was and/or is experiencing in other areas of his/her life. Family problems such as economic hardships, tension between parents and adverse living conditions all contribute to the mental health of a student-athlete. If a student-athlete had problems in his/her life before the injury, those conditions will still exist and could interfere with the recovery process and make the brain more susceptible to further damage.

From a neurological perspective, if the neurons are forced to divert some of the precious little energy available to deal with emotional stress caused by family problems, then it will have less energy to devote to the recovery process. While the student-athlete is at school it becomes imperative for all teachers to do everything possible to minimize the stress and anxiety levels that may be attributed to the "return to learn" process. The school community must become a safe-haven for the student-athlete during the recovery process.

ATTENDANCE

Depending on the symptoms, a student-athlete may need to remain home at complete rest for several days following the injury. Even upon returning to school, the student may need to stay home every second or third day as symptoms may return. Therefore, you must be prepared for irregular attendance and you should not count on a concussed student being present on any particular day or class. It is possible that the student-athlete may plan on being present on a certain day and then symptoms flare up the night before or the morning of the class and be unable to attend.

It may also be necessary for the student to prioritize his/her classes, attending core subject classes only, while resting during electives. Therefore, depending on the subject, a classroom teacher may not see the student for days on end, even though the student is at school. The student-athlete knows that he/she must try to focus the bulk of his/her energy on keeping up with compulsory subjects, but may find it necessary to cut back on some of his/her electives due to a lack of energy.

The student-athlete might also find it easier to attend school during mornings or afternoons, depending on when symptoms are worse. For example, a student who is having trouble sleeping may be too tired in the morning to attend classes and will therefore find the afternoons easier. On the other hand a student who finds that his symptoms worsen as the day goes on may prefer to attend school in the morning and go home in the afternoon.

The daily schedule is something that should be addressed by the guidance counsellor and the classroom teachers.

REST PERIODS DURING THE DAY

Following a concussion a student-athlete may find that he/she is absolutely drained of mental and physical energy. Some have likened it to a battery that loses its charge much faster than before. Further adding to the confusion, and to the internal stress felt by the student is the fact that the mental energy level will vary from day to day and activity to activity.

In fact, despite everything that the student-athlete is doing, he/she may still find that the symptoms are getting worse. This is normal and the classroom teachers must be sensitive to this phenomenon of concussions. In some cases the symptoms may not even appear for days or weeks following the initial injury. Teachers will have to be prepared to consol their student-athletes who are going though this phenomenon and who may begin to get depressed or anxious, wondering if they will ever recover from the injury. This is a time to assure them that what is happening is normal, but the Teacher should also make sure that the parent/guardian is aware of the increasing frequency of new symptoms so that further adjustments may be considered at home. The basic rule of thumb is that if something is causing symptoms, you stop or reduce the activity until the symptoms subside. Gradually you will be able to continue to build up the intensity and duration of the activity without producing symptoms.

Some student-athletes find that if they are allowed to take periodic rest breaks of 20 or 30 minutes in a quiet place when symptoms flare up, they are able to remain at the school for longer periods of time. Therefore, you should work out a procedure whereby the student-athlete could excuse him/herself and perhaps go and lie down in the nurse's room or the staff lounge for a while. It may be that all that is required is for the student-athlete to go to the library to do seatwork if the noise level gets too loud in the class. The rest breaks will gradually decrease in frequency as the recovery process continues.

Some sort of procedure will have to be established with school administration so that you can keep track of the whereabouts of the student. You cannot simply allow him/her to disappear with no one being aware of his/her location. This is not just to address liability issues with respect to supervision responsibilities but also in case the student has a health issue that may require emergency attention. You must be aware of the whereabouts of the student-athlete at all times. Therefore, you may want to have the student-athlete go directly to the office area once he/she leaves your class. And then check over the P.A. system to see that he/she arrived.

It may also be a good idea to send along a "buddy" when the student needs one of these rest sessions so that the "buddy" can do work nearby while the student is resting. Just make sure that the buddy understands that this is not a time for socializing. It is necessary for his/her friend to rest and be quiet while avoiding stimulation to the brain.

If you do employ the buddy system, make sure that the "buddy" is permitted to get up and follow the student-athlete out of the classroom at any time he/she decides to leave. This will ensure that the student-athlete is always accompanied by someone. We have come across many examples of a person appearing to be perfectly normal one minute and then collapsing on the floor the next. We want to have a buddy around if this ever happens to one of your student-athletes.

ASSIGNMENTS

One of the common symptoms of concussion is the inability to plan and organize. This means Student-athletes may be having trouble processing information, so you should allow extra time to complete homework assignments.

They may even lose track of homework assignments or have difficulty even approaching the planning of a project. This may appear to be a completely different student than you had prior to the injury. It will be extremely frustrating for the student and will also be a bit frightening as he/she wonders if things will ever get back to normal. As his/her teacher, you must continue to give the student hope that things will eventually get better as long as he/she follows the "program" and puts as little exertion on the brain as possible.

You may find that the student comes to class without text books, material or pens. Unfortunately, because of the demands on a classroom teacher it is possible that these problems could go undetected for some time. The student-athlete's "buddy" can be a huge help in this respect. He/she can help him/her get organized and even meet at the locker to make sure that all of the materials are brought to the class. He/she can even share material and/or books when they are misplaced. Eventually the student-athlete will recover to the point where he will rely less and less on the assistance in this area.

You may also want to consider reducing the expectations or requirements of the course so that the student-athlete is not required to produce the same amount of work as normal. Just stick to the core material and avoid the extras. This partial work load will assist in the recovery process even though it may create some difficulties for the teacher when it comes to evaluation of progress. Remember, this is not the same student as before. The workload cannot be the same as the others in the class. His/her brain is not functioning at full capacity. Unless it is absolutely necessary, you may even consider reducing the emphasis on spelling and grammatical requirements for written work, concentrating on the ideas and concepts instead. It will be difficult for the student-athlete to maintain his/her former standards in these areas.

Once the student-athlete is able to do homework it is always advisable that you provide him/her with written instructions that can be followed while at home rather than expecting him/her to remember what was said in class. Keep in mind that while in rehabilitation, the student-athlete may not be able to recall instructions or may find it stressful trying to remember exactly what the teacher said. By having the instructions down in writing it will be easy to follow at home. The "buddy" may also be able to help with this if they are in contact by phone each evening.

TESTING

This is perhaps one of the most important areas of adjustment that will have to be made for the recovering student-athlete, especially if the injury happens during Grade 12 or while taking courses that will affect entrance to university or college. And yet, if a student-athlete is forced to take a test while he/she is symptomatic it will place him/her at a great disadvantage for coming up with passing grades. In addition, the mental effort required to prepare for the test may even exacerbate the symptoms and delay recovery. We know how stressful tests can be at the best of

times, so imagine what this kind of "electrical activity and stimulation" would do to a concussed brain.

If possible, it would be best to find an alternative method of evaluation that would be appropriate for the student-athlete. This is something that should be considered if the exam is not a mandatory requirement, such as an entrance exam for post-secondary school. It is quite reasonable to calculate the marks for a student-athlete based on his/her daily seatwork, class participation and assignments, or to just use the marks earned up until the time of injury.

Postponing testing until the student-athlete is fully recovered is another alternative, but the anxiety of knowing that one will be facing a huge challenge to get caught up and do the test at a later date may also have negative consequences to the recovery process. Therefore, postponing the test is not recommended. Keep in mind that concussion symptoms may return even after it seems as if the student-athlete is symptom free. It would be terrible if a test brought on a "repeat concussion", but that is precisely what could happen if the brain is overstressed too soon after recovering from the original injury.

One thing is for certain - you should never expect an injured student-athlete to take part in a major mid-term or final exam during the recovery period. If there is no other choice, then try to schedule the exams so that the student-athlete can take only one per day or every second day with plenty of study time in between. You may even be able to break the exam up into smaller chunks and have it completed over several days instead of all at once in one sitting.

Some student-athletes may feel that they are well enough to take tests, but teachers are cautioned to be prepared to provide them with extra time to complete the test. The reason for allowing this extra time is because when the brain is impaired as a result of a concussion, it takes longer to process information, so the student-athlete may be able to successfully complete the test, but it will take longer for him/her to process material.

If a student-athlete wishes to take a test, it might be advisable to have him/her take the test in a smaller exam room where there may be fewer distractions and pressure.

One suggestion that may help is the utilization of multiple-choice or open-book tests which tend to minimize the need to retrieve information. The student may be able to recognize the correct answer, but may be unable to mentally recall the answer because those "connections" in the brain may be damaged. Therefore, whenever possible, try to create this type of test for the recovering student-athlete and you may be surprised with the positive results compared to what you would get if you forced the student-athlete to try to retrieve the information from memory.

SENSITIVITY TO LIGHT, NOISE, CROWDS

Student-athletes who are suffering from concussion symptoms often have difficulty during the recovery period from over sensitivity to light or noise. If the fluorescent lighting in the classroom is bothering the student, then perhaps you can make some accommodations that won't interfere with the rest of the class. For example, you might allow the student-athlete to wear a baseball cap

or sunglasses that will cut down on the light. You may even be able to turn down the lights a bit in one part of the room.

As for noise, it may be advisable to allow the student-athlete to eat lunch in a quiet area rather than in a noisy cafeteria. This is another opportunity for the student-athlete to have a "buddy" who will accompany him/her for lunch. Anything that is going to reduce the chances of causing stress on the brain is encouraged.

Be advised that even after recovering from the concussion, the student-athlete may be permanently sensitive to light and/or noise. This is not uncommon with some student-athletes. Most of the symptoms will go away, but because we are dealing with the most complex organ in the body, we just don't know what the end results will bring. Some of the damage may be permanent and the student-athlete will need to learn to cope.

Changing classes may be accomplished by allowing the student-athlete to leave class early so as to avoid the noise of the rest of the students moving in the hallway. Anyone who has been caught in the hallway of a large high school during class change is well aware of the noise as well as the physical contact that is often made as people are rushing too and fro. Therefore, by allowing the student-athlete some time to move prior to the heavy traffic in the hallway, you will be helping him/her prevent some further physical or mental stress which may impact on the original injury.

LIMITED PHYSICAL ACTIVITY

During the recovery process the student-athlete should absolutely not take part in any gym class. Nor should the student be around any activity where there is a risk of him/her being accidentally struck on the head by an errant basketball or baseball. Any blow to the head or body could result in a repeat concussion which could have serious consequences.

The student-athlete should also avoid carrying around heavy backpacks and loads of books from class to class. This physical exertion may be enough to bring on symptoms.

Even the climbing of stairs should be avoided, or at the very least, the student-athlete should be allowed to move up and down stairs when there is no danger of being bumped by other students.

It has been found that playing musical instruments may also be too much exertion for a recovering student-athlete, so if the student is in a band, it may be wise to avoid playing at least until the major symptoms subside.

That being said, it is quite acceptable for the student-athlete to attend gym class and simply "walk" around for periods of time. This light aerobic exercise is good on the recovery process. Once again, “where” the student-athlete does this walking is important. He/she should not be at risk of being struck on the head accidentally.

A bit of physical activity is permitted as long as it is light and there is no resistance involved. Even lightly riding a stationary bike with no resistance is fine, as long as no symptoms return. This little bit of exercise can actually have a positive affect on the mental stress level of the

student-athlete and help increase the blood flow and oxygen levels in the body. All of this may help with the rehabilitation process, as long as the exercise does not bring on symptoms.

READING

If a student-athlete finds reading to be too strenuous during the recovery period, some teachers have arranged to have another student "read" to the injured student, or create tapes that can be listened to by the student. It is crucial that as little mental exertion be created as possible in the initial stages of recovery. This stimulation should be increased gradually under careful observation. Reading is hard on the brain.

You should not ask the student-athlete to read orally in front of the class. This may prove embarrassing because of the difficulty in recognizing words because of his/her impaired reading skills.

The student-athlete will be able to build up to normal reading functionality in time, so if you can give him/her opportunity to do a bit of easy reading it will help the recovery. This will be considered "mental conditioning" and is just as important as physical conditioning. Just be prepared for the student-athlete to tire quickly or lose focus on what is being read. As always, if any symptoms return while reading, then the student-athlete must cease that activity.

TAKING NOTES

It has often been stated that writing is one of the most difficult skills for a person to master because of the different parts of the brain that must work to coordinate the activity. Therefore, during the recovery period it is advisable to have another student take and provide photo copies of lecture notes for the student-athlete. This will allow the student-athlete to concentrate on listening to the teacher instead of both listening and writing notes at the same time. This may not seem like a big deal, but when your brain is dysfunctional, it can be huge.

Some teachers also allow student-athletes to tape essays, stories and assignments. Therefore, they can say what they would normally write. If possible, provide the student-athlete with an outline of the lecture so that it will be easier to follow the presentation and keep on track.

CLASSROOM SEATING

Sitting at the front of the classroom or moving away from the windows and doors is something that is recommended for student-athletes recovering from concussion. This eliminates unnecessary distractions. Many students ask to sit at the front of the room while recovering so that they can concentrate better on what the teacher is saying and avoid distractions from the rest of the class.

By sitting near the front it is much easier to listen to what the teacher is saying, so there won't be as much stress trying to hear over any other background noises.

TUTORING ASSISTANCE

Some teachers are able to arrange for the services of a peer tutor or classroom assistant who will work with the student-athlete during the recovery process. This helps the student-athlete keep up with the concepts taken in class, keep track of assignments, tests, etc. For student-athletes who are forced to attend school every second day or on a part-time basis, a home tutor can work wonders.

EMOTIONAL STRATEGIES

The student-athlete who is suffering from a concussion is often very confused and may have undergone damage to the brain that will result in behavioural or emotional symptoms. Therefore, you may see emotional outbursts or behaviour that is completely out-of-character. This is normal during the rehabilitation period and teachers must be sensitive to the problems. Do not take things personally or overreact. Just make sure the rest of the class understands that you are not allowing him/her to get away with anything that is unacceptable.

It is advised that you avoid placing the student-athlete in a situation which might produce significant stress on the brain. For example, if the student does not raise his hand, do not call on him/her to answer a question or go to the front of the class to make a presentation of some sort. This may cause an unhealthy level of anxiety which could produce a "fight or flight" response and you will then have another problem in your class.

You should also be aware of signs that the student is becoming frustrated. This goes for times when he/she appears to be getting overly excitable or stimulated. When this happens it is best to allow the student to leave the class with a friend to go someplace where he/she can rest for a few minutes to calm down.

The natural goal of the brain is to be calm, happy and functioning. If the brain is experiencing these conditions then it produces neurochemicals that counter act the negative cortesol that causes stressful conditions and interfere with recovery. If the student-athlete is experiencing negative emotions before the injury, then the brain is already in a conflict situation and the damage from physical and/or cognitive trauma will be worse. Happy thoughts and success in the class will release the good "dopamine" neurotransmitters and this will help with recovery. Therefore, the accommodations described in this section are designed to help the recovering student-athlete experience success and sense that his condition is improving. If he senses that his conditions are deteriorating, then this will cause more stress, release harmful neurochemicals and his recovery will in fact be delayed.

SUCCESS CRITICAL TO RECOVERY

If a student-athlete is obviously having difficulties in one area of the curriculum, try to direct him/her to focus on areas where he/she will achieve success. It is better for recovery if the student-athlete experiences a lot of positive feedback and success.

It is also important for the classroom teacher to acknowledge the frustration and anger that the student-athlete is feeling. Removing the student from areas which are going to trigger negative emotional outbursts is something that should be considered.

RELATIONSHIPS

Because the student-athlete cannot take part in regular activities while recovering, peer relations often take a beating following a concussion injury. Classroom teachers may be able to spot signs of changes that need to be addressed. Friends may not fully understand what their "old friend" is going through. They may unfortunately take things personally when the student-athlete is unaware of what he/she is doing.

We also know that teenagers often feel they are falling deeply in love with their soul mates during high school. If a student-athlete's character changes in a negative way because of a concussion, this may cause some relationships to be strained and the student-athlete may feel his/her world is crumbling. Just be there for the student-athlete and help him/her get through these trying times.

It would also be a good idea to go over some of the symptoms of a concussion with the entire class so that they become more aware of what may be going on with their classmates who are suffering from this type of injury. If you are teaching a Grade 11 or 12 class, you can rest assured that anywhere from 30 to 50% of the students who participate in contact sports have experienced at least one concussion or sub-concussion during their lifetime. The information would certainly be of use to them in the future.

A student-athlete with a concussion is likely to exhibit impulsive behaviours that are hard to explain or rationalize. They will be very moody and often will be defiant to people in authority, lashing out when least expected. Keep in mind that this is not the person you used to know. The brain injury has changed this person and in time, with proper rehabilitation, the old person will return. Everyone just needs to be patient and understanding.

COUNSELLING

Because a brain injury can often affect a student-athlete emotionally, it is advisable to arrange for the student-athlete to meet periodically with a guidance counsellor or to meet with a teacher after school or during the day. Sometimes the student-athlete needs someone to confide in and just to talk with in order to help get a grip on emotions and mental outlook.

The student-athlete should be counselled on the importance of him/her being honest about symptoms that occur as he/she is gradually increasing the day-to-day workload in class. This is not to be considered an excuse to stay out of work, nor should the student-athlete be trying to hide symptoms. If a particular kind of assignment or activity brings on symptoms such as headaches, confusion, concentration difficulties, etc., then it is critical that the student-athlete let the teacher know.

DEPRESSION vs UNHAPPINESS

We feel that we should take a full section here to deal with depression. Depression is something that adolescents experience often and in fact is one of the most common mental disorders of this age group. When a student-athlete suffers a concussion it is even more common for him/her to present signs of depression so classroom teachers should be on the careful look out for the obvious signs.

Keep in mind that the main source of happiness for human beings, and in particular adolescents, is social connectivity and a sense of purpose. A student-athlete who suffers from a concussion experiences a denial of these two sources of happiness and may exhibit signs of depression. That being said, I also wish to point out that we should not over react and diagnose the student-athlete with depression simply because he is feeling unhappy. It is natural to have feelings of unhappiness due to the fact that he is no longer able to participate in the sport which gave him not only a sense of purpose but also raised his image tremendously in the eyes of his peers. However, this does not automatically mean that the student-athlete is suffering from depression.

If you notice that the student-athlete looks depressed or comes to school in a sad mood, talk to him/her. Try to encourage the student-athlete to gradually get involved in the activities he/she was interested in before the injury. Try to find ways to motivate the student.

It is extremely important for teachers to observe for signs of depression because lack of motivation, lack of energy and a feeling as if life is not worth living can lead to thoughts of suicide in adolescents. We must do everything possible to encourage the student-athlete to look at the positive side of things and focus on rehabilitation and recovery, not despair and hopelessness.

Gradually, the student-athlete will take on more and more of the workload, increasing the amount of concentration as long as there are no recurring symptoms. Eventually he/she will build up to a full workload without any symptoms as the original injury heals.

By the time the School Leader is prepared to issue a School Clearance to Resume Physical Training the student-athlete should be able to handle a full workload without accommodations.

CONCLUSION

These are just a few of the accommodations that you might consider if you have a student-athlete in your classroom who has suffered from a concussion. What you do in the classroom will have a tremendous affect on the student-athlete's recovery.

Understandably, as the student recovers from the effects of the concussion he/she will be able to handle more and more of the normal workload until such time as he doing everything that was expected of him prior to the injury. By that time the rehabilitation should be almost complete and he/she may be back into competition.

FINAL WORDS…

One of the most important things a classroom teacher can do to prepare for the eventuality, and likely probability of students experiencing a concussion at some point in the school year, is to take a survey of the students in the classroom who are actively participating in competitive sports which are known to have a high incidence of concussion. Those students, at the high school level, are most likely to either have had an identified concussion in the past, or have had sub-concussive injuries that have not produced any symptoms.

Once you know who these student-athletes are, create an in-class performance baseline and record your observations. Take note of their participation level in discussions. Notice their attention span and how long they are able to focus on their seatwork assignments. Take notice of their hearing skills and of how loudly they speak in class. Note their relationships with others in the class and if they are easy to get along with or if they are argumentative. Do some testing that measures reaction time and short term memory.

Once you have this baseline in place you will be in a much better position to help identify the signs, symptoms and behaviours consistent with concussions if they present themselves in your students. If you do notice any change from the baseline, talk to the student-athlete to see if an injury has occurred recently. Also let the coach and the parent/guardian know what you have observed so that they too can be more alert to signs that they may have been missing.

It is critical for all persons involved in the life of the student-athlete to work in partnership in order to identify this dreadful injury, which in the majority of cases, is hidden. It is dangerous to go about your normal activities while your brain is in the "healing process" from a traumatic injury. This is an extremely vulnerable period and anything we can do to assist the healing process will have long-lasting positive benefits for your student-athlete.

CHAPTER SIX

A GUIDE FOR STUDENT-ATHLETES

BEFORE YOU BEGIN…

Before you begin reading through this chapter you should complete Chapter Four: Elements of an Effective Training Program - Preparation, Identification & Rehabilitation.

INTRODUCTION

While there are many adults involved in any Student-Athlete Concussion Management Program, the most important person in the whole program is the Student-Athlete.

The Student-Athlete has the most to gain from a program, but also the most to lose if things don't go right. And in many respects, it is the student-athlete to whom the key adults will be turning for information about symptoms that may be present which could in fact indicate serious brain dysfunction as a result of a sport-related injury.

The reality is that if you have participated for a period of over six years in one of the more physical contact sports, such as hockey, soccer or football, chances are that you have already received at least one concussion. This makes you more susceptible for concussions in the future.

Perhaps more dangerously, you may have received numerous subconcussions that produced no symptoms, but over time their accumulated effect may produce the same kind of damage that a full-blown concussion can cause. Researchers are finding evidence that may support this conclusion, so until we are sure, we will exercise caution and assume that this is the case.

We don't say this to scare you, but rather so that you may understand the seriousness of this type of injury. Your brain is everything to you. There is no such thing as a minor brain injury. If you do suffer a concussion, we want to make sure you do all of the right things to recover properly before returning to play.

This Guide for Student-Athletes is mainly geared to the secondary level, but many of the concepts and information would be applicable to the post-secondary school level varsity student-athletes as well.

RECOMMENDED REQUIREMENTS FOR STUDENT-ATHLETES

It is our strong recommendation that in order to qualify to participate in try-outs for any school team that is covered by the Student-Athlete Concussion Management Program, you will have to take care of the following:

1. Bring a Parent/Guardian Permission Form to your School Coach;

2. Attend a Concussion Management Training Session once while in high school;

3. Take a Neuropsychological assessment every two years if required.

We understand that each individual school board may have different requirements for their student-athletes, however, we will continue with this chapter by indicating the protocols and procedures that are recommended by CMP Concussion Management Partners Inc. These are what we have found to be the core principles which would strengthen an effective student-athlete concussion management program.

PARTICIPATION IN A TRAINING SESSION

You should provide confirmation that you have attended one of the Student-Athlete Concussion Management Training sessions conducted by a School Coach or a School Leader. Therefore, you would simply bring a copy of your Certificate of Participation to your School Head Coach. This should be required for every team you try out for in order to verify that you have taken part in an approved training session. Your name should be included on a school board registry, so your coach should also be able to verify your training record from the registry.

If you have not completed one of the Student-Athlete Concussion Management Program Training Sessions, it is our recommendation that you be required to take part in one prior to being allowed to take part in any activities involving the team. Your School Head Coach should be offering the course for any student-athletes wishing to try-out for his/her team if they are not so qualified, but if you can get qualified in advance by taking the course early during your high school years it would be more convenient for you.

It is recommended that if you are interested in playing on any of the school teams while attending secondary school, you should attend a Concussion Management Training Session as soon as you can. You only need to take the course once, so the sooner you take it the sooner you will qualify for participation in school sports. You may also sit in on any course that is being conducted for other school teams in order to become qualified as a School Student-Athlete.

PERMISSION TO PARTICIPATE FROM PARENT/GUARDIAN

Well before the try-outs are scheduled to begin, you should see your School Head Coach and obtain a "Permission Form" that must be read and signed by one of your parents/guardians.

Your parent/guardian should be required to sign the permission form to acknowledge that you have their permission to participate on the designated school team and also to indicate that he/she has read and understood the main elements of the concussion management program.

The main reason we suggest this permission form be signed by the parent is so that the parent is aware of the protocols that will be put into place if you are suspected of suffering a concussion. Your parent/guardian plays a huge role in any concussion management program so it is important for your parent/guardian to be fully aware of the process.

VALID ImPACT BASELINE TEST

While there are several options on the market today, we recommend that all student-athletes who wish to participate on any of the designated school teams should have completed a valid baseline ImPACT test within two years of the end of the upcoming season. The test takes approximately 25 or 30 minutes to complete and can be administered by the trained School Coach or one of the School Leaders.

AWARENESS OF PROGRAM PROTOCOLS

We really cannot emphasize enough how important it is for you to be fully aware of the procedures and protocols that are to be followed with respect to the identification and rehabilitation when you are subject to an injury that could result in a concussion.

As a teenager, your brain is in constant development and growth; therefore, any trauma could have significant life-altering consequences. It is just not worth changing the course of your whole life simply to return to play a week faster.

INITIATING THE PROCESS

If you happen to be involved in a collision that one of your coaches or your parents/guardians feel may have been significant enough to cause a concussion, you will be very carefully monitored in the moments following the incident. Everyone, including you, should be on the lookout for signs and symptoms that would indicate a possible concussion.

If any of the universally accepted signs, symptoms or behaviours consistent with concussions are evident, then you should be removed immediately from further play and the Student-Athlete Concussion Identification & Rehabilitation Protocol should be initiated.

There can be no hesitation in making this decision. There can be no debating the merits of the decision. In other words, if one of your parents/guardians approaches the coach during the game and informs that coach that you appear to have been injured there should be no hesitation on the part of the coach. You should be removed from action immediately and the process will begin. If you make the request yourself, you will be listened to immediately - no questions asked.

You must understand that this is in your own best interests. You must go along with the decision without causing your parent/guardian or your coach any grief. Above all - do not try to hide your

symptoms. We don't want to scare you, but it could be a fatal decision, so think about your entire future, not just the next few shifts in the game.

Once again, there is no honour in continuing to play when you know you may have injured your brain.

SIGNS TO LOOK FOR

Keep in mind that "**everyone"** will be on the look out for signs, symptoms and behaviours consistent with concussion when you suffer a serious blow to your head or body. We will also acknowledge that not all hard hits will result in a concussion. In fact most physical contact during competition or practice may be fine and you will simply continue to enjoy the game.

Therefore, we are not suggesting that every time forceful contact is made with you we should be pulling you from the game. However, knowing what we know about concussions, and especially that we are now aware of the fact that upwards of 80% of all concussions go unreported when they first occur, it is critical that all concussion management partners be on the lookout for tell-tale signs of concussion after a significant blow to your body or head has occurred. You may be exhibiting signs and not even be aware of them yourself

BEFORE YOU CONTINUE…

Before you continue with the rest of this chapter, please look at Chapter Eleven: Signs, Symptoms and Behaviours Consistent With Concussion. We have devoted a special chapter specifically to provide a detailed outline of the signs, symptoms and behaviours that may indicate a person has suffered a concussion. It is critically important for all partners in the Student-Athlete Concussion Management Program to be fully aware of how to identify a concussion and also how to monitor the recovery process.

HIDDEN SYMPTOMS

The greatest concern about identifying a concussion is that very few symptoms are visible to the casual observer and you may not even feel any symptoms yourself. In fact it is said that some student-athletes don't even know they have a concussion until they exert pressure that causes the symptoms to appear or worsen. Up to 80% of professional athletes, for example, were not aware they had a concussion, mainly because they didn't know what to look for. We are going to do our best to make sure you know what to look for.

This is why one of the goals of any good concussion management program is to make sure that all adults who are involved in any way with you and your fellow student-athletes are as prepared as possible to look for the signs, symptoms and behaviours consistent with concussion and then take appropriate action to remove you from further play to avoid the possibility of further damage.

We recommend that even if there are no apparent signs and you report no symptoms, if a School Coach, the parent/guardian and/or a School Leader has a strong suspicion that a particularly hard blow to the body or head area may be cause for concern, then it is at the discretion of any one or more of them to initiate the protocol and request that the School Coach remove you from further action.

We are not doing this to be mean. We always recommend erring on the side of caution, so even if it means going through the steps of the concussion management protocol to find out that there was no concussion, it is worth the inconvenience to be sure that there is little risk of long-term damage to your brain.

We will never be upset with a Concussion Management Partner who initiates the protocol. There is, however, no excuse for ignoring obvious signs, symptoms and behaviours consistent with concussion. We feel that with so many "partners" looking out for your safety, someone will see a sign or recognize a symptom if it comes up.

ROLE OF THE SCHOOL HEAD COACH

If you are removed from play because of a suspected brain injury, the School Head Coach or one of the other School Coaches should bring you to the dressing room or to a quiet place along the sidelines so that you can begin to rest your brain. The School Coach should fill out a brief Injury Assessment Form which will describe the details of the injury and give your parent/guardian an Injury Package containing a number of blank Clearance Forms that will have to be filled out by your doctor, your parents/guardians, and yourself prior to your return to physical activity.

It is possible that your school board may also have someone trained on hand to give you a formal sideline concussion evaluation test such as the SCAT2 Sport Concussion Assessment Tool, but we don't recommend a School Coach administering any such test unless he/she has the appropriate training to do so.

Once the Injury Assessment Form has been completed, a copy should be given to your Parent/Guardian to bring along with him/her when you are brought to a physician for an examination.

Your parent should also be advised to contact the School Leader or the School Head Coach within 24 to 72 hours to arrange for a post-injury ImPACT test to be given to you at the school.

HOME ACCOMMODATIONS

Once you return home after the injury, it is important for you to remember that the brain may continue to deteriorate following an injury, and since the conditions in and around the brain after an injury are not all that conducive to healing, it is absolutely imperative that you reduce as much as possible any unnecessary activity that will cause the brain cells to experience any form of stress, no matter how trivial it may seem. Therefore, it is up to you to make sure that you get total physical and mental rest immediately following an injury.

This means that there is to be no television at all at home the day of the injury. The visual stress of watching a television program may strain the injured areas of the brain. This is not a time to go home, sit on the couch and watch television.

There is to be no "radio" or "music from MP3 players" for at least the first night or until the symptoms disappear. If once you begin listening to music again it brings back symptoms, then this activity must cease or be cut back.

You should not use the computer to play video games or for any other purpose. Forget about doing homework or assignments immediately after an injury. Teachers will understand.

There is to be no using of cell phones or sending or receiving text messages. Give your phone to your parent/guardian so there is no temptation - nor are there to be any phone calls over land lines.

You should refrain from doing any reading, whether they are books or magazines.

Finally, keep conversations to a minimum. You should go to bed in a dark, quiet room and just rest. This is a time to completely shut the brain down and let the body heal itself.

Even though you may not be feeling any symptoms from the injury, and this may be the case by the time you return home from the game, it doesn't mean the concussion has healed. The headaches, dizziness, vision concerns and feeling that something is wrong, will disappear if the stress causing the problems are removed. However, that does not mean that the healing is completed. It just means that as long as you reduce the stress on the brain, the symptoms will subside. Unfortunately, too many young people think that as soon as symptoms disappear they are ready to get back to normal. Nothing could be further from the truth. This is an injury that takes time and both physical and cognitive rest to heal.

In most cases the day after the injury should also be a day of rest. You may want to stay home from school that day if some of the symptoms still prevail. If the symptoms have gone away, you can get up and walk around slowly for a while. You might spend a few minutes watching television. You may even listen to some music if the volume is low (not with an earphone). The strategy here is to keep everything at the absolute minimum and to be carefully monitoring which activities cause symptoms to return. As soon as a symptom returns you must make sure to cease whatever activity was causing the problem.

You may gradually increase the amount of time doing normal activities, including a bit of light walking, but no weight lifting, jogging or anything else that will cause movement in the brain. As long as the increased activity does not bring on symptoms, you can continue to build up your activity sessions. This gradual increase in exertion actually helps with the healing process, but you must not push the threshold when symptoms begin to appear again.

ONCE SYMPTOMS HAVE DISAPPEARED FOR GOOD...

Once the signs and symptoms have disappeared for good and you are confident that it seems as if the injury has pretty well healed, you should sit down with your parent/guardian and talk about signing your Student-Athlete Clearance to Resume Physical Training form. This is a form that we recommend be included as part of the concussion management program. Keep in mind that the disappearance of symptoms usually happens before the damage has completely healed, so just because symptoms have subsided for a day or two does not necessarily mean you are no longer at risk for subsequent concussions.

Your parent/guardian should also be required sign a Parent-Guardian Clearance to Resume Physical Training. You and your parents/guardians can discuss your progress and together you can decide if you are ready to resume physical training.

POSSIBLE SCHOOL ACCOMMODATIONS

RETURNING TO CLASS

You and your parent/guardian will decide when the symptoms have subsided enough to allow you to return to school following the injury. In most cases, you will be able to return to some limited classroom activity within one or two days of the injury.

Teachers have been advised that until you are ready to return to school, it is not recommended that any work or notes be sent home for you to keep up since we do not want you to be doing any reading or other activity that will add to the cognitive stress levels. So make sure that you refrain from asking your peers to bring you any work while you are resting for the first day or so.

The first day back should be a very light day. You and your teachers should spend some one-on-one time with each other to assess the situation and discuss any of the accommodations that have been explained to your teacher as outlined below. We are providing you with the accommodation recommendations that have been suggested to the teachers, so you should talk about which ones you feel you would like to consider.

ATTENDANCE

Depending on the symptoms, you may need to remain home at complete rest for several days following the injury. Even upon returning to school, you may find that you need to stay home every second or third day, either because the symptoms are returning or you feel exhausted. Keep in mind that it is common for a person to feel very tired following a brain injury. Therefore, you must be prepared for irregular attendance and you should not count on being present on any particular day or class. It is possible that you may plan on being present on a certain day and then symptoms flare up the night before or the morning of the class and be unable to attend.

It may also be necessary for you to prioritize your classes, attending core subject classes only, while resting during electives. Therefore, depending on the subject, a classroom teacher may not see you for days on end, even though you are at school. You may feel the need to keep up with your compulsory subjects, but may find it necessary to cut back on some of your electives because these will be easier to maintain once you recover fully.

You may also find it easier to attend school during mornings or afternoons, depending on when symptoms are worse. For example, if you are having trouble sleeping you may be too tired in the morning to attend classes and will therefore find the afternoons easier. On the other hand you may find that your symptoms, such as fatigue, worsen as the day goes on so you may prefer to attend school in the morning and go home in the afternoon.

The daily schedule is something that you should discuss with your guidance counsellor and all of your classroom teachers. If all goes well, this disruption of scheduling should only last a couple of weeks at the most, as long as you follow your guidelines for rehabilitation.

REST PERIODS DURING THE DAY

Following a concussion you may find that you are absolutely drained of mental and physical energy. Some have likened it to a battery that loses its charge much faster than before. Further adding to the confusion and to the internal stress you are under is the fact that your mental energy level will vary from day to day and activity to activity. In fact, despite everything that you are doing, you may find that the symptoms are getting worse. This is normal and the classroom teachers will be sensitive to this phenomenon of concussions. In some cases the symptoms may not even appear for days or weeks following the initial injury, so don't let this worry you. It is quite normal.

You may find that if you are allowed to take periodic rest breaks of 20 or 30 minutes in a quiet place when symptoms flare up, you are able to remain at the school for longer periods of time. Therefore, you should work out a procedure with your teachers whereby you can excuse yourself and perhaps go and lie down in the nurse's room or the staff lounge for a while. It may be that all that is required is for you to go to the library to do seatwork if the noise level gets too loud in the class. The rest breaks will gradually lessen as the recovery process continues.

Some sort of procedure will have to be established with school administration so that your teachers can keep track of your whereabouts. You cannot simply disappear with no one being aware of your location. This is not just to address liabilities with respect to supervision duties, but also in case you ever have a health issue that may require emergency attention. Someone must be aware of your whereabouts at all times.

It may be a good idea to bring along a "buddy" when you need one of these rest sessions so that the "buddy" can do work nearby while you are resting. Remember, this is not an opportunity for socializing. It is a time to rest.

ASSIGNMENTS

One of the common symptoms of concussion is the inability to plan and organize. This means that you may be having trouble processing information, so you should allow extra time to complete homework assignments. You may even lose track of homework assignments or have difficulty approaching the planning of a project. In fact, you may appear to be a completely different student than you were prior to the injury. It will be extremely frustrating for you and will also be a bit frightening as you wonder if things will ever get back to normal. Don't let yourself get stressed out. If you are doing everything to help your own cause, things will get back to normal in time.

You may find that you forget to bring the right text books, material or pens to class. Unfortunately, because of the demands on a classroom teacher it is possible that these problems could go undetected for some time. We recommend that you find a "peer partner" or "buddy" during the recovery period. This partner can help you get organized and even meet you at your locker to make sure that all of the materials are brought to the class. You can even share material and/or books when yours are misplaced.

Your Teacher will also be asked to reduce the expectations or requirements so that you are not required to produce the same amount of work as normal. This partial work load will assist in the recovery process even though it may create some difficulties for the teacher when it comes to evaluation of progress. You should not take advantage of this and use your injury to get out of work. Once again, this is a very serious injury, so don't do anything to jeopardize the recovery process.

Once you are able to do homework it is always advisable that you ask your Teacher or a friend to give you written instructions that can be followed while at home. Don't try to remember what was said in class. Keep in mind that while in rehabilitation, you may not be able to recall instructions or you may find it stressful trying to remember exactly what the teacher said. By having the instructions down in writing it will be easy to follow at home.

TESTING

This is perhaps one of the most important areas of adjustment that you will have to make, especially if the injury happens during Grade 12 or while taking courses that will affect entrance to university or college. And yet, if you are forced to take a test while you are symptomatic it will place you at a great disadvantage for coming up with passing grades. In addition, the mental effort required to prepare for the test may even exacerbate your symptoms.

If possible, it would be best to find an alternative evaluation procedure that would be suitable and agreeable to you and your teachers. This is something that should be considered if the exam is not a mandatory requirement, such as an entrance exam for post-secondary school. It is quite reasonable to calculate your marks based on your daily seatwork, class participation and assignments, or to just use the marks earned up until the time of injury.

Postponing testing until you are fully recovered is another alternative, but the anxiety of knowing that you will be facing a huge challenge to get caught up and do the test at a later date may also have serious consequences to the recovery process.

One thing is for certain - you should never expect to take part in a major mid-term or final exam during the recovery period. If there is no other choice, then try to schedule the exams so that you are only taking one per day or every second day with plenty of study time in between.

You may feel that you are well enough to take tests, but even so you should ask your teachers to give you extra time to complete the test. The reason for needing this extra time is because when the brain is dysfunctional as a result of a concussion, it takes longer to process information, so while you may feel fine, and you may be able to successfully complete the test, but it will take longer for you to process things.

If you insist on taking a test, it might be advisable to take the test in a smaller exam room where there may be fewer distractions and pressure.

One suggestion that may help is the utilization of multiple-choice or open-book tests which tend to minimize the need to retrieve information. You may be able to recognize the correct answer, but may be unable to mentally recall what the answer is. Those "connections" in the brain may be damaged. You should ask your teachers if this is a possibility.

SENSITIVITY TO LIGHT, NOISE, CROWDS

Student-athletes who are suffering from concussion symptoms often have difficulty during the recovery period from over sensitivity to light or noise. If the fluorescent lighting in the classroom is bothering you, then perhaps you and your teacher can come up with some accommodations that won't interfere with the rest of the class. For example, you might ask if you can wear a baseball cap or sunglasses that will cut down on the light. You may even be able to turn down the lights a bit in one part of the room.

As for noise, it may be advisable for you to eat lunch in a quiet area rather than in a noisy cafeteria. This is another opportunity for you to have a "buddy" who will accompany you for lunch. Anything that is going to reduce the chances of causing stress on the brain is encouraged.

Changing classes may be accomplished without incident by leaving class early so as to avoid the noise of the rest of the students moving in the hallway. Anyone who has been caught in the hallway of a large high school during class change is well aware of the noise as well as the physical contact that is often made as people are rushing too and fro. Therefore, by allowing yourself some time to move prior to the heavy traffic, you will be helping to prevent some further physical or mental stress on the original injury.

LIMITED PHYSICAL ACTIVITY

During the recovery process you must not take part in any gym class. Nor should you be around any activity where there is a risk of being accidentally struck on the head by an errant basketball or baseball. Any blow to the head or body could result in a repeat concussion which could have serious consequences. So watch where you are standing during outside breaks and activities.

You should also avoid carrying around heavy backpacks and loads of books from class to class. This physical exertion may be enough to bring on symptoms.

Even the climbing of stairs should be avoided, or at the very least, you should be allowed to move up and down stairs when there is no danger of being bumped by other students. If there is an elevator, get permission to use it during your recovery period.

It has been found that playing musical instruments may also be too much exertion for a recovering student-athlete, so if you are in a band, it may be wise to avoid playing until you are free of symptoms.

That being said, it is quite acceptable for you to attend gym class and simply "walk" around for short periods of time. This light aerobic exercise is good for the recovery process. Once again, where you do the walking is important. You should not be at risk of being struck on the head accidentally.

READING

If you find reading to be too strenuous during the recovery period, you can ask your teacher to arranged to have another student "read" to you, or create tapes that can be listened to later on. It is crucial that as little mental exertion be created as possible in the initial stages of recovery. This stimulation should be increased gradually under careful observation.

You will be able to build up to normal reading functionality in time, so if you can find the opportunity to do a bit of easy reading it will help the recovery. This will be considered "mental conditioning" and is just as important as physical conditioning. Just be prepared to tire quickly or lose focus on what is being read. As always, if any symptoms return while reading, then you must cease that activity.

TAKING NOTES

It has often been stated that writing is one of the most difficult skills for a person to master because of the different parts of the brain that must work to coordinate the activity. Therefore, during the recovery period it is advisable to have another student take notes and provide photo copies of lecture notes for you. This will allow you to concentrate on listening to the teacher instead of both listening and writing notes at the same time. This may not seem like a big deal, but when your brain is disabled, it can be huge.

Some teachers also allow you to video record essays, stories and assignments. Therefore, you can say what you would normally write.

CLASSROOM SEATING

Sitting at the front of the classroom or moving away from the windows and doors is something that is recommended while you are recovering from concussion. This eliminates unnecessary distractions. Many students ask to sit at the front of the room while recovering so that they can concentrate better on what the teacher is saying and avoid distractions from the rest of the class.

By sitting near the front it is much easier to listen to what the teacher is saying, so there won't be as much stress trying to hear over any other background noises.

TUTORING ASSISTANCE

Some teachers are able to arrange for the services of a peer tutor or classroom assistant who will work with you during the recovery process. This helps you keep up with the concepts taken in class, keep track of assignments, tests, etc. If you find that you are forced to attend school every second day or on a part-time basis, a home tutor can work wonders.

EMOTIONAL STRATEGIES

A student-athlete who is suffering from a concussion is very confused and may have undergone damage to the brain that will result in behavioural or emotional symptoms. Therefore, you may experience emotional outbursts or behaviour that is completely out-of-character for you. This is normal during the rehabilitation period and teachers will be sensitive to the problems.

It is advised that you avoid placing yourself in situations which might produce significant stress on the brain. For example, talk to the Teacher and come to an agreement that if you do not raise your hand the Teacher will not call on you to answer a question or go to the front of the class to make a presentation of some sort. This may cause an unhealthy level of anxiety which could produce a "fight or flight" response and you will then have another problem to deal with.

You should also be aware of signs that you are becoming frustrated. This goes for times when you appear to be getting overly excitable or stimulated. When this happens it is best to leave the class with a friend to go someplace where you can rest for a few minutes to calm down.

The relations you have with your classmates may be strained while you are recovering. They may not fully understand what you are going through. They may take things personally when actually you are acting out of character and may not be fully aware of what you are doing. It helps if you have a close friend who is able to explain to your other friends and classmates why you are acting this way.

COUNSELLING

A brain injury can often affect a student-athlete emotionally. Therefore, it is advisable to arrange for you to meet periodically with a guidance counsellor or to meet with a teacher after school or during the day. Sometimes you just need someone to confide in and just to talk with in order to help get a grip on you emotions and you mental outlook.

The must remember the importance of being honest about symptoms that occur as you are gradually increasing the day-to-day workload in class. This is not to be considered an excuse to stay out of work, nor should you be trying to hide symptoms. If a particular kind of assignment or activity brings on symptoms such as headaches, confusion, concentration difficulties, etc., then it is critical that you let the teacher know. Gradually, you will be able to take on more and more of the workload, increasing the amount of concentration as long as there are no recurring symptoms. Eventually you will build up to a full workload without any symptoms as the original injury heals.

By the time the School CMP Leader is prepared to issue a School Clearance to Resume Physical Training you should be able to handle a full workload without accommodations.

LIFESTYLE ADJUSTMENTS

You must accept that the injury you have suffered to your brain is serious. Regardless of what some people may say about concussions, there is nothing minor or mild about them. Scientists are constantly exploring the brain and discovering new information about this extremely complex organ. That being said, you are the person who is ultimately responsible for your own rehabilitation. You shouldn't need to be told what to do by your parents/guardians, your teachers or your coaches.

Therefore, on top of everything that has been mentioned above, let's finish off this section with some final reminders about some of the personal lifestyle adjustments you may need to make following your injury:

1. If you feel any concussion-like symptoms, DO NOT KEEP IT TO YOURSELF! Let your parent/guardian know immediately. They are responsible for your well-being and they will know what to do, but they need to be told if you are experiencing symptoms. You know what the symptoms are and you know what kind of consequences you risk if you do not heed the signs.

2. Immediately stop what you are doing if any symptoms return. Keep track of what it was that caused the symptoms to return so that you can monitor what level of pressure or stress triggers those symptoms. As your brain heals you will be able to increase the level more and more before the symptoms come back. This is how you can judge your rate of recovery.

3. When you feel up to it, you can engage in light physical activities such as walking, gradually progressing to longer and faster paced walking. You may even be able to do the stationary bike as long as you do not place any resistance on the wheel. Once you feel symptoms, cut back to the duration and pace that did not produce symptoms. Remember that this is something you can do before you return to physical training. This is not training! Don't overdo it! And do not even attempt weights lifting.

4. Always talk to your guidance counsellor and/or classroom teacher if you are feeling overwhelmed. They understand the concussion management program. They know what you are going through and are prepared to drop whatever it is they are doing to address your needs. You are not alone in this.

5. Don’t try to take on too much. Take it slowly, step-by-step. Do not try to push yourself. You've suffered an injury to the most important part of your body.

6. Finally, one last time so that you know how important it is: DO NOT hide symptoms from your parents/guardians, your teacher, your coach or your guidance counsellor. Your entire future depends on how well you allow your brain to recover from this injury. If something is causing symptoms it means that the healing is still taking place. Let your body do its job. Give it time.

CHAPTER SEVEN

A GUIDE FOR SCHOOL COACHES

While this Guide for School Coaches is written primarily for coaches that are involved with student-athletes at the secondary school level, many of the concepts and principles will apply to the post-secondary varsity coaches and minor sport team coaches as well. The important thing is that each school board, post-secondary institution and minor sport organization should create and publish a special Guide for their coaches which contains all of the specific protocols and procedures that are to be applied with respect to the formal Concussion Management Program. Each Guide may be somewhat different, but nonetheless, the fundamental principles should be incorporated in order to ensure the highest standard of care possible for all student-athletes.

A MORE IMPORTANT ROLE THAN YOU REALIZE

It is becoming evident that the role of the coach, especially the coach of a school team, has a lot to do with the willingness of his/her student-athletes to report concussion symptoms. Athletes do not want to disappoint their coach or their team mates. This is one of the reasons why the number of estimated concussion injuries outnumbers those that are reported by as much as 40 to 1 according to some of the research in the field.

Educating players on the symptoms of concussion and the on the serious long term implications of not allowing these injuries to heal does not seem to be enough with high school athletes. And it is not like this is an uncommon injury. For example, it is estimated that at least 60% of student-athletes will suffer some degree of concussion injury before they graduate from high school. And yet, still, the underreporting of concussions is reaching crisis levels.

One of the most significant determinants as to whether or not student-athletes will report concussion symptoms is the attitude of the coach. A coach who encourages his players to report all symptoms and who makes it clear that this is not a sign of weakness, makes it much more likely that his players will comply and will report far more concussions than those playing for a coach who is constantly motivating his players by telling them to “tough it out” and “play with pain”.

This is a very important chapter in this Program Development Guide. We cannot undervalue the role of the coach in the implementation of an effective concussion management program for school boards or minor sport organizations.

BEFORE YOU BEGIN…

CMP Concussion Management Partners Inc.

Before you begin reading through this chapter you should complete Chapter Four: Elements of an Effective Training Program - Preparation, Identification & Rehabilitation.

INTRODUCTION

The Student-Athlete Concussion Management Program that we recommend includes four distinct positions of responsibility at any individual school.

1. One School Leader (Principal) and his/her Assistant Leaders (Vice-Principal and Physical Education Department Head) who will form the School Leadership Committee. This committee will oversee the implementation of the program at the school and be responsible for training School Coaches.

2. One School Head Coach for each designated team. This will be a licensed teacher on staff at the school.;

3. One or more additional School Coaches for each designated team. These will be licensed teachers on staff at the school;

4. Volunteer Community Coaches who may be involved with designated teams in any manner, such as coach, trainer, manager, etc.

All teachers, non-teaching staff and community volunteers who wish to be involved in any way with any of the school teams that are deemed to involve the risk of concussion injuries should be required to complete a Student-Athlete Concussion Management Training Course facilitated by a School Leader and be included on a school or school board Concussion Management Registry.

At the very least, there should be two trained members on any coaching staff, including the School Head Coach. It is recommended that over time all of the members of the coaching staff should be required to attend a mandatory training session.

SCHOOL LEADERSHIP COMMITTEE

The Principal of the school should be designated as the School Leader. He/she should be the person who is ultimately responsible for overseeing the implementation of the Student-Athlete Concussion Management Program at the school.

The School Leadership Committee should also include the Vice-Principal and the Physical Education Department Head. The School Leadership Committee will be responsible for facilitating the training and certification of all other School Coaches at the school.

Additional people may be added to the School Leadership Committee if the Principal feels that there is a need or that the other members may enhance the implementation of the program.

SCHOOL COACH

Anyone taking the training who has a valid teaching certificate, whether they are active or not, may be designated as a School Coach.

A School Coach would be qualified to facilitate training courses for Student-Athletes.

A School Coach would also be qualified to administer the baseline and/or post-injury ImPACT test to student-athletes if this is to be included in the program.

COMMUNITY VOLUNTEER COACH

Anyone who does not have a teaching license or certificate and who participates in the training should be designated as a Community Volunteer Coach.

A Community Volunteer Coach should be permitted to assume any of the responsibilities on the coaching staff such as coach, assistant coach, manager, trainer, etc.

With no disrespect to the quality and dedication of community volunteers, the Community Volunteer Coach **should not** be authorized to facilitate the Student-Athlete Concussion Management Training Courses or administer the ImPACT test to student-athletes. These responsibilities should be assigned to the School Head Coach and/or one of the other School Coaches at the school.

SCHOOL HEAD COACH

The School Leader should appoint one School Coach associated with the team to act as Head Coach for the team and that person will be called the School Head Coach.

Note that a Community Coach should not be qualified to be appointed as the School Head Coach since these are school-sanctioned activities and we feel that a staff member should be responsible for the concussion management program with the team.

This does not mean that the School Head Coach needs to be the main "coach" on the bench. It is simply referring to the Student-Athlete Concussion Management Program. In fact, it is quite possible that the School Head Coach may only be responsible for this function and may not even get involved in the general operations of the team. However, as you will see, there are a lot of responsibilities associated with the role of School Head Coach.

We further recommend that the School Head Coach should be an acting staff member at the school, employed by the School Board. We don't think this should be a position assumed by a retired teacher or an occasional teacher, even if they have a valid teaching certificate. There should be some employment relationship between the School Head Coach and the School.

DETERMINING DESIGNATED TEAMS

The School Leadership Committee should designate the sports and activities at the school that will fall under the Student-Athlete Concussion Management Program.

Those should be the sports and activities for which there is significant risk of head injury, including but not limited to: football, hockey, soccer, basketball and volleyball for both boys and

girls. We advise here that it is possible that the School Leadership Committee may decide to include “all” activities at the school under the program, including intra-mural activities and physical education classes. The Guides could very well apply to any individual who receives a traumatic brain injury by any cause.

Nevertheless, it is important that at the very least, the student-athletes who participate in high risk sports should be required to follow the formal concussion management program.

TRAINING OF TEAM COACHING STAFF

The coaching staff for any of the designated teams will include head coaches, assistant coaches, trainers, managers, teacher supervisors, community volunteers, and anyone else who will be assisting the team in any way.

The School Leader will ensure that "all" of the members of the coaching staff who are also teachers on staff at the school are formally trained and designated as official School Coaches. It is recommended that while we recommend at least two trained and qualified School Coaches per team, all of the professional licensed teachers should be trained in order to provide maximum effectiveness for the program.

If there is more than one School Coach working with the team, then one of them should be designated as the School Head Coach and will be the person responsible for overseeing the Student-Athlete Concussion Management Program with that team. Keep in mind that the School Head Coach does not have to be the person who is the "Head Coach" of the competitive side of the team. The School Head Coach is responsible for administering the Student-Athlete Concussion Management Program with the team, so this becomes somewhat of a managerial role. In some instances, the School Head Coach may simply be a teacher who is assigned to work with the team in this capacity alone and may have nothing to do with the actual running of the team.

If there is only one School Coach working with the team, then that person should be deemed the School Head Coach. The major responsibilities of the School Head Coach include receiving the permission forms from parent/guardians; the training and certification of the student-athletes; making sure that all of the student-athletes have valid ImPACT baseline test scores if neurocognitive testing is part of the program; and overseeing the identification and rehabilitation of injured student-athletes. This is a very important position on the team. The School Head Coach will report directly to the School Leadership Committee.

The School Leader will be responsible for making sure that at least two (2) members of the Coaching staff for any of its designated teams or activities, including any of the current teachers on staff who are part of the team, have been certified through the Formal Training Program. This means, for example, that if the coaching staff consists of three teachers and two volunteers from the community, then all three teachers should be trained and certified and this will meet the requirement. However, if only one teacher is part of the coaching staff and the rest are volunteers from the community, then that means the teacher must be certified and in this case take on the School Head Coach role, plus at least one of the other volunteers must attend a formal training

session in order for the team to be qualified to begin practice and/or play. We feel it is important for all teams to have members of the coaching staff who have been trained through the school board approved concussion management program in order to be familiar with the protocols and procedures with respect to concussions.

COMMUNITY VOLUNTEER COACHES

We strongly recommend that all community volunteer coaches be required to take the training program at the earliest opportunity. The training will be of benefit to the volunteers while working with the school team and also with any of the minor sports organizations with which they may be involved. This is not a waste of time for them and will certainly give parents more confidence knowing that all members of the coaching staff are certified. Ultimately, it might be required that this training and certification be completed annually as a form of refreshment training.

LOCAL SCHOOL BOARD REGISTRY

The qualifications of the members of the coaching staff should be confirmed from their listing on a school board registry. The School Leader must make sure to confirm that the coaching staff are members on the Registry. Therefore, anyone who wishes to confirm their training and qualification simply needs to provide the School Leader with a signed copy of their original Certificate of Participation or the School Leader can verify that the person is on the school board Registry.

The School Leader should make sure that sufficient opportunities are provided during the year for members of the Coaching staff as well as any other teachers, non-teachers, volunteers who are not yet on the local Registry, to take part in a Student-Athlete Concussion Management Program Training Workshop. We recommend that the School Leader or designated School Assistant Leader organize one such session at the beginning of each semester. We would also suggest that this might be a good exercise to do during one of the Professional Activity Days during the school year. It would be a way of certifying all members of the teaching staff at once so that they are all qualified for future participation with school teams.

Keep in mind that a person needs only take the Student-Athlete Concussion Management Training Workshop once.

PREPARING FOR THE NEW SEASON

PRE-SEASON MEETINGS

The School Head Coach should organize meetings with his/her coaching staff well ahead of the beginning of the season in order to establish procedures and responsibilities with respect to the concussion management protocols. This team meeting will also help identify which of the coaches are certified and trained under the program.

At least four weeks prior to the beginning of training camp or try-outs, the School Head Coach should ask for all of the student-athletes who will be trying out for the team to indicate their desire by signing a registration sheet.

PARENT/GUARDIAN CLEARANCE TO PARTICIPATE

The School Head Coach should at that time provide each student-athlete who wishes to try-out for the team with a Parent/Guardian Declaration and Permission to Play form.

The Parent/Guardian form should not only contain a clearance for the child to participate on the team, it will also contain a section where the parent/guardian acknowledges that he/she is aware of the fundamental principles of the concussion management program and will accept the responsibilities outlined for parent/guardians.

This signed form should be in the School Head Coach's hands before the student-athlete is permitted to even try-out for the team. It will also be needed in order for the student-athlete to take the CMP Student-Athlete Concussion Management Training & Certification Course (if necessary) and the baseline ImPACT test if either or both of those are required.

NOTE: **A student-athlete who is not a member of the School Board Registry should not be permitted to take the ImPACT test or any other neurocognitive assessment.**

We have provided a sample of a Permission to Play form on the next page:

PARENT/GUARDIAN DECLARATION & PERMISSION
FOR CHILD TO PARTICIPATE IN COMPETITION

NAME OF STUDENT-ATHLETE _____

ADDRESS: _____

PHONE: _____

NAME OF SCHOOL/TEAM _____

SPORT/ACTIVITY _____

I certify that I am a parent/guardian of the above named student-athlete.

As of this date he/she does not show or self-admit any signs, symptoms or behaviours consistent with concussion.

As the student-athlete's parent/guardian, I hereby give permission for him/her to participate in the above activity.

I also give him/her permission to take part in an ImPACT test if and when it is determined that he/she is required to take such test in order to become qualified to participate in the sporting activity, and/or if he/she has been injured and it is necessary for him/her to take such post-injury tests as deemed necessary in order to determine the extent of brain dysfunction as a result of an injury or to help monitor the rate of recovery from that injury.

I further give him/her permission to take part in a Student-Athlete Concussion Management Training Program sanctioned by the school board if and when it is determined that he/she is required to take part in such a course.

I also certify that I am aware of the Student-Athlete Concussion Management Program that has been adopted by the school board and agree to support and abide by all of the procedures and protocols that are part of said program and which are available on the school board web site. These procedures and protocols include, but are not limited to the following:

1. My child will immediately be removed from further play if it is suspected that he/she may have suffered a concussion;
2. Once removed from play, it will be my responsibility as his/her parent/guardian to bring him/her to a physician for examination to determine if there are any injuries that would prevent him/her from returning to physical activities;
3. I will be responsible making sure that the necessary Clearance forms are completed and signed if he/she is injured;
4. My child will not be permitted to take part in any activities of a physical nature while under a rehabilitation program for concussion. This includes non-school related activities.
5. I will be responsible for informing all of my child's teachers about the nature of my child's injury and the need to adjust his/her school activities and expectations;
6. I will agree to monitor the progress of my child at home and will only sign the Parent/Guardian Clearance to Return to Physical Training if I am certain that I have not seen any signs, symptoms or behaviours consistent with concussion within a reasonable period of time.

SIGNATURE OF PARENT/GUARDIAN _____

NAME OF PARENT/GUARDIAN _____

TODAY'S DATE: _____

LOCAL SCHOOL BOARD REGISTRY

Student-Athletes who have already taken a Student-Athlete Concussion Management Course will be asked to provide the School Head Coach with a copy of the Certificate of Participation they received when they completed their training.

Alternatively, the School Head Coach may just check to see if they are listed on the school or school board Registry. Student-Athletes who obtained their training from another school board will obviously need to be able to produce their signed Certificate, if this is acceptable to the School Leader. It is quite understandable if a school or school board wishes to have all student-athletes trained by their own staff.

Student-Athletes who are not listed on the school or school board Registry will be required to take part in a Student-Athlete Concussion Management Training Session before they are permitted to take part in any try-outs or do the ImPACT Baseline test.

The School Head Coach for the team or for any one of the other teams at the school will make arrangements to provide the course on one or more occasions in order to allow student-athletes to become qualified by taking their certification course. The course should take approximately 90 minutes to complete.

It must be noted that student-athletes should be permitted to sit in on the courses that are being presented to other designated teams in order to become qualified. All of the sessions should contain the same basic content and information.

BASELINE NEUROPSYCHOLOGICAL TEST

If this is included in the program, the School Head Coach should then take the names of all student-athletes who have registered to try-out for the team and verify that each of them has a valid baseline ImPACT test on file that will be no more than two years old by the end of the upcoming season. Information on how to access this information will be provided by the School Leader or designate who will have a password to obtain this data.

Student-Athletes who do not have a valid baseline ImPACT test should then be given an opportunity to take a test that will be administered by one or more of the School Coaches. The School Head Coach will make arrangements to reserve one of the computer labs for as often as is needed in order to allow all of the student-athletes an opportunity to take the baseline test. It should be noted that the School Coach who is administering the test need not be directly involved with the student-athlete's school team. It could be another School Coach from another team or one of the School Leadership committee who offers to supervise the test.

CONCUSSION IDENTIFICATION GUIDELINES FOR SCHOOL COACHES

PREPARATION AND SAFETY

The risk of sport-related concussion will always be present in certain activities. It doesn't matter how good your equipment is, or whether you have the most advanced helmets to protect your head, it is going to be impossible to prevent your brain from moving inside your skull in reaction to significant impact to your body. However, we feel it is possible to reduce the risk of concussion with education, appropriate equipment and qualified coaches.

We strongly encourage coaches to show their players how to "play safe" and how to avoid putting themselves in vulnerable situations where injury may occur. If players are more aware of what is going on around them and develop playing styles that enable them to be prepared for contact, they may be able to brace themselves and reduce the impact on the brain. Often it is the unexpected hit, or reckless play with complete disregard for personal safety that results in incidents which lead to concussions. We do not recommend "playing scared", but just "playing safe". There are numerous sources of information on sport-specific safe play strategies, so we encourage coaches to read up on the most appropriate ones.

We also encourage coaches to make sure that their players are "physically fit", especially in the upper back and neck areas. This training should continue all season long. It is important that players be in "game shape" before exhibition games are played.

Finally, we urge school boards to place more emphasis on the training and development of coaches. Improving the qualifications of the coaching staff is an investment in the safety of student-athletes.

ESTABLISHING A BASELINE WITH STUDENT-ATHLETES

Much has been said about the importance of establishing a baseline evaluation of a student-athlete which can be compared to a post-injury assessment in order to have some idea of the extent of deficiency that may exist. Most of the discussion about baseline assessment is focussed on the computerized tests that are conducted through ImPACT.

However, we would like to recommend that each School Coach also create a baseline with respect to sport-specific skills that can serve as a very important comparison. For example you can develop a simple test that will produce some objective measurements which involve reaction time, skill level, light sensitivity, balance, coordination, etc. These observations and results should be recorded in a way which will allow the coach to compare the progress of any rehabilitation program as the student-athlete begins the return-to-play progression. If the post-injury levels differ significantly from the baseline, then the coach can assume that the effects of the concussion are still present, even if symptoms have subsided. This will simply give another measurement upon which to determine any return-to-play status. You may need to re-test in order to up-date the baseline several times during the season to allow for skill development.

INITIATING THE PROCESS

If a student-athlete receives a serious blow to the body or head during practice or competition that in the opinion of **any one or more** of the School Coaches, a Community Volunteer Coach, the Parent/Guardian, or a School Leader, may have been sufficient enough to have caused a concussion, then the player **"must"** be observed very closely in the ensuing minutes following the incident. It may not be necessary to initiate the concussion management protocol yet, so we don't want to overreact, but once a significant force has been experienced by the body, all trained partners must direct their attention to the student-athlete to look for signs, symptoms or behaviours that are consistent with a concussion.

If during this observation period **any** of the universally accepted signs, symptoms or behaviours that are consistent with concussion are evident, then the player **must** be removed from further play and the Identification & Rehabilitation Protocols will be initiated immediately.

We will always acknowledge that individuals have different thresholds when it comes to brain trauma. Some forces that would injure one person may not have an affect on another. However, we must all pay particular attention to a person who seems to have suffered a significant blow. There may not be a need to keep the player out of the game, but if there is "any" indication that an injury may have been suffered; the player should be immediately removed from action.

NO HESITATION OR DEBATE

There can be no hesitation in making this decision. There can be no debating the merits of the decision. In other words, if a parent/guardian of a student-athlete approaches the coach during the game and informs that coach that his/her son/daughter appears to have been injured and that the parent/guardian would like to initiate the Concussion Management Identification & Rehabilitation Protocol, there should be no hesitation on the part of the coach. The student-athlete should be removed from action immediately and the process will begin.

The fact that we have so many pairs of eyes observing student-athletes in competition should help us to spot the accepted signs that will give us cause for concern.

We expect the School Head Coach to step in at that moment and make sure that the proper procedures are followed. That is why, when the School Head Coach is absent from the game or practice, there should be a clearly designated person who will assume the role. It must also be pointed out at this time that there should always be two (2) certified trained coaches present for all team activities. At least one of them must assume the role of School Head Coach if the official Head Coach is absent.

SIGNS TO LOOK FOR

Keep in mind that while **every one of the partners** must be on the look out for the signs listed below, when a student-athlete suffers a serious blow to the head or body, a great deal of responsibility falls upon the shoulders of the School Head Coach to take charge of this part of the process.

Once again, we are not suggesting that every time forceful contact is made with a student-athlete we should be pulling the player from the game. However, knowing what we know about concussions, and especially when we are now aware of the fact that upwards of 80% of all concussions go unreported when they first occur, it is critical that the School Coaches be on the lookout for tell-tale signs of concussion after a significant blow to the body or head has occurred.

BEFORE YOU CONTINUE…

Before you continue with the rest of this chapter, please look at Chapter Eleven: Signs, Symptoms and Behaviours Consistent With Concussion. We have devoted a special chapter specifically to provide a detailed outline of the signs, symptoms and behaviours that may indicate a person has suffered a concussion. It is critically important for all partners in the Student-Athlete Concussion Management Program to be fully aware of how to identify a concussion and also how to monitor the recovery process.

HIDDEN SYMPTOMS

Even if there are no apparent signs and the student-athlete reports no symptoms, if a School Coach, the parent/guardian and/or the School Leader has a strong suspicion that a particularly hard blow to the body or head area may be cause for concern, then it is at the discretion of any one or more of them to initiate the protocol and request that the School Coach remove the player from further action.

The School Head Coach must make sure that everyone associated with the team understands that we will always err on the side of caution. When it comes to head injuries, we must demonstrate that it is well worth the inconvenience of going through the process and finding out that the student-athlete did not suffer a concussion. It is much better for us to be safe than sorry, because the consequences of making a mistake are serious. There is a growing body of evidence that concussions during teen years, especially repeat concussions, tend to change the course of a person's life.

SIGNIFICANT CHALLENGES WITH STUDENT-ATHLETES

When it comes to identifying concussion in student-athletes, we run into several significant challenges:

1. ***Student-athletes may have sustained a concussion and may actually not be aware of it at the time.*** Many symptoms may not appear for hours or days after the incident. This is why it is so difficult to identify a concussion, but the School Head Coach and his/her coaching staff must do everything they can to spot the tell-tale signs. We have a lot of eyes on our student-athletes, at the game, at home and in the classroom. It should be pretty hard for signs to go undetected.

2. ***Student-athletes may think there is something wrong but haven't told anyone about how they feel in order to remain playing.*** Teenagers are natural risk-takers and they get a "chemical rush" in their brains from playing sports. They may even try to hide symptoms for a while, but a careful observer should be able to spot some signs that would indicate trouble. The student-athlete has also agreed to abide by the Student-Athlete Concussion Management Protocols in order to be on the team, so just remind him/her of this commitment if there is any arguing about being pulled from the game.

3. ***Student-athletes may think there is something wrong but haven't told anyone about how they feel because they are unable to articulate their symptoms.*** Once again, careful observations by all partners involved after a significant blow to the head or body should be able to identify subtle signs, symptoms and behaviours consistent with concussion. It is also why we ask School Coaches to "talk" to the student-athlete when he/she comes to the sidelines. All the person needs to tell you is that he/she doesn't feel right and that is enough to initiate the protocol. Again, please make sure that student-athletes must let their coach or parent know when something just doesn't feel right.

IDENTIFICATION PROTOCOLS

SIDELINE CONCUSSION EVALUATION

Once it is suspected that the student-athlete may have suffered a concussion and he/she is removed from play, the School Head Coach or one of the other School Coaches who can leave the playing area should take the student-athlete to a quiet area or dressing room to rest and get changed. There is no way the player should be going back into the game. At that time the School Coach should fill out an Injury Assessment Form that has been developed and approved by the school board to provide as many details of the incident as possible. You can also include observations and symptoms that are being admitted by the student-athlete.

Some school boards may wish to administer the SCAT2 Sport Concussion Assessment Tool sideline concussion evaluation test at that time, but we recommend that this only be done if the School Coach is trained and experienced in using this assessment tool.

Once the Injury Assessment Form is completed a copy should be made for the School Head Coach and the original given to the Parent/Guardian to bring along with him/her when the student-athlete is brought to a physician for an examination. The Parent/Guardian will be encouraged to bring their child to a physician at the earliest opportunity.

STUDENT-ATHLETE MUST GO HOME WITH A RESPONSIBLE ADULT

It is very important to remember that a Student-Athlete who is injured and has a suspected concussion must always be taken home by a responsible adult. If the parent/guardian is not at the game or practice, then you must try to contact them and see if they can come and pick up their child. If not, then it is important that another adult take responsibility for bringing the child home and making sure that he/she is not left alone. Under no circumstances should the student-athlete

drive him/herself home or be left home alone. If the student-athlete has driven to the game or practice, then another adult should drive the vehicle home with the student-athlete.

GO TO HOSPITAL IF CONDITIONS WORSEN OR CHANGE

It is not always necessary to go to the hospital the night of the injury. However, if the student-athlete lost consciousness for even a brief period of time, you must get the student to the hospital to be checked for structural damages.

Also, once the athlete is brought home, if symptoms worsen during the evening, then it is strongly advised that the child be brought immediately to the hospital. We never want to take chances when symptoms begin to get worse. And, once at home, the child should never be left alone during that first night. Somebody should always be checking on him/her. There is nothing wrong with allowing the student-athlete to rest and sleep. But someone should be around in case symptoms worsen.

INJURY PACKAGE FOR PARENT/GUARDIAN

The School Coach completing the Injury Assessment Form should provide the parent/guardian with an Injury Package that contains a number of clearance forms that will be needed in the coming days and weeks as the student-athlete goes through the process.

This package should include (sample copies on the pages that follow):

An injury assessment note that describes the nature of the injury and informs the parent/guardian that the Concussion Management protocol has been initiated for their son or daughter.

A medical clearance form for the doctor;

A parent/guardian clearance form;

A student-athlete declaration form

STUDENT-ATHLETE CONCUSSION MANAGEMENT PROGRAM
INJURY ASSESSMENT PACKAGE

NAME OF STUDENT-ATHLETE _____

ADDRESS: _____

PHONE: _____

NAME OF SCHOOL/TEAM _____

SPORT/ACTIVITY _____

As a result of the following incident the Student-Athlete Concussion Management Protocol has been initiated for the above-named student-athlete.
DETAILS OF INCIDENT DATE OF INCIDENT: _____

This information package is being provided to the Parent/Guardian of the student-athlete.

It is advised that the student-athlete see a medical physician at the earliest possible time in order to assess any possible damages and determine if a concussion has occurred. Included with this package is a Sideline Assessment that was done when the student-athlete was removed from play. This assessment should be presented to the physician. Also included with this package are four forms that must be filled out and signed before the student-athlete will be permitted to begin gradual physical training for the purpose of returning to competition. The Parent/Guardian will ensure that the forms are signed by the respective authorities and returned to the student-athlete's School Head Coach or as directed.

A Medical Clearance to Resume Physical Training for the physician to sign
A Parental Clearance to Resume Physical Training for the parent/guardian of the student-athlete to sign
A Self-Declaration to Resume Physical Training for the student-athlete to sign.
A School Leader Clearance to Resume Physical Training for the school principal.

The Parent/Guardian will make arrangements with the person signing this document to schedule a Post-Injury ImPACT Test for the above-named student-athlete within 24 to 72 hours of the date of the incident. In the meantime, the student-athlete should be monitored carefully for signs of concussion-like symptoms and should get as much physical and cognitive rest as possible. It is suggested that both the Parent/Guardian and the Student-Athlete review the information about the protocols and procedures that are recommended as part of the Student-Athlete Concussion Management Program which can be found online.

SIGNATURE OF SCHOOL COACH _____

NAME (PRINT) _____

TODAY'S DATE: _____

MEDICAL CLEARANCE TO RESUME GRADUAL PHYSICAL TRAINING FOR RETURN TO SPORTS COMPETITION

NAME OF STUDENT-ATHLETE _____

ADDRESS: _____

PHONE: _____

NAME OF SCHOOL/TEAM _____

SPORT/ACTIVITY _____

DETAILS OF INJURY	DATE OF INJURY: _____

The above-named student-athlete was examined and/or treated for symptoms of a possible concussion.

I certify that, as of this date, the above named student-athlete does not exhibit any medical reason which would prevent the beginning of a gradual physical training process for the purpose of returning to sports participation.

NOTES / DIRECTIONS FROM EXAMINING PHYSICIAN

SIGNATURE OF EXAMINING PHYSICIAN _____

NAME OF EXAMINING PHYSICIAN: _____

TODAY'S DATE: _____

PARENT/GUARDIAN CLEARANCE TO RESUME GRADUAL PHYSICAL TRAINING FOR RETURN TO SPORTS COMPETITION

NAME OF STUDENT-ATHLETE _____

ADDRESS: _____

PHONE: _____

NAME OF SCHOOL/TEAM _____

SPORT/ACTIVITY _____

DETAILS OF INJURY	DATE OF INJURY: _____

DESCRIPTION OF HOME CARE / MONITORING FOR SIGNS, SYMPTOMS AND/OR BEHAVIOURS CONSISTENT WITH CONCUSSION

I certify that I am a parent/guardian of the above named student-athlete whom I have been monitoring for signs, symptoms or behaviours that would indicate to me that he/she is suffering from a concussion.

As of this date he/she does not show or self-admit any concussion-like signs or symptoms.

Therefore, as the student-athlete's parent/guardian, I hereby give clearance for him/her to begin a gradual physical training process for the purpose of returning to sports participation and will continue to monitor him/her for the return of any signs, symptoms or behaviours consistent with concussion.

SIGNATURE OF PARENT/GUARDIAN _____

NAME OF PARENT/GUARDIAN _____

TODAY'S DATE: _____

STUDENT-ATHLETE DECLARATION OF CLEARANCE TO RESUME GRADUAL PHYSICAL TRAINING FOR RETURN TO SPORTS COMPETITION

NAME OF STUDENT-ATHLETE _____

ADDRESS: _____

PHONE: _____

NAME OF SCHOOL/TEAM _____

SPORT/ACTIVITY _____

DETAILS OF INJURY	DATE OF INJURY: _____

DESCRIPTION OF SIGNS, SYMPTOMS OR BEHAVIOURS CONSISTENT WITH CONCUSSION

I certify that I am the above-named student-athlete and I am aware of the usual signs, symptoms or behaviours which would indicate that I have a concussion.

I certify that, as of this date, and to the best of my knowledge, I am not aware of any signs, symptoms or behaviours which would prevent me from beginning of a gradual physical training process for the purpose of returning to sports participation.

I declare that I will follow a gradual physical training process for the purpose of returning to sports participation under the direction and supervision of my School Coach and I will not hesitate to admit to the return of any concussion-like signs or symptoms.

SIGNATURE OF STUDENT-ATHLETE _____

NAME OF STUDENT-ATHLETE _____

TODAY'S DATE: _____

STUDENT-ATHLETE CONCUSSION MANAGEMENT PROGRAM
NOTIFICATION TO CLASSROOM TEACHERS

NAME OF STUDENT-ATHLETE _____

NAME OF SCHOOL/TEAM _____

SPORT/ACTIVITY _____

As a result of the following incident the Student-Athlete Concussion Management Protocol has been initiated for the above-named student-athlete. This means that there may be a need for accommodations to be made to the regular classroom routines in order to compensate for concussion symptoms.

DETAILS OF INCIDENT DATE OF INCIDENT: _____

This notification is being given to all classroom teachers of the above-named student-athlete. It is possible that a number of accommodations may be required during the recovery period. The following is a list of suggestions that are being provided in order to assist in the rehabilitation process.

- Find an alternative to testing or delaying testing until after recovery
- Allow someone to copy notes for the student athlete or permit taping of lessons
- No physical education classes, including weight training or aerobics
- Do not assign homework unless the student-athlete indicates that he/she is capable of doing some
- Once the student is able to do some homework, provide written instructions
- Have the student sit near the front of the room or where there are the fewest distractions
- If the lighting bothers the student, perhaps the lights over the student can be dimmed
- Allow the student to wear sunglasses or a hat with a visor if the light bothers him/her
- Allow the student to visit with the counsellor whenever he/she requests
- Allow the student to move from class to class before the hallway gets crowded
- Allow the student to take lunch in a quiet place with one or two friends only
- waive time constraints for tests and assignments – take as long as necessary to complete
- be flexible with respect to assignment due dates
- don't expect the student to catch up on missed lessons – adjust the requirements for him/her
- provide preferential seating for close monitoring and decreased distractions
- allow the student-athlete to leave the room if he/she is feeling overwhelmed
- Provide regular sessions with the counsellor to discuss concerns and challenges
- The classroom teacher should provide individualized attention as much as possible

We appreciate the cooperation of all teachers and staff in accommodating for the needs of our child at this time.

SIGNATURE OF PARENT/GUARDIAN _____

NAME OF PARENT/GUARDIAN _____

TODAY'S DATE: _____

RECORD KEEPING IS CRITICAL

At the earliest opportunity, the School Head Coach should provide the School Leader with a copy of the Injury Assessment Form along with a detailed account of the incident. The School Leader or one the other members of the School Leadership Committee will begin a special file for the student-athlete in order to gather all of the relevant documents, clearance forms and reports that may be forthcoming as a result of the initiating of the concussion management protocol.

It is important that you document all steps in the process and keep accurate and complete records. You have a responsibility for the well-being of students enrolled at the school and must always be certain that everything possible has been done to fulfill your responsibilities. The student-athlete file is something that you can turn to in the future when making decisions that are in the best interests of the student. For example, it may be noted that a particular student has suffered several concussions in the previous year or two. That may have a tremendous influence in the School Leader's final decision on whether or not to give the student-athlete clearance to play for the school team.

Another reason for keeping accurate records has to do with the fact that once a person has suffered one concussion, he/she is much more susceptible to receiving another concussion. The brain becomes more vulnerable. Therefore, having a file on record for the student-athlete will be extremely valuable moving forward. Care must be taken to protect the privacy of the student-athlete, but that should not be hard for the school to guarantee.

POST-INJURY ImPACT TEST

The Parent/Guardian will also be advised to contact the School Head Coach within 48 to 72 hours to arrange for a post-injury ImPACT test to be given to the student-athlete at the school. It is important that the School Head Coach make sure that the parent/guardian calls to make this arrangement. If the parent/guardian does not call, then the School Head Coach must call the parent/guardian. It would be a nice gesture on the part of the School Head Coach to make the phone call the following morning in any event just to check up on the condition of his/her player.

It should be noted that the post-injury ImPACT testing should not be performed until one or two days have passed since the injury. If the student-athlete has suffered a concussion, the stress of taking the test may aggravate the condition. Therefore, if there are any obvious signs, symptoms or behaviours consistent with a concussion present, the post-injury test should be delayed until those symptoms subside.

When the parent/guardian brings in his/her child for the post-injury ImPACT test, it critical that that this test be done in a quiet place without distractions. The student-athlete will already be feeling pressure to perform well on the test or face a lengthy rehabilitation process which may keep him out of action for the rest of the season. Conditions must be perfect so that the student-athlete can do the test in as relaxed a state as possible.

If possible, the School Head Coach should try to have one of the members of the School Leadership Committee supervise the post-injury test. Otherwise, it can be administered by any other certified School Coach. At this point it might be recommended that the School Head Coach for the student-athlete remains out of the testing room so that there can be no perceived conflict of interest with respect to the results of the test. Some people may claim that the School Head Coach will try to influence the student-athlete to perform well in order to be able to return to play faster. Having a 3rd party, especially if that is the School Leader, will alleviate any of this concern.

The assessment of the post-injury test will depend on where you have made arrangements for your neurocognitive testing, but there must be some way of accessing the results. For example, if CMP Concussion Management Partners Inc. have been given the responsibility for managing the concussion management program, the School Leader will notify CMP (Dr. Czarnota will give the School Leader a contact email and/or phone number) that a post-injury ImPACT test has been submitted and will provide all of the necessary details about the incident and the student-athlete involved. This information will normally be sent by email and the School Leader or designate must make sure that he/she receives confirmation that the message has been received. Follow up again if confirmation does not come within a reasonable amount of time.

If the results of the post-injury ImPACT test show evidence of diminished functioning as compared to the student-athlete's baseline score, CMP will advise the School Leader or designate that clearance to return to physical training should be delayed until another test can be performed at a date that will be recommended by CMP.

The School Leader or designate will administer subsequent post-injury ImPACT tests as directed by CMP or as advised by the medical doctor treating the student-athlete. Once the test results have returned to baseline levels, CMP will so advise the School Leader of the return to baseline.

CMP Concussion Management Partners Inc. will never be giving an official "clearance to return to physical training" because there is so much that we do not know about the student-athlete. The responsibility that will have been taken on by our Consulting Neuropsychologist, Dr. Michael Czarnota, is to examine the post-injury test results and let the school know when the student-athlete's scores have returned to baseline levels. This would be a sign that the cognitive functioning in the areas covered by the ImPACT test have been restored to pre-injury levels according to the test results.

This is an important thing to keep in mind. Just because the ImPACT test results have returned to baseline levels, one must not automatically assume that the student-athlete has recovered sufficiently to resume physical exertion. It is a good sign, but it is not an absolute sign. At CMP we feel that the parents/guardians will be in a better position to know when their child is "back to normal". Even the classroom teacher will be in a good position to know if there is still "something going on".

Nevertheless, the return of the ImPACT results to baseline levels is a significant sign that cognitive functioning has been restored. Until then, it must be assumed that there are still problems going on in the brain.

RESUMPTION OF PHYSICAL TRAINING

Permission to resume physical training should only be given once all of the clearance forms have been returned to the School Leadership Committee and it appears that all signs, symptoms and behaviours consistent with concussion have subsided. Keep in mind that the student-athlete, up to this time, should only have been involved in light activities and should have been receiving some accommodations in the classroom which have not resulted in the return of any of the symptoms of the original concussion. This simply means that the student-athlete is ready to begin applying more physical and cognitive stress in order to gradually build him/herself back to normal.

The School Head Coach should receive some official written document signed by the School Leader before allowing the student-athlete to begin a physical training program that will include a gradual step by step progression designed to eventually prepare the student-athlete for a return to full contact practice and competition.

STEP-BY-STEP GRADUAL PHYSICAL TRAINING PROGRAM

The supervised training will consist of light aerobic exercises such as walking or stationary cycling that gradually increases in length and resistance. If there is no recurrence of symptoms, then this will progress into sport-specific training, such as skating in hockey; running in soccer, etc. At this stage you should be working on the specific skills that will be needed in your sport.

If no symptoms return while performing the sport-specific skills, you can progress into non-contact training drills. This can be done with teammates who understand that under no circumstances are you to be involved in contact, whether that contact be accidental or deliberate. This is extremely important for your team to know and accept. Some players wear a special coloured sweater to remind team mates not to hit.

The Parent/Guardian will play a role in this physical training program and will monitor their child for any signs that symptoms are returning. Home observation is critical at this point because the child may actually be reluctant to report any symptoms to the coach. If the Student-Athlete experiences any symptoms while going through the step-by-step progression, he/she will be required to return at least one step until the symptoms disappear. At no time should the student-athlete be engaging in any activity that brings on symptoms.

Each of the preceding steps should take at least one day to complete. This is not a time to rush into things since a return of symptoms could easily occur and seriously delay recovery.

If the School Head Coach, the Parent/Guardian and the student-athlete are satisfied that the step-by-step progression has been successful and there has been no return of concussion-like symptoms during the training, then the School Head Coach will meet with the School Leadership Committee and may then recommend that the student-athlete is ready to return to full contact practice and competition. If the School Leadership Committee accepts the recommendation, a School Clearance to Resume Athletic Competition and the student-athlete will be permitted to return to full contact practice and competition.

CHAPTER EIGHT

A GUIDE FOR PARENTS/GUARDIANS

"When It Comes To the Well-Being of Their Children, Parent/Guardians Must Be Directly Involved."

Parents and guardians have often been left out of the decision-making process when it comes to deciding on the return to play protocols for concussed athletes. However, it is our opinion that the assessment a parent/guardian can provide about their child when it comes to recovering from a concussion is perhaps the most crucial information we can obtain.

The parent/guardian knows when his/her child not functioning normally. A parent can tell. That is why we will always go out of our way to include the parent/guardian in every aspect of our Student-Athlete Concussion Management Program.

As a parent of three healthy active boys who were into all sports, I can recall so often feeling left out when it came to the well-being of my children in sports. We will never underestimate the key role played by parents/guardians.

As you go through the rest of this chapter and other sections of this Program Guide you will see for yourself how we've recognized this important role you play. This is your child we are dealing with. We want to make sure that the future health and well-being of your child is protected.

Always remember that when it comes to the welfare of children, there is no one more qualified than the parent/guardian.

SECONDARY & POST-SECONDARY SCHOOL STUDENT-ATHLETES

While we acknowledge that the information that is contained in this chapter is more relevant to parents/guardians of student-athletes at the secondary school level, we also know that many post-secondary school student-athletes still live at home for some or all of the year while they are attending school.

Therefore, we feel that many of the concepts and principles will still be applicable to parents/guardians of post-secondary level student-athletes.

GENERAL GUIDELINES FOR PARENTS/GUARDIANS

BEFORE YOU BEGIN…

Before you begin reading through this chapter you should complete Chapter Four: Elements of an Effective Training Program - Prevention, Identification & Rehabilitation.

AN EQUAL PARTNER IN THE PROCESS

We feel that it is critical for any Student-Athlete Concussion Management Program to place as much weight on the clearance to play from the parent/guardian as from a medical practitioner. It is our position that the doctor is the best person to examine for structural damage and physical signs of trauma, but since a concussion presents itself with symptoms that are more functional in nature, it is the parent/guardian who may be in the best position to know if their child is functioning at a level comparable to his/her pre-injury norm.

STEP ONE - PERMISSION TO PLAY

It is highly recommended that prior to the team try-outs, the School Head Coach will give each student-athlete a "Parent/Guardian Permission and Declaration Form" that must be taken home and signed by at least one of his/her parents/guardians.

The form will contain a space that indicates the parent/guardian is granting permission to the student-athlete to take part in a Student-Athlete Concussion Management Program Training Session if the child has not already taken one of the courses in the past; permission to take an ImPACT baseline test if he/she has not had one within the previous two years; and permission to participate in try-outs and/or eventual competition on the school team if so selected.

This permission will allow the School Head Coach to give your child the ImPACT test if and when it is determined that he/she is required to take such test in order to become qualified to participate in the sporting activity, and/or if he/she has been injured and it is necessary for him/her to take such a test to determine the extent of brain dysfunction as a result of an injury. This test is critical to the success of our program and as such all student-athletes who participate on school teams must have one.

You will also be giving your child permission to take part in a Student-Athlete Concussion Management Program Training Session if and when it is determined that he/she is required to take part in such a course. Your child will only be required to take part in the course once during his/her time in secondary school.

If a student-athlete does not bring the signed declaration form to the School Head Coach, the student-athlete will not be permitted to participate on the team or to take part in the try-outs. In fact, the signed declaration form must be turned in before the Student-Athlete even takes the

baseline ImPACT test and/or the training course, if they have not already done so. This is an important thing to remember. Your child will not be able to participate in any sport activity without your express written permission.

The form will also contain a declaration that the Parent/Guardian understands his/her/their roles and responsibilities under the Student-Athlete Concussion Management Program. In other words, the parent/guardian will be declaring knowledge of the information that is contained in a special Guide for Parents/Guardians which should be available in either print form or online.

It is recommended that you sit down with your child to talk about the main elements of the Student-Athlete Concussion Management Program so that you can all come to an understanding of the importance for your child to take everything in the guide seriously.

A sample copy of the Parent/Guardian Declaration & Permission For Child to Participate in Competition form can be found on the following page:

PARENT/GUARDIAN DECLARATION & PERMISSION
FOR CHILD TO PARTICIPATE IN COMPETITION

NAME OF STUDENT-ATHLETE _____

ADDRESS: _____

PHONE: _____

NAME OF SCHOOL/TEAM _____

SPORT/ACTIVITY _____

I certify that I am a parent/guardian of the above named student-athlete.

As of this date he/she does not show or self-admit any concussion-like signs or symptoms.

Therefore, as the student-athlete's parent/guardian, I hereby give permission for him/her to participate in the above sporting activity.

I also give him/her permission to take part in an ImPACT test if and when it is determined that he/she is required to take such test in order to become qualified to participate in the sporting activity, and/or if he/she has been injured and it is necessary for him/her to take such post-injury tests as deemed necessary in order to determine the extent of brain dysfunction as a result of an injury.

I further give him/her permission to take part in a Concussion Management Training Program if and when it is determined that he/she is required to take part in such a course.

I also certify that I am aware of the Student-Athlete Concussion Management Program and agree to support and abide by all of the procedures and protocols that are part of said program and which are available on the school board web site. These procedures and protocols include, but are not limited to the following:

1. My child will immediately be removed from competition if it is suspected that he/she may have suffered a concussion;
2. Once removed from play, it will be my responsibility as his/her parent/guardian to bring him/her to a physician for examination to determine if there are any injuries that would prevent him/her from returning to physical activities;
3. I will be responsible making sure that the necessary Clearance forms are completed and signed if he/she is injured;
4. My child will not be permitted to take part in any activities of a physical nature while under a rehab program for concussion.
5. I will be responsible for informing all of my child's teachers about the nature of my child's injury and the need to adjust his/her school activities and expectations;
6. I will agree to monitor the progress of my child at home and will only sign the Parent/Guardian Clearance to Return to Physical Training if I am certain that I have not seen any signs or symptoms of concussion;

SIGNATURE OF PARENT/GUARDIAN _____

NAME OF PARENT/GUARDIAN _____

TODAY'S DATE: _____

PARENT/GUARDIAN DECLARATION STATEMENTS

1. The first and most important thing you will be declaring is that as of the date you signed the form your child **does not** exhibit and/or admit to any of the signs or symptoms that would be associated with having a concussion. You must not knowingly put your child in danger if you are aware that he/she may be suffering from the effects of a concussion.

2. You will also be declaring that you are fully aware of the Student-Athlete Concussion Management Program and that you agree to support and abide by all of the procedures and protocols that are part of the program.

3. You will be stating that you are aware of and agree that your child will immediately be removed from competition if it is suspected that he/she may have suffered a concussion.

4. You will agree that once removed from play, it will be your responsibility as his/her parent/guardian to bring your child to a physician for examination to determine if there are any injuries that would prevent him/her from returning to physical activities;

5. You are accepting responsibility for making sure that the necessary Clearance forms are completed and signed if your child is injured. Those forms can be found in the Injury Package which you will be given by your School Head Coach.

6. You are declaring that you will accept the fact that your child will not be permitted to take part in any activities of a physical nature, either at school or elsewhere, while under a rehabilitation program for concussion, unless approved by the School Leader or School Head Coach. There are certain protocols that we will be following to help your child deal with a concussion injury, and it is imperative that he/she follow the protocols without endangering him/herself in outside school activities. Therefore, since your child is under your care outside of school, it is critical to our program that you support the protocols. It wouldn't do much good for a child to be prevented from playing hockey for his/her school team but still be playing for his minor sport club. It is up to the parent/guardian to inform the minor sport team coach of the injury and to prevent the child from playing on any outside team.

7. The School Head Coach will be expected to advise your child's classroom teachers about his/her injury, but under an abundance of caution, we would also like you to declare that you will be responsible for informing your child's teachers about the nature of his/her injury and the need to adjust his/her school activities and expectations.

8. Perhaps the most important declaration on your part will be your agreement to monitor the progress of your child at home and that you will only sign the Parent/Guardian Clearance to Return to Physical Training if you are certain that you have not seen any signs or symptoms of concussion for as long a period that satisfies you he/she has recovered. We feel despite all of the training that doctors, teachers and coaches may have, there is no one who knows your child better than you. You see your child at home. You know whether your child's sleep patterns, behaviour patterns, emotional stability,

and general approach to life is the same as it was before the injury. You are the best one to determine whether or not your child is ready to get back to physical training designed to return him/her to competition. Nothing happens until your child's School CMP Head Coach receives your clearance.

BASELINE NEUROCOGNITIVE ASSESSMENT OF STUDENT-ATHLETES

If your school board decides to include a neurocognitive assessment as part of the program, we recommend ImPACT, which is a computer-based battery of tests developed specifically for assessing sport-related concussion. The computer program measures multiple aspects of cognitive functioning, including attention span, working memory, sustained and selective attention time, response variability, and several facets of verbal/visual memory. This will register a "baseline" record of their abilities of your child with which to test against should they suffer some form of brain injury during the season.

The School Head Coach will give your child the ImPACT test if and when it is determined that he/she is required to take such test in order to become qualified to participate in the sporting activity, and/or if he/she has been injured and it is necessary for him/her to take such a test to determine the extent of brain dysfunction as a result of an injury. This test is critical to the success of the program and as such all student-athletes who participate on school teams must have one if it is part of the program adopted by your school board.

IDENTIFICATION PROTOCOLS

INITIATING THE PROCESS

If a your child receives a serious blow to the body or head during practice or competition that in the opinion of **any one or more** of the School Coaches, a Community Coach, the Parent/Guardian, or a member of the School Leadership Committee, may have been sufficient enough to have caused a concussion, then the player **"must"** be observed very closely in the ensuing minutes following the incident.

It may not be necessary to initiate the full protocol yet, which would require immediate removal from the activity, so we don't want to overreact, but once a significant force has been experienced by the body, everyone must direct their attention to the student-athlete to look for signs of a possible concussion.

If during this observation period **any** of the universally accepted signs or symptoms of concussion are evident, then your child **must** be removed from further play and the Student-Athlete Concussion Management Program Identification & Rehabilitation Protocol will be initiated immediately.

We acknowledge that individuals have different thresholds when it comes to brain trauma. Some forces that would injure one person may not have an effect on another. However, we must all pay particular attention to a person who seems to have suffered a significant blow. There may not be

a need to keep your child out of the game, but if there is "any" indication that an injury may have been suffered, he/she is to be immediately removed from action.

NO HESITATION OR DEBATE

There can be no hesitation in making this decision. There can be no debating the merits of the decision. In other words, if you approach the coach during the game and inform the coach that your son/daughter appears to have been injured and that you would like to initiate the Student-Athlete Concussion Management Program Identification & Rehabilitation Protocol, there is to be no hesitation on the part of the coach. Your child will be removed from action immediately and the process will begin.

Likewise, if one of the other partners feels as if your son/daughter may have suffered a concussion, you, as the parent/guardian, must accept that decision and must not attempt to have the decision overturned. This is something you will have committed to when you signed the permission for your child to participate on the team.

SIGNS TO LOOK FOR

Keep in mind that while **every one of our partners** must be on the look out for the signs listed below, when a student-athlete suffers a serious blow to the head or body, a great deal of responsibility falls upon the shoulders of the parent/guardian if in attendance to take charge of this part of the process. This is your child. It is only a game but it is your child's future.

Once again, we are not suggesting that every time forceful contact is made with a student-athlete we should be pulling the player from the game. However, knowing what we know about concussions, and especially when we are now aware of the fact that upwards of 80% of all concussions go unreported when they first occur, it is critical that the School Coaches be on the lookout for tell-tale signs of concussion after a significant blow to the body or head has occurred.

BEFORE YOU CONTINUE…

Before you continue with the rest of this chapter, please look at Chapter Eleven: Signs, Symptoms and Behaviours Consistent With Concussion. We have devoted a special chapter specifically to provide a detailed outline of the signs, symptoms and behaviours that may indicate a person has suffered a concussion. It is critically important for all partners in the Student-Athlete Concussion Management Program to be fully aware of how to identify a concussion and also how to monitor the recovery process.

IN CASE OF INJURY:

As mentioned previously, if your child suffers an injury that in the opinion of one or more of his/her coaches, the School Leader, yourself, or your child, may have caused enough of a brain trauma to possibly result in a concussion, we will immediately put into effect the protocols included in the Student-Athlete Concussion Management Program.

Once the School Coach completes an Injury Assessment Form for your child you will receive the Injury Package from the School Coach. This should be given to you at the game or practice. However, if you were not at the game or practice, you will get the information package when your child comes home. The Injury Package simply contains a brief description of how the injury occurred and also the clearance forms that must be filled out by yourself, a doctor, and your child before returning to physical activity.

Because of the nature of brain injuries, you may be required to come to the site to pick up your child. Our coaches are extremely wary about leaving a child on his/her own following a suspected brain injury. I'm sure you understand our concern for your child.

Whether you bring your child to the emergency department that night or wait for the next day to bring him/her to your family doctor will depend on the nature and extent of the injury. We want to make sure that there is no physical damage such as a fracture to the skull or neck area, and we want to rule out the possibility of internal bleeding from the rupture of a blood vessel. The urgency of that visit will be something that you as a parent/guardian will have to determine based on all of the information you are provided after the incident.

NOTE: If your child's symptoms increase in severity, do not hesitate to bring him/her to the emergency room that first evening. Use your intuition as a parent. If you feel your child is getting worse, then take him/her for a check up. It is better to be sure that there are no complications.

HOME CARE

Once you bring your child back home, it is important for you to remember that whereas the brain may continue to deteriorate following an injury, and since the conditions in and around the brain after an injury are not all that conducive to healing, it is absolutely imperative that we reduce as much as possible any unnecessary activity that will cause the brain cells to experience any form of stress or stimulation, no matter how trivial it may seem. Therefore, it is up to you to make sure that your child gets total physical and mental rest immediately following an injury.

This means that when your child returns home following the injury, even if he/she has seen a doctor immediately after the game, there is to be no television at all at home that day. The visual stress of watching a television program may strain the injured areas of the brain. Therefore, this is not a time to go home, sit on the couch and watch television.

There is to be no "radio" or "music from MP3 players" for at least the first night or until the symptoms disappear. If the music brings back symptoms, then this activity must cease.

Your child should not be allowed to use the computer to play video games or for any other purpose. Forget about doing homework or assignments immediately after an injury. Teachers will understand.

There is to be no use of cell phones or sending or receiving text messages. Take the phone away so there is no temptation. Nor are there to be any phone calls.

You should also make sure your child refrains from doing any reading, whether they are books or magazines.

Finally, keep conversations to a minimum. Your child should go to bed in a dark, quiet room and just rest. This is a time to completely shut down the brain and let the body heal itself.

You can gradually allow your child to begin doing these things over the next few days, but only as long as symptoms do not reoccur.

HELPING YOUR CHILD UNDERSTAND

You must be prepared to explain to your child that even though he/she may not be feeling any symptoms from the injury, and this may even be the case by the time you return home from the game, this doesn't mean the concussion has healed.

The headaches, dizziness, vision concerns and feeling that something is wrong, will disappear if the stress causing the problems disappears. However, that does not mean that the healing is completed. It just means that as long as you reduce the stress on the brain, the symptoms will be reduced.

Unfortunately, too many young people think that as soon as symptoms disappear they are ready to get back to normal. Nothing could be further from the truth. This is an injury that takes time and both physical and cognitive rest to heal. When the brain is experiencing rest it means that the normal demand for blood flow and electrical demands can now be directed to the damaged area of the brain. This healing process can only take place if extra blood and electrical stimulation can be focused on the injured component. Any other cognitive or physical activity will require that blood and electrical stimulation to go towards the activity and the repair to the damaged neural connections will be delayed or hindered.

In most cases the day after the injury should also be a day of rest. You may want to keep your child home from school that day if some of the symptoms still prevail. If the symptoms have gone away, you can consider allowing your child to get up and walk around slowly for a while. You might allow a few minutes of watching television. You may even allow some music if the volume is low (not with an earphone). The strategy here is to keep everything at the absolute minimum and to be carefully monitoring which activities cause symptoms to return. As soon as a symptom returns you must make sure your child ceases whatever activity was causing the problem.

RETURNING TO SCHOOL

You will contact the School Leader and make arrangements to bring your child in for a post-injury ImPACT test. This should be done 48 to 72 hours following the injury. Your School Leader will set up a time when your child can be brought in to do the test.

You should then fill out the information on the Notification To Teachers that is part of the Injury Package and make enough copies for your child to bring to his/her teachers. Depending on the speed of recovery of your child, you may want to implement a gradual return to class where he/she attends for half-days for a few days. This will all be decided in collaboration with your child's teachers, your child and yourself.

CAREFUL OBSERVATION

In the days that follow the injury, you should carefully observe your child for any abnormalities in behaviour. Your child may not notice the changes, but you should. You should especially notice if there is any change in sleep patterns, emotional stability, depression, etc. All of these are common with brain injuries.

Allow your child to gradually increase the amount of time doing normal activities, even encouraging a bit of light walking, but do not allow weight lifting, jogging or anything else that will cause movement in the brain or resistance to the muscles. As long as the increased activity does not bring on symptoms, you can allow the progression to continue. In fact, low level activity has been shown to be helpful since it tends to elevate the mood and reduce the stress that may be felt by the student-athlete. It may also help the student sleep.

CLEARANCE TO RETURN TO PHYSICAL ACTIVITY

Once the signs and symptoms have disappeared and you are confident that it seems as if the injury is well on its way to healing, you may sign the Parent-Guardian Clearance to Resume Physical Training.

When you are ready to sign that form, we would suggest that you also sit down with your child and examine the Student-Athlete Clearance to Resume Physical Training form. That way, both you and your child can discuss the recovery that has taken place and you can be even more satisfied that he can proceed with the next steps.

Ask your child some tough questions. This is not a time to be hiding symptoms in order to get back into competition. The rest of his/her life may depend on this decision.

WATCHING FOR A RETURN OF SYMPTOMS

Once your child is cleared to begin Physical Training, your job as parent/guardian is still not finished. You should be observing your child for signs that the symptoms may be returning. If you feel that symptoms are returning, it is critical that you tell your child that it is time to slow down the training and that you will inform his coach. Keep in mind that a concussion injury is a

process, it is not an event. Also, we are not completely sure about the extent of the damage that has been caused, so the only way we can tell if the rehabilitation is successful is by observing to see if there is any return of symptoms while we are gradually increasing physical and cognitive exertion. Once we go too far, we must pull back or risk causing even more damage than we had with the original injury.

Eventually, your child will be able to return to competition. Our goal is to make sure that when he/she does finally return to play, the risk of a second concussion will be greatly reduced. If anything, the Student-Athlete Concussion Management Program is designed to "delay" the return to play longer than may be necessary, just to make sure.

Of course, you should be making regular contact with your child's classroom teachers to see what kind of progress he/she is making at school. This return to the classroom process is just as critical to the successful rehabilitation of your son/daughter.

If you ever have any questions, please make sure you contact your School Leader.

FINAL THOUGHTS

Just a final note for parents/guardians:

You are the primary care-giver for your child. Therefore, despite the best efforts of your child's teachers, coaches and principal, you child's well-being is your ultimate responsibility. Therefore if you notice any of the following, you should seriously consider whether to allow your child to continue to participate in the sport activities.

1. If you notice concussions are occurring more frequently;

2. If you notice that concussions are occurring as the result of lesser impacts and forces;

3. If you notice that longer recovery times are required with each subsequent injury;

4. If you notice that your child is having increasing difficulties with non-sport activities and tasks, such as school, job performance, social functions, interpersonal relationships, etc.

If you notice any of the above, or if you notice that your child is behaving in an uncharacteristic manner, then you should suspect that the brain damage may not be as temporary as once thought. We are finding out more and more about the human brain each year, so we really don't know the full ramifications of concussion.

CHAPTER NINE

UNDERSTANDING THE BRAIN

BASIC FACTS ABOUT THE HUMAN BRAIN

This chapter is intended to provide you with some very important facts about how the human brain functions. This will give you a better understanding of what is happening when we deal with the different aspects of the Student Athlete Concussion Management Program.

LEARNING GUIDE

Before you continue we recommend that you watch a special 30 minute video presentation entitled: *Understanding The Brain* The video can be found by going to www.concussionmanagementpartners.com and going to the video section where you will find two videos. Find the one on The Brain and watch it. Once you have completed watching the video you will continue reading this chapter where you will find out more about how the brain works and what happens when the brain suffers a concussion.

NOT AS TEMPORARY AS ONCE THOUGHT

If there is one thing we are all learning from latest research into the brain, it is that not knowing what you are doing when it comes to concussion management can change who you are and who you could have become. New studies are starting to emerge that are finding evidence that a concussion at a young age can actually change the trajectory of a person's life and career. This is not turning out to be as temporary a dysfunction as we previously were lead to believe.

Many men and women in their 40's and 50's are only now discovering that the multiple concussions and subconcussions they may have passed off as insignificant when they were younger are responsible for symptoms such as depression, anxiety, mood disorders, memory loss, early onset dementia, suicidal thoughts, relationship problems, irritability, and the list goes on and on as they increase in age.

To be clear, while we will use the term "subconcussion" often in this document, it should be understood that a concussion is an umbrella term that has been used to include "all" degrees of what has been called "mild traumatic brain injury" or MTBI. Any shaking to the brain that causes stretching or shearing of neurons and axons, the main elements of our entire central nervous system, produces a "concussion". The only difference is in the degree of damage. Nonetheless, we will use subconcussion when we refer to damage that is generally restricted to stretching of axons that do not produce any obvious symptoms.

Those persistent headaches that keep coming back when you attempt a particular activity; the dizzy spells that come now and then; the personality change you went through during

adolescence. All of these things may have something to do with brain trauma you experienced over the years. It is now known that a single concussion in some student-athletes might kick off a degenerative process of neurons that continues for the rest of that person's life.

Furthermore, with all of the attention being given to concussion management, we are seeing evidence that after an athlete has been deemed to have recovered from a concussion, he/she may not always return to the same level of functioning in all areas of his/her life. For example, once declared healthy following a rehabilitation program, many professional athletes are never able to regain quite the same level of performance they enjoyed prior to the original injury. Their reaction time may have changed, albeit ever so slightly, but just enough to have an impact on their ability to perform at the highest of levels. They may not be quite as fearless as they once were, or they may be more reckless, thus putting themselves at greater risk of injury.

This leads us to the conclusion that it may well be found from further research that the injuries sustained by the brain when one is concussed may not ever totally heal. In fact, during the rehabilitation process it is possible that the synaptic architecture within the brain is actually reconstructed and that this reconstruction may not be a complete replication of the original architecture. More will be said about this later on in this section, but rehabilitation may in fact be better thought of as the attempted restoration of skills in order to return to near normal functionality.

This re-learning or restoration may be more quickly accomplished than when the skills were originally developed because not all of the neural connections may have been lost or damaged as a result of the concussion. There may be enough left so that the skills can be brought back "close" to the pre-injury level, but just not exactly the same. Rehabilitation becomes increasingly important the more we learn about the brain.

PERMANENT LOSS OF NEURONS CAN OCCUR

For example, as we will examine later on in this module, during the milliseconds following a brain trauma there is a tremendous metabolic cascade, or sequence of events, that causes cells to release neurotransmitters in a kind of mini-seizure as billions of brain cells turn themselves on at the same time. The neurotransmitters are chemicals that are needed for one cell to communicate with others, so when they all begin communicating at once the system becomes overloaded, the brain becomes confused and chaos results. This power surge of activity in the brain creates an imbalance of chemicals which then leads to all sorts of problems. Under normal conditions there are certain chemicals that are contained inside axons, the tubules through which communication is conducted, and other chemicals remain outside. When the brain suffers a trauma which produces this power surge, these chemicals change positions, and some that should be outside the axons end up inside and vice versa.

As soon as this power surge is over, the neurons try to restore the equilibrium and get back to normal. There is an urgent need to restore the chemical balance and get everything back to normal so that communication can be returned. In some cases this process can take hours. In other cases it can take days, weeks, or the damage can be permanent. We do know that most student-athletes with concussions need at least 10 and 14 days to recover. During this recovery

period the student-athlete can suffer from a wide range of cognitive, emotional and psychological symptoms and any further physical and/or cognitive stress or trauma can make matters worse and delay recovery. The symptoms are the brain's way of telling the student-athlete to take it easy so that the neurons can continue to focus on recovery of the damaged cells and neural infrastructure.

The important thing to remember is that the healing process that goes on inside the brain must be continuous and without interruption. That is why repeat concussions are so common among student-athletes who return to play too soon. One study found that 40% of student-athletes return to play too soon and another study has found that the majority of repeated concussions occur within the first 10 days of the original concussion.

In the period following an injury, the brain also experiences an energy crisis so if another trauma occurs, even if it seems minor in comparison to the impact that caused the first concussion, the damage may be much more severe. Another "power surge" has the potential to destroy recovering brain cells causing a massive loss of neurons that may very well turn out to be permanent.

If this permanent loss of neurons occurs, then restructuring is definitely going to occur and we know then for certain that it will be unlikely the student-athlete will ever return to pre-injury functionality and that some of the symptoms may remain with him/her permanently.

SERIOUS IMPLICATIONS FOR ADOLESCENTS

With respect to adolescents (children from the age of 13 to 19) we now understand that a concussion is indeed a type of traumatic brain injury that has a huge impact on the way the brain functions. To add further confusion to the mix, there are now two schools of thought emerging on the impact of concussions on young brains.

First of all, research has found that teenagers who suffer sports-related brain trauma have more widespread injury and prolonged brain swelling than adults. This may be related to the fact that the developing brain in a teenager has double the number of neural connections than that of an adult, so an injury will impact a much larger region of the brain.

We also know that the immature brain is approximately 60 times more sensitive to the chemical substances that are produced following an injury. And since an injury to the brain creates a massive power surge of electrical energy that produces a cavalcade of chemicals which are then released into the brain in areas where the chemicals may not normally be found, this increased sensitivity may have serious consequences on a young adolescent brain.

Therefore, many experts feel that high-school athletes might well be expected to have a slower recovery than older adults and to be more susceptible to severe neurological deficits should they be re-injured during the recovery period.

Because of the increased sensitivity to the chemical changes following an injury, coupled with the inadequate blood supply to help with the repair process, complete physical and mental rest is absolutely critical to prevent further damage. This is why the student-athlete concussion

management program guidelines emphasize the importance of all partners being completely satisfied that all symptoms have been resolved before even beginning to return to physical activity.

On the other hand, some experts argue that teenage student-athletes should have a better prospect for recovery after a concussion because of their greater potential for reorganization of the neural connections in the brain compared with adults. The fact that the developing brain has double the neural connections of an adult means that the excess connections will allow for neural rerouting during the recovery period. It means that if the usual communication pathway has been damaged or blocked because of a concussion, the brain may more easily find another route to restore the communication to near post-injury functionality. This leads some experts to conclude that this functional plasticity may in fact mean that teenage athletes never completely recover from their original injury, but that they actually reacquire near normal functionality because of the reorganization of the communication network through new pathways that are closely related to the original.

In other words, the teenage brain should be able to discover a new way of achieving approximately the same results. What is not completely understood is whether or not the reorganization and rerouting can ever accomplish the exact same results because of the widespread impact of the original injury on so many other regions of the brain. Some experts are of the opinion that there will be some remaining damage or deficiency, regardless of how successful the recovery happens to appear.

Another concern is that there may be areas of the brain that are not reconstructed simply because they involve functions that may not be normally drawn upon by the student-athlete. This may explain changes in behaviour or personality that occur following a brain injury. The new behaviour is what is being regenerated and reinforced, thus replacing the old behaviour. Therefore, when a coach is beginning to rehabilitate an athlete through training that will be designed to re-establish the skills of the player, he/she must also pay attention to the motivation and rebuilding of attitude and passion to the game so that both areas are brought back to pre-injury levels. The connections that existed prior to the injury may not have been re-established and therefore may not elicit the same responses post-injury. A player may not be quite as passionate about the game as before the injury simply because the brain does not “recall” this passion.

Therefore, the general consensus that teenagers take longer to recover from brain injuries may simply be due to the fact that teenagers who don’t allow sufficient time for the original injury to heal may in fact never recover from their injury, but rather they may develop new connections that may give them almost the same functionality as they had pre-injury. This means that it is even more critical that student-athletes take more time to ensure that their concussion has had enough time to heal so that they do not end up generating a rerouting or reorganization that may be life-altering.

The reconfiguring that takes place in the brain during a controlled rehabilitation period may be able to "recover" most of the functionality that was impaired as a result of the injury, but the

affected areas of the brain may remain weaker and vulnerable to future injury with less intense trauma.

Think of an athlete who receives a bad ankle sprain for the first time. Even after the sprain has healed, the athlete may find that he now has what we call a "weak ankle" and is much more easily injured, thus suffering the inconvenience of future ankle sprains from less intense trauma to the ankle. The same may be found for injuries to the brain. Once you get your first concussion, you are much more vulnerable to getting future concussions, possibly because you now have a weak area of the brain that is more easily injured from less intense trauma. We may eventually discover that the areas of the brain that were originally damaged are in a continuous, life-long state of recovery and will forever remain susceptible to further injuries which will then produce concussion-like symptoms.

ADOLESCENT MAY BE OWN WORSE ENEMY

Unfortunately, adolescents may end up inadvertently prolonging their recovery simply because of the way the brain develops during this stage of life. For example, teenagers are prone to taking risks and being impatient mainly because the executive functions in their frontal lobes are still immature and won't be fully developed until they are in their 20's. Yet when recovering from a concussion, patience is critical. Frustration and anger may set in when an adolescent finds it difficult to perform cognitive functions that were strong before the injury. The lack of quick recovery will then create a significant level of stress in the student-athlete.

The tendency among parents and coaches is often to accede to the pressure of the student-athlete to return to play and therefore in many instances the player is allowed to return to play perhaps too soon. Another concussion will further aggravate the original injury and may increase the level of stress and anxiety in the athlete. Stress releases a chemical into the brain called cortisol that increases concussion symptoms which may not present themselves for days or weeks following the injury. The fact that these symptoms keep coming up, especially if they are new symptoms, causes the student-athlete to be increasingly frustrated, angry or depressed, thus releasing more chemicals that prolong recovery. The student-athlete may find it difficult to understand how this self-induced stress is basically just as harmful as going back to physical activity. It becomes a vicious circle.

UNIVERSITY OF TORONTO STUDY

Evidence of the impact of this kind of stress on the brain was found by researchers at the University of Toronto in a report that was released in November 2011. The study was done to examine the effects that non-head (orthopedic) injuries, such as broken legs or torn ligaments might have on the brain. They tested a total of 72 varsity athletes, most of whom played football or hockey. A total of 18 suffered concussions, 18 suffered non-head injuries, and the remaining 36 did not suffer any form of significant injury. All were given neuropsychological tests three days after their injuries.

What they found was that the concussed athletes showed slower reaction times and worse results on memory tests than the players who had muscle and ligament injuries. But what was

interesting is that the players who had muscle and ligament injuries performed more poorly than uninjured athletes. The researchers speculated that the athletes with non-head injuries may have performed on the test at a level that was somewhere in between the concussed and the uninjured athletes levels because of psychological factors which would include emotional responses of frustration and anger about being unable to perform and anxiety over how long it would take for their injury to heal.

It is clearly understandable that an athlete with a concussion will perform more poorly on the neuropsychological testing which is evidence that the cognitive functioning level has deteriorated because of the brain trauma. This study has shed some light on the fact that there may also be a relationship between the biochemical impact in the brain that trauma to another part of the body will trigger since the neurons in the brain are connected to the sensory neurons throughout the body. The brain is the body's "central nervous system", so this makes sense.

For example, a broken leg or a torn ligament will generate a tremendous power surge to the brain creating its own cavalcade of events including the release of neurotransmitters and chemicals into the area of the brain receiving the "painful messages" from the damaged area of the body. We are not sure if this would lead to a displacement of chemicals from within axons in the same manner that would occur if the axons were stretched, but there is some extraordinary activity to be sure. This could result in damage to the brain over a smaller, more contained region, but the interconnectivity of the neurons in the brain may still have significant effect on other functions, which in turn would lead to a student-athlete doing more poorly on the tests than an uninjured athlete. He/she will have "some" of the symptoms of concussion that would have been caused in the exact same way if the athlete was actually concussed.

Another possible conclusion from the U of T study is that no matter where an injury occurs or whether it is an injury to the head, muscles, bones, etc., this trauma to the body has a direct effect on neural functionality and will result in a certain amount of deficiency. The symptoms will present themselves in certain ways that may or may not be noticeable or detectable. However, when an athlete suffers a direct trauma to the brain, the intensity of the injury and the amount of deficiency and dysfunction is greatly magnified because the brain trauma is much broader in scope and elicits a much greater cavalcade of electrical and bio-chemical reactions. In other words, and this has been proven by researchers, the damage to specific areas of the brain may not have been caused by a direct hit to that area, but rather from the results of being "down-stream" from another area where the injury occurred. Since neurons are located all over our body and the communication system is connected to the central nervous system which is in the brain, it is conceivable that damage to neurons in the area of a torn muscle in the leg would impact neurons in the brain that are connected to the muscle neuron.

What the University of Toronto study does confirm, in any event, is that there is a need to pay attention to the emotional and mental health of a student-athlete who suffers any form of sport-related injury. Whether the injury is diagnosed as a concussion or not, we must be aware of the fact that a serious injury to any part of the body will have triggered some form of power surge reaction inside the brain. It is therefore important to reduce the stress levels in order to control the production of negative chemicals that will delay recovery.

Family problems involving finances, parental conflicts, work schedule or loss of employment by parents, part-time job commitments, fear of losing your place on the team, the feeling of hurting your team mates chances of being successful, the loss of a potential scholarship, appearing weak to the opposite sex or to your friends, the loss of a source of self-esteem - these all wear heavily on the mind of an injured student-athlete. This stress makes it difficult for the brain to repair the damaged neural connections and adds to the chemical imbalance which may cause more dysfunction than just what was caused by the concussion. The brain is your most important, complex and vulnerable organ. When it suffers an injury, it can affect your entire way of life.

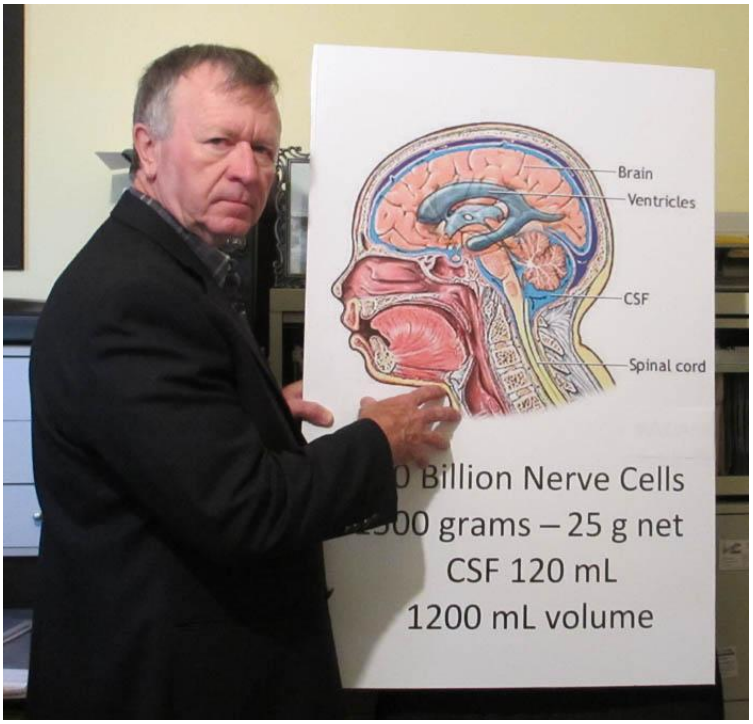
This could mean that parents, coaches and teachers may now have to be much more aware of all injuries that are sustained by a student-athlete, even those that do not result in any kind of force that would cause the brain to move inside the skull. There may not be any stretching or tearing of axons at all, but the brain may experience a trauma that would produce minor symptoms consistent with concussion. This trauma would render the brain vulnerable to further forces that might then cause what would be consistent with a concussion producing injury and what we feel was the first concussion may in fact be the second trauma to the brain. It is difficult enough identifying concussions to begin with. If we now must be aware of orthopaedic injuries and the normal stresses of day to day living that may impact on the brain, then we are in even more danger.

THE MOST COMPLEX ORGAN IN THE BODY

We will now examine this incredible machine we call the brain. There is nothing like the human brain. No man-made computer even comes close to the capacity of the human brain. However, when the brain experiences a traumatic injury, a whole lot of things happen that are cause for concern. We will take a look at a very simple, basic explanation of how the brain works under normal circumstances and what happens inside the brain when it is injured.

As you gain a better understanding of how your brain works, you will appreciate why it is important for us to have an effective concussion management program in place for student-athletes who suffer sport-related traumatic brain injuries.

HOW THE BRAIN WORKS

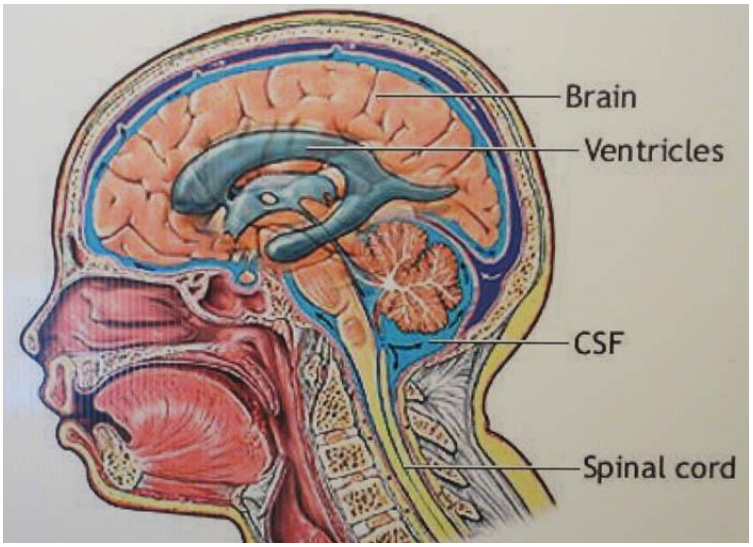


Robert Kirwan is shown on the left presenting information about the brain during a Concussion Management Training Seminar.

The adult human brain is a soft, jelly-like organ that weighs about 1500 grams (3 pounds) and is about 1200 cubic centimeters in volume.

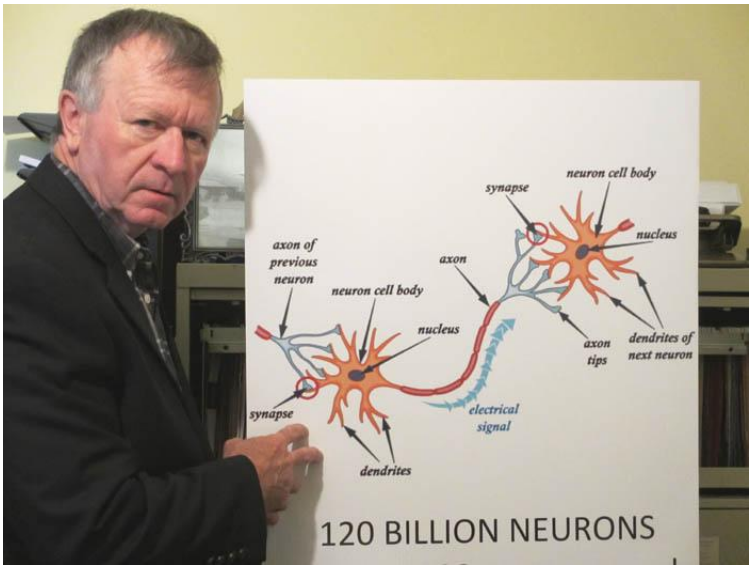
You could fit the human brain into one of the three milk bags you get in a 4L package of milk.

There are over 100 billion neurons in the brain. We often refer to these as brain cells.



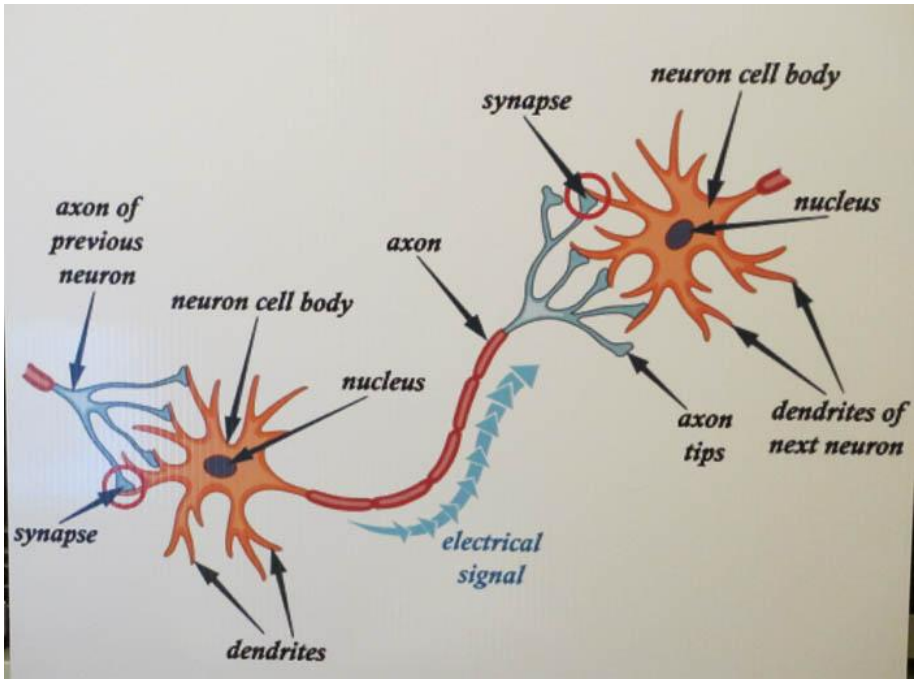
Each of these neurons includes between 1000 and 10,000 protrusions called dendrites which are used to receive chemical and electrical signals from other neurons. The electrical signals travel through axons, which are long slender tubes and projections that conduct electrical impulses and allow biochemical reactions to take place across a tiny space called a synapse at the point where the axons meet up with dendrites. Axons and dendrites don't actually touch. They just come very close to each other. Close enough for the chemical neurotransmitters to jump across from the axons to receptacles in the dendrites.

Each neuron has one axon which takes electrical impulses and chemicals "from" the sending neuron to as many as 10,000 dendrites of other neurons throughout the body and the brain.



Under normal conditions, neurons send neurotransmitters back and forth as they pass signals to one another. For example, if one neuron wishes to communicate with another neuron to which it is connected by an axon, the first neuron sends out a specific chemical (neurotransmitter) which is received by the second neuron through its dendrites with a receptor. Once the neurotransmitter and the receptor begin exchanging signals, it causes the receiving neuron to react in a very specific manner, creating its own neural signal pattern before sending it to other neurons in its network though its own axon.

The diagram below will show you how the neurons communicate with each other. Now imagine each axon branching off to go throughout the brain, connecting to thousands of other neurons that will become part of the specific communication network that is needed in order for this particular function to take place. Imagine how many neurons will be included in any one of these networks and you have some idea of just how complex the operation of the brain really is.



To give you another idea of just how incredibly small this complex structure is, if you could lay all of the axons that are inside your brain connecting the nerve cells, end to end, you would be able to go around the world at the equator over four times. That's about 160,000 km of axons all jumbled up together inside your brain providing the communication link between the 100 billion nerve cells contained in your brain – the central nervous system.

All of this fits in a space about the size of a milk bag and weighing about 3 lbs or 1500 grams.

The neurons and axons make up only part of the volume of the brain. Scientists differ on just how much of the volume this consists of, but the rest of the volume consists of glial cells. Glial cells provide support and protection for the neurons and assist in some way with the communication between neurons.

There are four main functions of the glial cells.

1. They surround the neurons and axons, holding them in place.
2. They insulate one neuron from another and keep the axons separated from other axons so the wires don't cross inadvertently.
3. They supply nutrients and oxygen to the neurons.
4. And, they destroy and remove dead neurons, essentially keeping the brain clean.

Early studies of the brain estimated that up to 90% of the volume of the brain consists of glial cells. More recent studies take the position that the balance is more like 50% of glial cells with the other 50% being neurons. Regardless, both neurons and glial cells play critical roles in the central nervous system.

DEVELOPMENTAL DIFFERENCES BETWEEN ADULTS AND CHILDREN

There are a number of theories as to why it takes a child's brain longer to recover from a concussion. The developmental differences between an adult and an adolescent are significant and these differences influence how the brain reacts to trauma.

The first consideration deals with the substance which surrounds the axons. This substance is known as myelin. It is like the plastic coating that you find on electrical wiring in your house. The coating protects the wire and allows for efficient transmission of electricity. You can twist and bend the wire and the coating protects the copper wiring inside. The axons of an adult have the same kind of protection. The myelin is built up and works to protect the axons from injury. Concussions still occur in adults, but it takes more force to damage the axons because of the protection from the myelin.

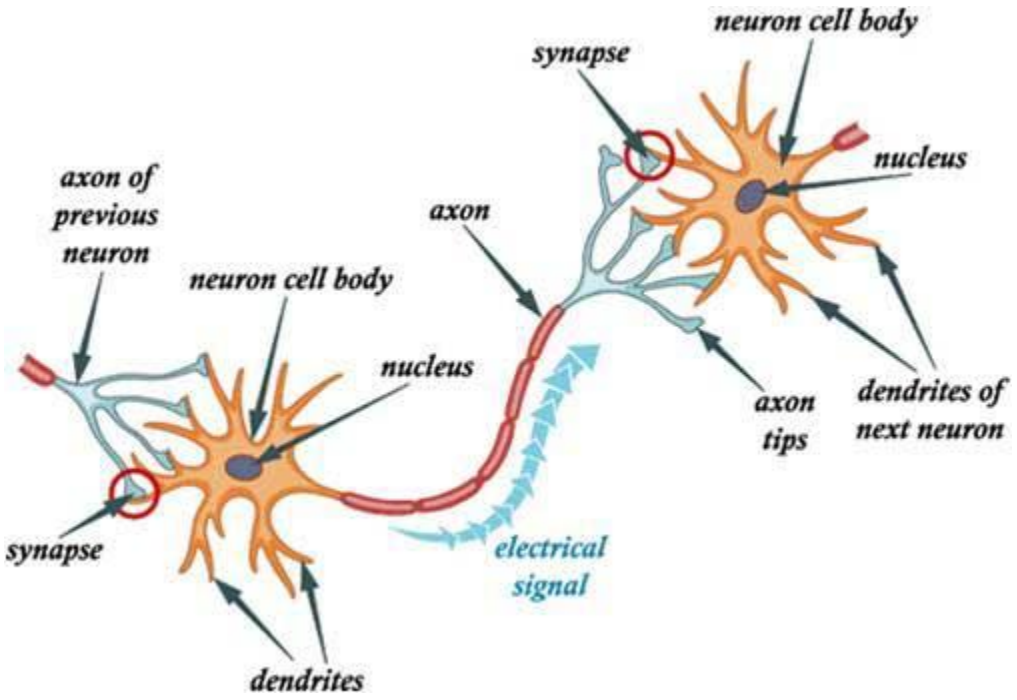
Children and adolescents have less myelin since their brains are still developing. Therefore it is much easier for damage to occur to the axons and it takes less force to cause stretching or shearing of axons that are not as protected as with adults.

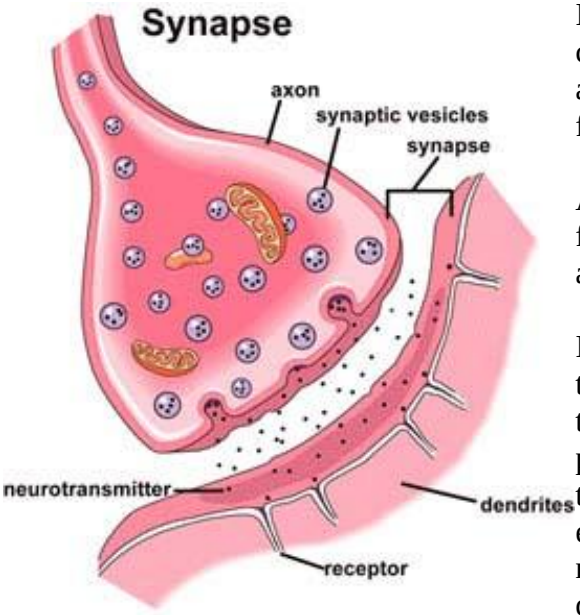
Another development issue has to do with the size of the head which is disproportionately larger relative to body size during childhood and adolescence. For example the brain is 90% developed by the age of 5, but the body is only 20% of its adult size. This extra size and weight influences the force that is being applied to the brain as a result of blows received to the head and body during sport competition.

The final development issue we will consider deals with muscle development. The muscles in a child and adolescent are not yet fully developed, therefore the student-athlete may not be strong enough to brace for contact. This lack of development is critical in the neck area which has a lot to do with the movement of the head following a body blow.

So when you consider the size and weight of the head relative to the rest of the body; the lack of muscle strength; and the lack of myelin protecting the axons running through the brain, it is easy to see why children and adolescents take longer to recover from concussions.

COMMUNICATION SYSTEM BETWEEN NEURONS





It is a very complex process, but the ability of nerve cells to effectively communicate with each other along a complicated network is what allows you to function as a normal human being.

A concussion changes the way the brain normally functions which is why this is such a serious injury and should not be taken lightly.

If you look to the diagram to the left, you will notice that the axon from one neuron never actually touches the dendrite of another neuron. Instead, it meets at a place that is called a synapse, which is the name of the small space between the end of the axon and the end of the dendrite. Let me repeat - the synapse is the name of the "space" between the axon and the dendrite. This is an important point to remember.

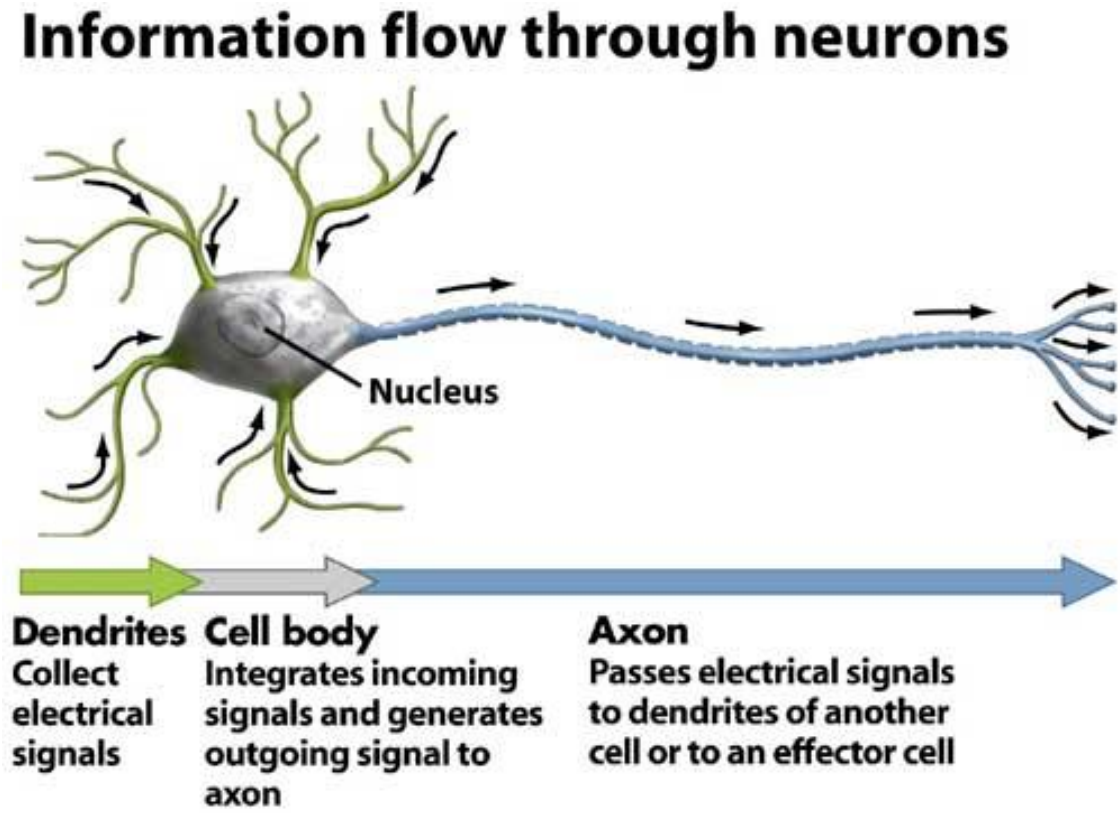
As amazing as it sounds, from what we know about the brain, it would appear as if we have over 100 billion neurons, each with up to 10,000 dendrites, connecting through a single axon to up to

10,000 other dendrites, and yet no two neurons are actually physically connected. They are all separated by a small space at the synaptic junction.

The actual communication is by chemical neurotransmitters that influence the receiving neuron. No two of the more than 100 billion neurons are actually physically connected. This is an amazing phenomenon that is hard to comprehend considering the small space inside the skull.

So, to repeat, when a signal is sent through the axon, it creates a chemical reaction that produces neurotransmitters which are sent across the synapse to receptors on the dendrite. When this happens, the receiving neuron transforms the signal from the sending neuron to its own special electrical signal and then sends that signal along to other neurons through its own axon. This process can involve thousands of neurons along a network located in many different areas of the brain for a single message.

The diagram below will give you another overview of how information flows through neurons throughout the brain.



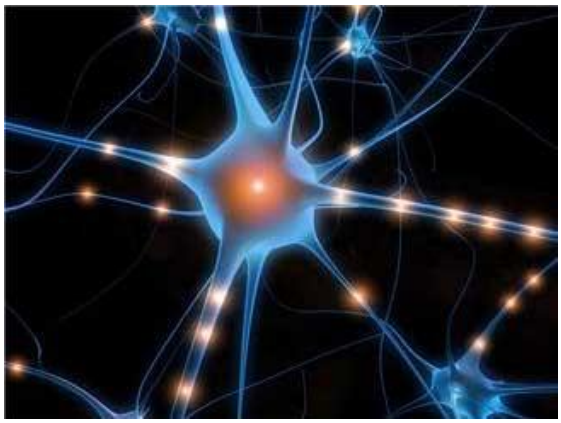
AN INJURY INTERRUPTS THE FLOW OF INFORMATION

When your brain suffers an injury that results in a concussion many things happen all at once and as a result some of the axons may be stretched or broken. There is also a tremendous power surge as billions of neurons send out electrical impulses simultaneously, releasing a cavalcade of neurochemicals from the axons in the brain.

This results in a disruption or disconnection of the pathways between many of the nerve cells and causes all kinds of problems in the way messages are communicated and distributed throughout the brain. With over 160,000 km of axons weaving their way through the brain to neurons in many areas of the organ, the interruption of the signal pathway along a single axon could have significant impact on the functioning of the brain and may produce a wide variety of symptoms depending on which pathways have been affected.

The power surge of energy as the neurons all fire up their electrical signals at once, coupled with the release of chemicals into areas of the brain where the chemicals may not have been before, adds to the crisis situation and causes all kinds of unpredictable events to occur.

THE BRAIN - A NEW FRONTIER

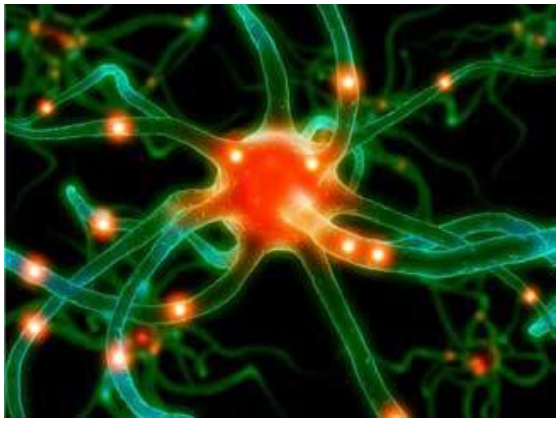


Keep in mind that most of what we know about the brain has just recently been discovered.

But what we do know for sure is that each one of the 100 billion nerve cells can connect with thousands of other nerve cells through these dendrites and axons which wind their way around the brain.

In fact up until about the age of 20 your brain is continually forming neural connections until you reach up to about 1,000 trillion connections between nerve cells. As you get older about half of the connections are discontinued in a sort of pruning process, mainly because they are not being used, but you will still end up with no less than 500 trillion connections between neurons for most of your adult life. The period when you have the greatest number of neural connections is during adolescence, from ages 13 to 19, typically the years when you are in the intermediate and senior grade levels of secondary school (Grades 7 through 12)

CENTRAL NERVOUS SYSTEM



Dendrites and Axons, therefore, are similar to telephone wires or internet cables carrying the messages being sent between nerve cells in the brain and throughout the body via the spinal column to and from the brain. This is why the brain is called the "central nervous system". It acts a lot like a bus terminal where signals are sent and then distributed elsewhere depending on where they can be put to best use.

Everything you do is the result of electrical impulses and biochemical reactions that travel through some of the 160,000 km of axons connecting each of the 100 billion nerve cells in your brain to

thousands of other nerve cells, resulting in up to 1000 trillion different connections in total, all producing chemical reactions across the synapses that permit communication to take place.

As well, the neurons inside your brain are connected through the brain stem and the spinal cord to the nerve cells and sensory cells throughout your body, sending signals that tell your body how to function.

Just reading these sentences involves thousands of nerve cells being connected along hundreds of km of axons, producing millions of neurotransmitters that are being taken in by millions of receptors, and all of this happens in a split second. If I tell you to put your finger on the letter Q on the key pad, just think of what your brain has to go through to make your finger actually move to the keyboard letter. This simple command requires memory, vision, muscle coordination, reasoning, etc. All of this is instantaneous, even though the communication is being sent along neural pathways that are in a variety of different areas of the brain.

The brain is an incredible machine that is pretty durable under normal circumstances. But if something happens to cause the brain to suffer any kind of injury, there are so many things that can go wrong because of its complexity.

CEREBROSPINAL FLUID (CSF)

Something else you need to know is that the brain is submerged in cerebrospinal fluid (CSF).

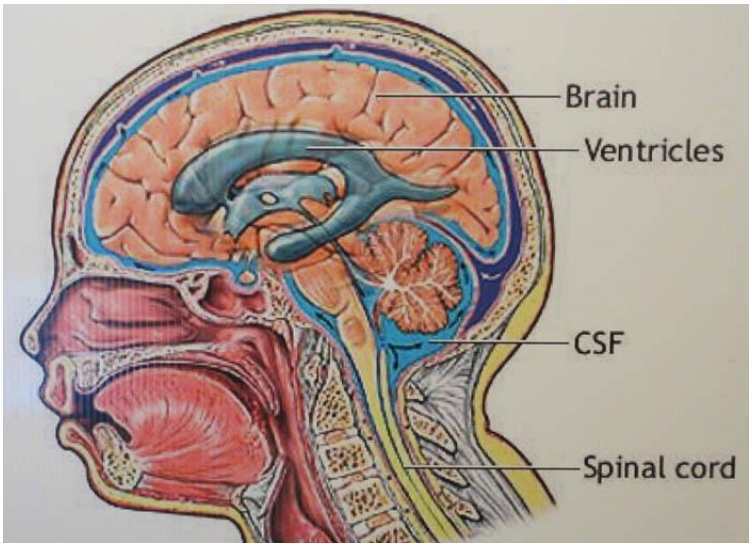
This fluid occupies the open space inside the skull and among other things, provides buoyancy for your brain.

CSF also protects the brain tissue from damage against the inside of the skull during normal movement of the head or body. It provides a cushion between the brain and the skull bone, so the brain doesn't strike the skull very often under normal conditions.

CSF CONTROLS INTRACRANIAL PRESSURE

There is normally space for about 130 to 150 ml of CSF in side the skull and it is replaced about 3 or 4 times a day, draining into the blood.

The intracranial pressure is maintained by the body at a fairly constant level by maintaining just the right total volume of CSF; just the right amount of blood flow to the brain; and obviously by the composition of the brain itself.



Any increase or decrease in one of the three elements (CSF, blood flow, or volume of the brain) means that one or both of the other two must be reduced or increased in order to maintain the right amount of intracranial pressure. Since the brain is a constant size and the blood flow doesn't change much, and since the CSF is constantly being produced and drained so often each day, the body usually uses the amount of CSF production to keep the pressure constant whenever the need arises.

HUGE IMPACT ON WEIGHT OF THE BRAIN

The cerebrospinal fluid provides buoyancy for the brain, so even though the brain has an actual mass of about 1500 grams, the net weight of the brain suspended in the normal amount of CSF is equivalent to a mass of only 25 grams, or about the weight of two normal sized grapes.

This is important since it allows the brain to maintain its density without being impaired by its own weight which would cut off blood supply and kill nerve cells in the lower sections of the scull cavity without the right amount of CSF.

Keep in mind that without the CSF the brain would feel 60 times heavier.

The amount of CSF is extremely important in order to provide what is known as neutral buoyancy. This means that the net weight of the brain allows it to be "suspended" in the CSF instead of floating to the top of the skull or sinking to the bottom. The suspension of the brain in this state of neutral buoyancy allows it to keep its shape and density. If it sank or floated it would rest up against the top or bottom of the skull, placing pressure on the blood vessels, restricting blood flow and killing off neurons. The amount of CSF is critical to the functionality of the brain.

Therefore, as the brain is suspended inside the skull, it feels very light, which is why we can move around a lot and not feel anything moving around in our head. Even most rapid movements of the head would not produce much of an impact against the side of the skull since the brain feels so light when everything is normal.

RECAP…

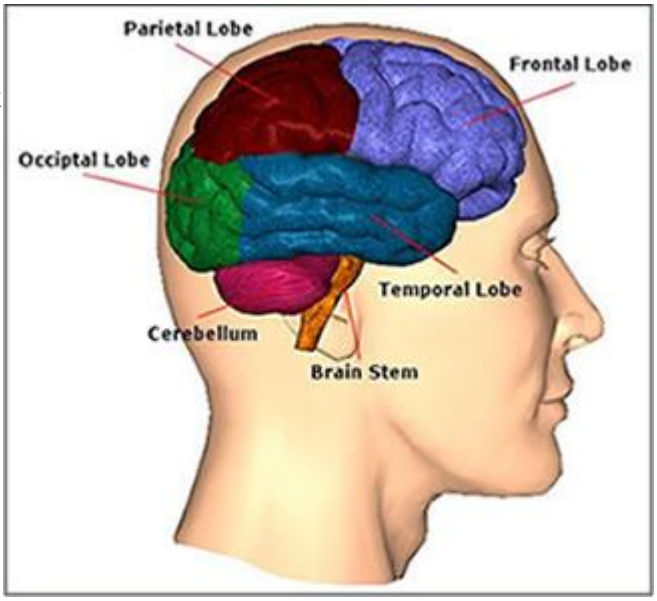
So, to be clear, what you have inside your skull is your brain matter (basically dendrites, axons, nerve cells) which takes up about 1200 ml of space; the CSF fluid which takes up another 130 ml of space; and the remaining portion consists of blood vessels. All of this is kept together inside a bag called the dura.

PARTS OF THE BRAIN AND THEIR FUNCTIONS

In order to better understand what happens when the brain is injured, we would like to take a bit of time to examine the main parts of the brain and their functions.

FRONTAL LOBES

The Frontal Lobes are located at the front part of your head, just behind the forehead. This part of the brain is very prone to injury because it is very close to the ridges of the skull and in many instances with head-on force this area slams against the bone. This part of your brain is responsible for helping you make plans, organize things, solve problems, and effectively use your memory. It is also the part of your brain that controls your emotions and impulses and helps you maintain socially acceptable behaviour. It also helps you with your ability to pay attention to details and to make decisions. Finally, this area plays a huge role in your speech and language abilities.



TEMPORAL LOBES

The temporal lobes are found at the sides of the brain behind the frontal lobes right around the level of your ears. This part of the brain is responsible for your hearing and for helping you to recognize and understand sounds and speech and also to produce speech for communication purposes.

OCCIPITAL LOBES

This part of your brain is located right at the lower back of the head and is where you process visual information which is sent from your eyes. It helps you make sense out of what you see and perceive shapes, colours, sizes, and distance.

PARIETAL LOBES

This part of your brain is located right behind your frontal lobes. It is the part of your brain that integrates the sensory information that comes from all parts of your body when you touch things or feel hot, cold, etc. The parietal lobes also help you with some of your balance and give you the ability to navigate around without bumping into things.

CEREBELLUM

The cerebellum is located at the back of the brain and controls your balance, movement and co-ordination. It allows you to perform the physical activities that are necessary for sports and just for movement in general. It is the area of your brain that is most involved in coordination of all parts of your body.

BRAIN STEM

The brain stem is located at the base of the brain and controls all of the functions that are necessary for survival, such as your breathing, heart rate, and blood pressure. These are all of the involuntary functions of the brain that you do without thinking.

A COMPLEX SYSTEM

The brain is a very complex system that serves us well normally. However, when brain trauma occurs that results in a concussion, the damage can be widespread and can impact any number of these sections. Because of the interconnection of neurons, and the fact that each neuron can be connected to up to 10,000 other neurons, and each of those neurons can be connected to up to another 10,000 neurons, and so on, it is safe to say that whatever happens to one neuron may in fact have an effect that reaches all parts of the brain. We will accept that in most cases the impact may be negligible, but nonetheless, there is an impact and if enough neurons are damaged or enough of the axons are stretched and/or sheared, there can be significant and widespread damage.

You don't need a medical degree to see that the different parts of the brain work together in order for one to function normally. Damage to the Frontal Lobes will definitely have an effect on how you respond to what you see and the signals coming from your Occipital Lobes. And if you have damage to your Cerebellum, thus affecting your balance, it is going to have an impact on multiple regions of your brain.

This is why any force to the body that results in the brain moving violently inside the skull gives cause for concern. Let us see what happens to the brain when it is injured.

WHAT HAPPENS TO THE BRAIN WHEN IT IS INJURED?

WHAT IS A CONCUSSION?

There seems to be general agreement that a concussion is caused by a direct blow to the head, face, neck or any other part of the body. Loss of consciousness is not necessary for a concussion to occur. In fact, only a small percentage of concussions involve loss of consciousness.

The force of this contact, no matter where it occurs, causes the brain to move violently from side to side, front to back or rotationally within the skull. As a result, the brain as a whole is stretched or squashed slightly as it bangs against the inside of the skull, causing it to change its shape and become temporarily deformed. It very quickly returns to its original shape, even though it may be a bit swollen from striking the inside wall of the skull.

No matter what definition you use, the fact remains that a concussion changes the way the brain functions. What is not known at this time is how long or how permanent the damage will remain.

Many people refer to a concussion as a "mild Traumatic Brain Injury" or a temporary TBI. You will often see the definition include reference to the "rapid onset of short-lived impairment of neurological function that resolves spontaneously".

However, there is great debate going on now as research points that the impairment of neurological function may not repair as rapidly as once thought and the resolution may not be as spontaneous as we had hoped.

This temporary impairment may be true for the most obvious symptoms such as headache and dizziness, but the long-term impact of a concussion may result in impairment of emotional and psychological functions as a result of the changes that occur in the brain.

In fact, there are studies that have found middle aged adults who suffered concussions while in college exhibiting premature brain aging and deficiencies in concentration, balance and motor control many years after suffering their concussions. It is most likely that most people who are suffering from these kinds of functional deficits may simply attribute them to normal aging and getting older, not even relating any symptom or deficit to their history of concussions. And yet, there may be things they could have done during rehabilitation that might have reduced or eliminated these functional deficits, thus impacting on their quality of life many years after the injury. Our goal in developing the most effective student-athlete concussion management program possible is to reduce the long-term consequences of sport-related concussions.

A CONCUSSION IS A PROCESS – NOT AN EVENT

Evidence is being produced by researchers which proves clearly that a "concussion is a process". It is not an event. And this process does not simply involve "injury, healing and recovery". Many symptoms of concussion do not present themselves for hours, days, weeks or months. In fact some people admit to experiencing concussion-like symptoms for many years following an injury.

We will concede that there may well be a rapid onset of short-lived impairment of neurological function in some areas that resolve spontaneously, but what about the long-term impairment that does not resolve. What about personality changes? What about anxiety and mood disorders? What about interpersonal relationship skills? What about one's attitude towards life? These are all recognized as signs and symptoms of concussion but they are also unfortunately accepted by most people as part of growing up and normal development. They may not be that normal after all.

Admittedly, we all change our personality slightly from time to time. We all have periodic bouts of anxiety and we are all moody from time to time. We all have some difficulties with relationships and our attitude towards life is often affected by our environment and the people around us. But for young people who suffer a concussion, are these changes part of their natural evolution, or are they consequences of their brain injury? And is there something we can do to reduce the risk of life-altering consequences?

Symptoms of a concussion may also not be evident until you are required to perform a specific task. For example, you may not even know that you are no longer able to recall math facts until you are asked to recite your times table. You may not realize that you get dizzy riding a bike until you have a chance to ride a bike. You may not know you have problems adjusting your vision when things are being thrown quickly in your direction from the side until this actually

happens. These symptoms take time to present themselves and they will only be noticed if you have people around you who are looking for signs and symptoms of concussion. That is why we use the "partner approach" to concussion management.

WHAT HAPPENS DURING A CONCUSSION?

Axons get their shape from internal structures called microtubules which look like a string of sausages strung together. As the shape of the brain gets temporarily deformed from the twisting or rapid acceleration and/or deceleration, the axons may stretch or break. Normally, since your brain is constantly jiggling like a mold of jello, axons are often stretched gently with no damage to any of the internal skeletal structure that is found inside axons. This is what is often referred to as a “slow stretch”.

If the axons are stretched too quickly, they tend to stiffen up causing their internal skeletons to become destroyed and the axons will shear, causing a total interruption of signals. In most cases, concussions are mild traumatic brain injuries where the axons do not actually shear, but rather are stretched with enough force that they don’t quite rip apart but still sustain significant damage to their internal skeletal structure.

For example, if the axon is stretched hard enough, the microtubules that act like conveyor belts carrying nutrients from one end of the axon to the synaptic connections in its network may break at some point. When this “conveyor belt” is broken, the supplies that are being carried will continue to flow but they will basically “fall off” at the break and will collect inside the axon. This causes a “bulb” to form inside the axon. More importantly, it prevents the part of the axon beyond the break from receiving the nourishment and supplies it needs to survive. Eventually, the part of the axon that is not receiving nourishment will wither away and die, thus disconnecting from the original axon. That means that signals that would normally have gone along that axon will no longer get through. This then causes the axons with the bulbs of protein to also shrivel up and die because they can no longer do what they are supposed to do and the neuron will die as well. All communication that was conducted that one neuron will then cease.

There are some injuries where the damage is beyond repair, but the communication is still continuing in a faulty manner. The signals are getting through but they are not clear. In this case the damaged connection may end up corrupting the entire system with static communication.

Dr. Douglas Smith of the University of Pennsylvania and a number of his colleagues have done extensive research on concussions and axonal damage. What they found is that if you stretch an axon gently the first time, it produces an increase in the number of tiny pores that line the outside skin of an axon. These pores allow sodium and calcium to come inside. If you stretch the axon gently a second time shortly after the first time, these tiny pores became enlarged and sodium and calcium came rushing in. Other scientists had previously discovered that increased levels of calcium in an axon created an enzyme that actually ate away the internal structure of the axon. Therefore, the implication is that if a person suffers a seemingly minor blow to the head or body, there may not be any obvious symptoms of concussion present, but the stretched axons will be extremely vulnerable if there is another minor blow. That is why some people are surprised when

they receive serious concussion-like symptoms from what seemed like a very small force. It's because the axons were vulnerable at the time from the stretching caused by the first blow.

"THE METABOLIC CASCADE"

When the brain suffers from a force as a result to a blow to the head or some other part of the body, it experiences a "power surge" producing an extreme amount of chemical neurotransmitters, effectively "lighting" up the entire brain with electrical charges. This surge only lasts a minutely brief period of time and seems like a mini-seizure. The physical movement causes neurons and axons all over the brain to be pulled, twisted and stretched.

The neurons send out signals through the axons to allow sodium and calcium to enter through the tiny pores on the outer skin that have been enlarged by the twisting and stretching. At the same time potassium is allowed to rush out of the neurons through the axon openings. The problem with too much sodium is that it also brings in water which can cause swelling of the axons and thus dangerously increase intracranial pressure. Calcium produces an enzyme that eats away at the internal structure of the axons.

Once the initial power surge is over, the brain immediately attempts to restore the equilibrium and get things back to normal levels. The first thing the neurons do is send a signal to pump potassium back into the axon and pump sodium back out. The potassium counteracts the effects of sodium by neutralizing its electrical charge. This process requires a lot of energy which is usually produced inside the neuron by something called the mitochondria, which acts like an internal power plant for each cell.

The mitochondria require fuel in the form of glucose to produce energy. Glucose is carried to the neurons by the blood flow in the brain. The demand on the cell for energy causes a drain on the supply which causes the brain to lose power and operate on a slower speed. The brain then demands for an increase in blood flow in order to bring in more glucose to the mitochondria to repair the damaged areas. However, the message somehow is disrupted and the blood flow to the brain is actually slowed down. No matter how many signals the neurons send out for more fuel, there is no increase in blood flow and the cells are in danger of dying. Because of this the brain releases high quantities of potassium in order to try to calm things down even more.

Since each dendrite or axon may be part of a communication line that carries impulses to thousands of nerve cells as it winds its way around the brain, any damage to a dendrite or an axon can impact many areas of the brain in the network other than just the area where the original damage was caused. This domino affect can cause symptoms that may seem unusual based on the point of impact, but neurons in one part of the brain connect to neurons in other parts of the brain and may be part of a communication link with many other functions.

This is why we often see a variety of symptoms when a person suffers a concussion. The damage can affect your cognitive, physical, emotional and psychological functioning and it can play havoc with your sleep patterns and relationships.

THE HEALING PROCESS IN THE BRAIN

AUTOMATIC RESPONSE

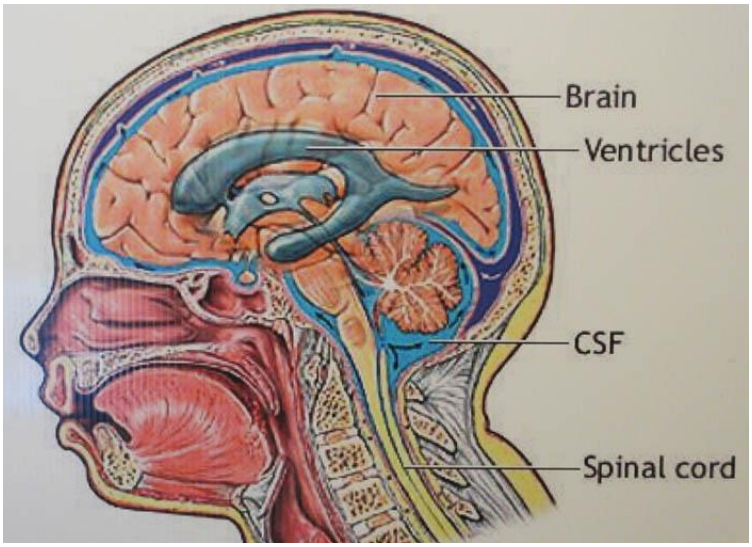
So, as we can see, when the brain experiences a trauma, the body goes into an automatic emergency protection mode and a number of things take place that are designed to help the brain begin the healing process. However, it is this healing process that may actually put the student athlete in jeopardy if the proper procedures are not followed when an injury occurs.

REDUCTION IN BLOOD FLOW TO THE BRAIN CAUSES AN ENERGY CRISIS

Immediately following a brain injury where there is damage to nerve cells, dendrites and axons, along with some swelling of the brain, there is an automatic response by the body that results in a reduction of blood flow to the brain. While this may reduce internal bleeding if a blood vessel breaks, it also means that the damaged areas of the brain are being deprived of oxygen and energy needed in order for healing to take place. This "energy crisis" makes the stretched or torn dendrites, axons and damaged neurons (nerve cells) extremely vulnerable and seriously impedes the healing process. In fact, studies have shown that a large number of neurons can die during this initial period because of the lack of oxygen and energy that result from the reduced blood flow. Death of a neuron is permanent.

REDUCTION OF CSF LEVELS INCREASES WEIGHT OF THE BRAIN

Because of the swelling that generally occurs in the damaged area of the brain, the intracranial pressure may begin to rise slightly. In order to compensate for this dangerous increase in pressure the body reduces the amount of CSF present around the brain since this is the quickest way for the body to naturally reduce intracranial pressure. The brain simply drains out some CSF and does not replace it until the pressure is back to normal.



While this is happening, the reduction in CSF has a critical impact on the buoyancy of the brain. There isn't as much CSF surrounding the brain as there is under normal conditions, therefore the net weight of the brain feels much heavier than the usual 25 g. Remember that the brain itself would weigh about 1500 grams (3 pounds) without the CSF. With the normal amount of CSF it would only weight 25 g because it is suspended in the fluid. This buoyancy effect is the reason why you seem to weigh less when you are swimming.

SUSCEPTIBLE TO FURTHER INJURY

This reduction of blood flow and CSF is going on in your head, even as you are coming back to the bench to "shake it off" and recover from your immediate symptoms. The emergency response in your brain is going into overdrive and you may not even be aware of what is happening unless you begin to feel a bit of a headache or a bit dizzy.

Keep in mind that studies have shown that in up to 80% of the cases where a student-athlete has suffered a concussion, the student-athlete was not aware of any symptoms right away. So this could be taking place without you having any knowledge that you were injured in the first place. The headaches and dizziness may come minutes or hours after the injury.

With less buoyancy causing the brain to feel much heavier after an original injury, it is extremely susceptible to serious injury if the body suffers another blow and the brain suffers an additional trauma. Even a minor, seemingly insignificant blow to the body could result in a much more serious injury than the original blow because the much heavier brain will be hitting the inside of the skull and twisting with much more force because of the increased net weight.

On top of this, because of the original injury, the damaged axons have been stretched and become brittle. If there is another trauma that triggers an immediate surge in chemicals and electrical impulses through these stretched and brittle pathways, the pressure may cause the stretched and weakened axons to break completely and this will completely interrupt communication along those pathways.

The reduced blood flow to the brain will continue for up to five days following the original concussion, so while the brain is attempting to restore the damaged areas back to normal, it won't be in any position to direct additional resources to any other subsequent injury. That means that if the student-athlete suffers a minor force to the head during this period of time, new symptoms may emerge. This again is why so many people are surprised when a player complains of severe symptoms from a seemingly insignificant blow, but they say nothing about the original hit.

COMPLETE SHUT-DOWN IS NECESSARY

This is why we strongly suggest that a student-athlete who has suffered what appears to be a serious blow that could have resulted in concussion should remain out of action for at least the rest of that day and reduce both physical and cognitive exertion for several days until we can be sure of the extent of the damage or allow the brain to heal itself without any further trauma.

Everything may seem fine on the surface and there may be no indication of obvious symptoms of a concussion immediately after the event, but inside the skull the body may have already taken necessary precautions as part of its emergency response, thus leaving the brain exposed to further and potentially much more serious damage.

DANGER OF REPEAT CONCUSSION

This is why a "second repeat concussion" is often more severe than the original concussion. The original trauma may have stretched and damaged the axons and brain cells, but they may not have been completely broken. This means that even if their function has been reduced, they have not been discontinued. They can still operate in a reduced capacity and gradually they will return to their original condition and regain their flexibility. Eventually the flow of chemicals and electrical impulses will be able to reach their pre-injury levels and everything should be back to normal within a period of time.

On the other hand, if you don't allow the proper time for healing and you don't try to avoid over stimulating the damaged areas, you are taking a chance of causing serious internal structural damage in the axons, and then you are in serious trouble. There is no guarantee that you will ever regain full functioning in these areas if they are damaged a second, third or subsequent time.

What is even more frightening is that you could damage those injured areas simply by increasing the electrical and chemical impulses by watching television, playing video games, texting on the cell phone, or listening to music. You don't just need to worry about physical exertion. You also have to be concerned about cognitive exertion. You need to shut down all physical activity and you also must shut down your brain!

CONSEQUENCES OF A CONCUSSION

DYSFUNCTION – TEMPORARY OR PERMANENT?

Most experts agree that about 80% of people who suffer a concussion appear to be symptom-free within 10 days to two weeks of getting the injury. However, and this is an extremely important point to remember, especially with our student-athletes, there is no consensus about whether subtle changes remain in the brain following those 10 days. Furthermore, we need to be especially concerned about the 20% of people whose symptoms do not go away within the first ten days. What is happening to their brains as they wait for recovery? What must we do to help them cope with what they are going through?

Therefore, when we speak of a student-athlete who has a concussion, we mean that the student-athlete is experiencing a complex process that is affecting the normal functioning of a part of his brain that may have an impact on many areas of his life. Our goal is to do everything in our power come up with a rehabilitation program that will make this truly one of those temporary conditions and prevent it from having life-altering consequences.

MANY SYMPTOMS DO NOT SHOW UP IMMEDIATELY

What many people fail to understand is that some of the symptoms may last much longer than others, and as we are going to find out, many of the symptoms of concussion do not produce obvious signs. In fact, many of the symptoms only show up much later and often as a result of a second blow to the body that transmits a force to the same area of the brain that was injured in

the first place. This is why CMP will always take the position that once any sign, symptom or behavior consistent with concussion is observed or experienced, you must assume that there are other symptoms that you may not yet be aware of.

We all know that many student-athletes involved in a competition experience a play where they are "dazed" and have their "bell rung". After a couple of minutes of rest they may be able to "shake it off" and feel ready to go back into action. This temporary symptom may have resolved itself in a few minutes, but that doesn't mean that the brain is totally recovered.

For example, symptoms such as headache, nausea, dizziness, vision problems, vomiting, loss of balance, confusion, feeling in a fog, ringing in the ears, and slurred speech may be evident and temporary. In fact they may appear and then disappear within minutes.

However, other behavioural symptoms may only be noticed over time, often over days or weeks. For example, decreased playing ability may have resulted from the injury, but those signs may not be evident right away, especially if the player is removed from play. Mood disorders, such as sadness, anxiety, irritability, aggressiveness and other inappropriate emotions may appear as subtle changes that are hardly noticeable at first and which may simply be passed off as normal reactions to being injured and out of action.

Cognitive signs may only be noticed when the student-athlete returns to the classroom or may only be noticed by parents/guardians during normal day-to-day activities. Being slower to react when responding to questions an having difficulty concentrating or remembering information are symptoms of serious symptoms that are on-going and which may take some time to resolve.

Sleep difficulties may only be noticed by parents/guardians and can easily be overlooked or passed off as other problems. A student-athlete who complains about being drowsy may seem normal unless it is about being more drowsy than usual. A parent will notice if his/her child is having trouble falling asleep or if he/she is sleeping more or less than usual. These are all signs of concussion symptoms that cannot be ignored.

Since a concussion is actually a "dysfunctioning of the brain" that is the result of a force to the head, even though the student-athlete may feel he has recovered physically, the impact of the blow may still be creating problems emotionally, intellectually and psychologically.

SUSCEPTIBLE TO REPEAT CONCUSSIONS

In fact, the number of people who seem to be more susceptible to repeat concussions once they suffer the first one gives rise to the theory that even once symptoms seem to be gone, there are still unseen vulnerabilities that may place the person at risk. In fact, the area of the brain that was originally damaged may end up being more vulnerable to future damage or the area may have weakened surrounding areas that end up becoming more vulnerable. The thing is - we just don't know enough about the brain to be certain. However, based on what we do know about the brain it is not surprising to find out that once you receive the first concussion it is much easier to get repeat concussions is absolutely true.

SUBCONCUSSIONS

Experts also believe that many student-athletes may suffer what is referred to as subconcussions.

These are very minor injuries that do not produce any obvious symptoms, but over time if a person suffers enough repetitive subconcussions, the accumulative deterioration of the nerve cells and axons may cause long-term changes in brain function that often appear in mid-life and have a significant effect on behavior, personality, memory, speech, frequency of headaches, dizziness and social relationships.

Subconcussions may also weaken enough areas of the brain so that a full concussion is inevitable with the right amount of force. Since subconcussions are almost impossible to detect in that they produce no obvious symptoms, we should adopt the philosophy that if it is felt that a student-athlete suffered a hit to the body or head that "might have" produced enough force to the brain to cause a concussion, it very likely resulted in at least a subconcussion and warrants further investigation and monitoring.

Despite the fact that many experts believe that symptoms from a concussion are temporary, there is no doubt that as the recovery process unfolds the brain is extremely vulnerable to further trauma which may result in serious long-lasting consequences that go far beyond what we would call temporary. Therefore, the question remains: is a subconcussion a concussion? Are signs and symptoms necessary in order for the brain to be experiencing a concussion? Is a subconcussion simply a minor concussion? Can subconcussions be responsible for post-concussion symptoms? In fact, can a person have post-concussion symptoms without even being aware that he/she suffered a concussion in the first place? If he/she suffered a subconcussion instead?

The reality is that most adults have suffered from some traumatic brain injury at some point in their life. The injury may have come while playing sports or an accident. And anyone who has played a contact sport surely has suffered some degree of a concussion at some point in their playing career. So when a person claims to have never suffered a concussion it may just be that they were not able to identify the signs and symptoms of a concussion or that they had what we now call subconcussions where signs and symptoms were not obvious.

A good way of thinking about this was once explained by Dr. Michael Czarnota, the consulting neuropsychologist with CMP Concussion Management Partners Inc. Dr. Czarnota suggests you think of a concussion or a sub-concussion as you would a scab that has formed over a cut on the skin. If you allow the wound to heal, there is an excellent chance that there will be no permanent sign of the original injury. However, if you constantly pick at the scab, it will take longer to heal, perhaps will get infected, and quite likely it will leave a permanent mark on your skin even once it has healed. So it is with a sub-concussion or concussion. If you rest and allow the brain to heal properly, then there is a good chance that all symptoms will resolve and you won’t experience any permanent dysfunction. However, if you constantly re-injury your brain with repeat concussions or sub-concussions, the healing will be impeded and you may end up with permanent symptoms for the rest of your life, or with symptoms that will evolve over years of continuous repeat concussions.

POST-CONCUSSION SYMPTOMS

Statistics show that at least 10% of individuals with a concussion suffer post-concussion symptoms for months and years, especially if they were not properly treated after a concussion. And many others may have functional deficits that they do not relate to previous concussions and/or subconcussions, but nonetheless they do exist. It is quite likely that this figure is much higher.

What we do know from research studies is that well after they have "recovered" from an injury, student-athletes who have suffered two or more concussions are more likely to report having concussion-like symptoms such as headaches, balance problems, sensitivity to light and noise, trouble concentrating and sleeping, irritability and nervousness than those student-athletes who only experienced one concussion or none.

Student-athletes with two or more concussions have also been found to be more likely to score lower on measures of attention and concentration and tend to do worse in school than those with one or no concussions. All of this points to the importance of having a solid concussion management program in place that will make sure student-athletes fully recover from each concussion before being allowed to return to play.

IMPACT OF DAMAGE TO THE FRONTAL CORTEX

Researchers are learning more and more about the brain every year. They have now found evidence that the Frontal Cortex or as they are often called, the frontal lobes of the brain seems to be the most common region of injury from a concussion. Damage to this part of the brain can cause a wide variety of symptoms since the neurons found in the frontal cortex are involved in motor function, problem solving, spontaneity, memory, language, initiation, judgment, impulse control, and social and sexual behaviour. This is considered our emotional centre and is where we exhibit our personality.

Frontal lobe damage has been associated with reduced ability to perform fine motor movements and diminished strength in the arms, hands and fingers. Difficulty in speaking has also been common with this type of injury.

It has also been noted from studies that even when a student-athlete appears to have recovered completely from a concussion, there is evidence of a lingering interference with attention and memory, both which would impact tremendously on the ability of a student-athlete to handle the demands being made in the classroom.

So when we discuss the temporary nature of concussions or we talk about concussions completely healing, we cannot ignore the changes in social behaviour or personality that often follow a concussion. We tend to pass these changes off as part of growing up, or simply changes that were triggered by the injury, however, researchers may eventually find evidence that concussions actually change the course of a person's life and thus have permanent repercussions.

We must avoid the tendency to diminish the consequences of a concussion by stating that it is a mild traumatic brain injury that will resolve spontaneously. The explosion of neurotransmitters during the power surge in the brain at the time of impact may in fact result in permanent changes to the neural pathways and the synaptic architecture of various regions of the brain, such as the frontal cortex which is connected to just about every other area of the brain. The reorganization and rerouting of the neural pathways may bring a student-athlete to close proximity with pre-injury functioning, but changes may still exist and in fact the person may need to strengthen those reconfigured pathways all over again.

INJURY THRESHOLD

Adding to the mystery surrounding concussions is the fact that studies of athletes have shown that the amount of force and the location of the impact are not necessarily correlated to the severity of the concussion or its symptoms. This has lead to some confusion among experts about the amount of force that is actually required in order to cause a concussion.

Studies have also found that concussions occur over a wide range of impact magnitudes and that individuals have different levels of biomechanical concussion thresholds. A blow of a certain level of intensity that gives one person a concussion may not have the same affect on another.

Furthermore, it has also been found that the injury threshold "within" an individual is dynamic and not at all constant. This means that a certain magnitude of impact will produce different results in an individual depending on the level of impact tolerance that person has at the time of impact. It changes with the day and the time of day.

There is a school of thought that if the injury tolerance is indeed dynamic in an individual, then this tolerance threshold may be influenced by the number of subconcussive impacts sustained by the athlete in the weeks or months prior to the impact that causes the concussion. Or that the longer a player participates in a sport, the more likely he is going to display signs, symptoms or behaviours consistent with concussion at some point in time because of the cumulative effect of subconcussive impacts. This will receive further study over the next number of years, but when you think of what happens to the pathways when they stretch after a trauma, and if you imagine these pathways going through the stretching and healing process a number of times, it makes sense that after a certain amount of stretching they would become weaker. The more often you stretch a balloon for example, the weaker it gets and eventually it will break.

It must never be forgotten that a concussion can alter the brain's physiology for anywhere from hours to weeks, setting in motion a variety of events that interfere with the functioning of the neurons in the brain. The damage that occurs in most affected brain cells is usually reversed, but a few cells may die after the injury and some cells may take longer to heal than others. This is just something normal to expect.

IDENTIFICATION OF A CONCUSSION

RULING OUT STRUCTURAL DAMAGE

Sometimes the trauma to the body during practice or competition results in what we call "structural damage" to the head. That means that the skull might be fractured or a blood vessel might have been broken causing internal bleeding and swelling. These structurally injuries will usually show up in x-rays or digital imaging technology like CT or MRI scans.

That is why one of the first things you do if you think you might have a concussion is visit your family doctor or a sports medicine specialist. The doctor will check for physical damages first.

The problem with concussions is still that this is an injury where there is usually not going to be any structural damage. The nerve cells, dentrites and axons are all too small to see. The symptoms they produce tend to be "functional" in that you will be prevented from doing things you normally were able to do without any difficulty before the injury. The messages in the brain are not getting through as easily as before so you will experience dysfunction in areas that are affected by the communication breakdown.

It is possible for a person to have a fractured skull without any corresponding "functional disruption of the brain", but usually when there is structural damage, there is also a going to be some significant functional disruption because of the force that is needed to cause the structural damage in the first place. The structural damage is relatively easy to identify and diagnose by a physician.

So what makes most concussions hard to identify is that the damage is usually not something you can see. The only way you know a concussion has occurred is by observing signs and recognizing symptoms in the way an injured person functions. You must find observable and distinguishable evidence that proves there is a functional disruption of the brain and this is not always easy.

SPRAINED ANKLE COMPARISON

One injury I like to use to help people understand a concussion is the sprained ankle.

Quite often a student-athlete will roll over on his/her ankle and stretch the ligaments or muscles. The athlete will come to the bench and move it around, even walk on it to see where it hurts and what kind of movement is causing the most pain. After a few minutes the pain may subside and the player may feel that he/she can get back into the game. The athlete may play the entire game with just a limp and never aggravate the injury again, then take a few days to let the sprain heal in between games.

However, if the athlete twists it again, the injury will be much more severe because the ligaments and muscles will already be in a weakened state. Another thing that happens with sport injuries is that a player who sprains an ankle in the game often goes to the doctor the next day for an x-ray.

At that time he/she may discover that he/she actually had a fractured bone in the ankle and that by going back into the game it could have broken completely resulting in being out of action for a much longer period of time. The athlete listens to the doctor and stays off the ankle until it heals or even has a cast placed on the ankle to prevent him/her from using it.

The problem with a concussion is similar.

You may be able to come back to the bench to "shake it off" and feel better right away. But inside the head there may be a "fracture" or "dysfunction" that you are not aware of and by going back into the game you are a walking time bomb just waiting for the right conditions to explode.

So when it comes to identifying whether or not you have a concussion, sometimes you just need to look for the signs and symptoms. At other times you just have to use your better judgment and give it time to heal.

There have been numerous examples of players who return to the bench or sidelines following a serious check to the head and appear to be fine and thus allowed to continue playing only to receive another contact that seemed insignificant and yet rendered the player seriously incapacitated. Or other student-athletes who finish playing the game and then collapse when they are back in the dressing room.

BEFORE YOU CONTINUE…

Before you continue with the rest of this chapter, please look at Chapter Eleven: Signs, Symptoms and Behaviours Consistent With Concussion. We have devoted a special chapter specifically to provide a detailed outline of the signs, symptoms and behaviours that may indicate a person has suffered a concussion. It is critically important for all partners in the Student-Athlete Concussion Management Program to be fully aware of how to identify a concussion and also how to monitor the recovery process.

USE OF COMPUTERIZED NEUROPSYCHOLOGICAL TESTING

One of the cornerstones of an effective concussion management program is the use of neuropsychological assessment such as ImPACT. ImPACT is a computer-based battery of tests developed specifically for assessing sport-related concussion.

LEARNING GUIDE

As a conclusion to this section you should read Chapter Ten: Baseline & Post-Injury Assessment. This will give you a good overview of the ImPACT assessment, which is something that you student-athletes should have done every two years as part of the concussion management program. This baseline data is critical to have if a concussion occurs during the season.

NOW YOU HAVE A BETTER APPRECIATION OF WHAT IS AT STAKE

By now you should now have a much better appreciation of what is at stake when it comes to managing concussions that are sustained by student-athletes. Every year we are increasing our knowledge base about the brain and how it works. Unfortunately, much of what we are learning is pointing out the errors we have made in the past when it came to dealing with sport-related head injuries. The challenge facing all of us today is to move forward, not in fear, but with care, choosing to implement protocols and procedures that err on the side of caution. We can no longer ignore the fact that any damage to the brain may produce life-altering consequences, changing the entire course of a person's life.

CHAPTER TEN

BASELINE & POST-INJURY ASSESSMENT

WHAT IS BASELINE ASSESSMENT?

The first thing we would like to make perfectly clear is that when we refer to "baseline" assessment, we are not simply talking about computerized neurocognitive testing. Unfortunately, the media has focussed on the growing popularity of some of the high-profile baseline tests on the market and most people use "baseline test" as a general term to describe the computerized tests.

When we use the term baseline, we are talking about a starting point. It is what one would consider normal for a particular individual. This is another very important point. Everybody has a different baseline. Everybody also has a variety of different baselines to consider when it comes to skill development, intellectual ability, physical ability, emotional stability, etc..

When it comes to the identification and/or rehabilitation of a person who has a experienced brain trauma it is critical that we know the baseline levels in order for us to determine, first of all if any change has occurred that would signify a traumatic brain injury and secondly to determine the rate of recovery. We consider recovery to have been successful if the person has "returned to baseline levels".

WHAT BASELINE ASSESSMENTS SHOULD BE PERFORMED?

In order to have an effective concussion management program for student-athletes, it is important for a number of different baseline assessments to be completed. These baseline assessments will provide reference points against which we can check post-injury assessments when we are attempting to identify a concussion and will also give us a target to work towards while we are helping a person recover from such an injury.

The following five baseline assessments are recommended:

1. A medical doctor already has a structural baseline in that he/she knows what is normal with respect to the condition of a skull, intracranial pressure, blood vessel structure, and muscle structure in the neck. The family doctor also knows the history of the student-athlete and so should be able to recognize signs and symptoms that are unusual;
2. A parent can establish a baseline assessment of activities and functional levels at home;
3. A teacher can establish a baseline assessment of performance in the classroom;
4. A coach can establish a baseline assessment of basic sport-related skills;
5. A computerized neuropsychological assessment of cognitive abilities can be obtained;

Whereas we have been recommending a partner approach to concussion management, it stands to reason that each of the partners should be able to create a baseline against which they can

compare when it comes to identifying possible concussions. Without the baseline, you really don't have a valid reference point. You are just guessing from what you feel "should be" normal. We will spend a little bit of time reviewing what each of the partners may consider when establishing their own baseline assessment for the student-athlete. When a school board, post-secondary institution or minor sports association develops a customized student-athlete concussion management program, this is something that should be given a great deal of attention. The program should include specific guides for each of the partners so that they can perform their baseline assessments and have information on hand to be used at a later date if necessary.

STRUCTURAL BASELINE

A doctor doesn't generally need to perform a "structural baseline assessment" on a student-athlete, especially if he/she is the family doctor. When a doctor examines an injured student-athlete he/she knows what a normal skull should look like. It does not have any cracks or fractures. He/she knows what the normal intracranial pressure should be; therefore, if the pressure is higher than normal it is easy to diagnose swelling of the brain or internal bleeding. An MRI or CT scan will show if there are any abnormalities with respect to broken blood vessels in the brain or muscle damage in the neck area. This is why we recommend that a visit to the doctor should be the first step in the identification process. Any change in basic physical structure could be serious and even life-threatening. When it comes to any kind of injury, the first treatment of the patient is to make sure that the person's life is not in danger. Once that has been determined, then you can deal with the non-life-threatening matters.

HOME BASELINE

Parent/guardians should be encouraged to create a "baseline" assessment of normal activities that their child is involved with at home. By now it should be pretty clear that we place a great deal of significance on the role of the parent/guardian when it comes to concussion management. Of all partners in the program, the parents/guardians are the ones who are in the best position to identify the changes that their child is undergoing following a traumatic brain injury.

It is relatively simple for a parent/guardian to create a baseline assessment with his/her child. And since the child will have received training in concussion management, this is something that the child will have no trouble establishing. Some of the assessment will simply be observational on the part of the parent/guardian while others will require the cooperation of the child.

For example, record the normal volume level that your child uses when watching television, listening to music, or playing video games. You can see where the volume level is usually set and "record" the appropriate volumes. Remember that each may be at a different level, and be as specific as possible. You want accurate data.

Make a note of the normal level of his/her voice during regular communication at home. The normal time he/she goes to bed and gets up as well any other sleep habits (getting up at night; disposition upon waking) are extremely important. Is your child always alert during the day or are there times of the day when your child gets tired and needs to rest or take a nap? Homework habits are also important. How much homework does your child do? Where does he/she do their

homework? How often does he/she get up for a break? What kind of lighting is used while doing homework, reading, watching television, etc. There are many other behavioural observations that can be made and "recorded" with respect to how your child gets along with siblings; whether he/she is argumentative; aggressive inclinations; who his/her good friends are; how much he/she gets involved in conversations at dinner, after school, before bedtime, while watching television, etc.

These are all behaviours and habits that we tend to take for granted. However, if your child is injured and you are trying to determine if he/she may be suffering from a concussion, it is hard to recall what the normal levels were. You will second-guess yourself. On the other hand, if you have a number of recorded baseline assessments on file, you can quickly compare post-injury assessments to the baseline levels to determine if and where changes have occurred. You will also be able to determine when your child has recovered from an injury by knowing when he/she has returned to baseline levels.

I cannot emphasize enough the importance of accurately and clearly recording all of the data and observations. You must keep things on file so that you can pull them out when needed and not be guessing.

There are many other simple home baseline assessments you can do with your child that involve balance, memory recall speed, etc. If you look at some of the signs and symptoms of concussion we are sure you can come up with some simple tests you can do right at home so that when you do a post-injury assessment you will be able to compare to help you identify a concussion. You should be able to come up with some interesting baseline assessments once you read Chapter Twelve – Signs, Symptoms and Behaviours.

Keep in mind that we are not recommending that you take the place of a medical practitioner, but since the parent/guardian is a partner in this process, it will be comforting to know that you have your own baseline to compare with in order for you to better help out with the identification and rehabilitation process. When a doctor asks you if you have noticed any change in sleep patterns, you can explain exactly what those changes are rather than wondering. You can pull out your chart and show the comparisons to the baseline records.

We should also point out that not all concussions are sport-related. If your child is injured while playing or falling down the stairs, you may be the primary concussion management partner, so establishing a home baseline for all of your children and updating those assessments every year or so is a good idea. If you suspect a possible concussion it will allow you to feel more comfortable in determining your own home-based concussion management protocols. For example, if you do notice any signs, symptoms or behaviours consistent with concussions, then regardless of where the injury took place, you should first of all see a doctor to rule out any serious life-threatening conditions. Then you can follow your rehabilitation procedures.

CLASSROOM BASELINE

Classroom teachers are also a very important part of the concussion management program; therefore we recommend that they should be encouraged to create a "baseline" assessment of classroom performance for student-athletes who are participating on high-risk teams.

One of the easiest baselines is the normal grade that the student receives from tests and assignments. However, those grade levels tend to change over time and we need to be able to assess changes that take place soon after an injury has occurred. Therefore, functional assessments work best.

We suggest that the learning skills which can be observed on a daily basis be assessed and subjective recordings taken and placed on file for future reference. For example, frequency of participation in class discussions, ability to focus on seatwork, completion of homework, handwriting, etc.. These are all functions that may be affected by a concussion, so knowing exactly what the baseline levels were at the beginning of the year will be helpful if a classroom teacher must get involved with the return-to-learn accommodations for an injured student-athlete.

When doing these assessments for student-athletes in your class, you must be more specific than the general Good, Very Good, Needs Improvement. You need to collect data that indicates the normal number of times the student-athlete volunteers an answer during a given period. And it should be done during an activity that is repeated on a fairly regular basis.

The nature of relationships with peers is also important. The level of lighting around the student-athlete; the reliability of the student to bring proper books and materials to class; the alertness of the student; all of these things are likely to be changed with a concussion, so having a written baseline level to compare with will indeed be helpful in identifying a concussion and then determining the kinds of accommodations that may be necessary during rehabilitation.

When the School Coach informs you that one of your student-athletes is suspected of suffering a concussion, as the classroom teacher you can conduct post-injury assessments and compare with your baselines. If you notice significant differences, the coach and the parent/guardian must be shown immediately.

SPORT-SPECIFIC PERFORMANCE BASELINE

The coach plays a huge role in all aspects of the concussion management program. Therefore, we recommend that a "performance baseline" assessment be given to each of the student-athletes at the beginning of the season and repeated several times during practice sessions. This would require an assessment of the basic sport-related skill level for each player and would also include attitudinal, emotional and behavioural assessments. The coach and his/her assistants could put the players through some sort of skill testing to establish their starting point. These would include specific skills that may be affected by a concussion, including skills that require balance, eye-hand coordination, peripheral vision, endurance, recall of instructions, etc. It is easy to establish a baseline score for these tests. You could also make notes with respect to relationships with the other players, frequency of communication with the coaching staff, ability to focus, and

perhaps aggressiveness levels. If you suspect that there may be a concussion in one of your players, you can refer to your baseline assessments to determine if there has been significant and abrupt change in any of the areas.

If a student-athlete suffers a concussion during the season, the coach will be responsible for supervising a step-by-step progressive rehabilitation program designed to return the player to normal and prepare him/her for return to competition. By knowing what the normal skill level was for the player, it will be much easier for the coach to assess the rate of recovery and also to know which skills must be re-developed or what accommodations must be made to allow for deficiencies.

We feel that this is something that will require some guidance for coaches in different sports and it is an element of the formal student-athlete concussion management program that deserves a great deal of attention. Coaches should have some flexibility in the types of baseline assessments they record, but there are some that should be consistent for all teams.

NEUROPSYCHOLOGICAL ASSESSMENT

When it comes to baseline and post-injury assessments, it is always desirable to rely on objective measurements. Parents/guardians, coaches and classroom teachers will be able to include some objective assessments into their baselines, but in many cases they are making subjective observations of behaviours and functions that are measured along a spectrum which is often hard to pin-point.

However, the structural assessment done by a medical doctor is very specific and objective. You know when a skull is fractured. You know when the intracranial pressure is elevated. You know when a blood vessel is broken. You know when there is muscle damage in the neck.

So too, when it comes to computerized neurocognitive assessment, everything is pretty much objective. The performance is measured and a baseline score is established.

We strongly recommend that a Student-Athlete Concussion Management Program include the use of a neuropsychological, or as it is often referred to, a neurocognitive test as one of the methods of identifying a concussion and tracking the recovery of student-athletes who have suffered a brain injury.

Experts contend that each student-athlete who is injured must be managed on an individual basis, therefore by incorporating neurocognitive assessment as part of our program we can help to objectively evaluate a concussed student-athlete’s post-injury condition, keep track of the rate of recovery during the rehabilitation period, and ensure a safer return to play. Our goal is to prevent the cumulative effects of concussion from returning to play too early and risking subsequent injuries.

There are a number of neurocognitive assessment options available to school boards. We recommend ImPACT.

Dr. Michael Czarnota, Ph. D., the consulting neuropsychologist for CMP Concussion Management Partners Inc., is a credentialed ImPACT consultant who has been working with athletes since 1998. It is his opinion that ImPACT is one of the best and most recognized of all neurocognitive tests available for student-athletes.

ACCESS TO SERVICES OF A NEUROPSYCHOLOGIST

One of the most important services we provide through the Student-athlete Concussion Management Program is the assurance that we will be assessing the results of the neuropsychological tests under the supervision of a licensed professional neuropsychologist who is familiar with sport-related concussion. Dr. Michael Czarnota, Ph. D., will be in charge of the testing and assessment component of the program.

This is a huge benefit for school boards that wish to include neuropsychological assessment as part of their Student-Athlete Concussion Management Program. Because of the general lack of accessibility of neuropsychologists, the vast majority of secondary schools do not have contact with a neuropsychologist when it comes to examining these scores or in developing their own concussion management programs. Those schools must rely upon athletic trainers or staff members to evaluate the scores.

There is no doubt that trained neuropsychologists familiar with computerized testing will be able to glean more information from these tests than non-neuropsychologists, especially if the tests are complicated. Therefore, we recommend that if you are going to include neurocognitive assessment in your program, you should make arrangements to have those baseline and post-injury assessments examined and evaluated by a licensed neuropsychologist.

Some research studies have found that student-athletes who are assessed with computerized neurocognitive tests like ImPACT are less likely to return to play as quickly as those who are assessed without such testing. This is evidence of the success of this type of testing in detecting deficiencies in brain function or at least they result in a more conservative approach when it comes to returning an injured athlete to competition. We will always recommend caution when it comes to student-athletes and would much rather have a student-athlete stay out of action a bit too long than return to play too soon and risk a life-altering injury to an already dysfunctional area of the brain.

COMPLIANCE WITH PHYSICAL EDUCATION SAFETY GUIDELINES

The Physical Education Safety Guidelines developed by the Ontario Physical and Health Education Association (OPHEA) in partnership with the Ontario School Boards' Insurance Exchange (OSBIE), the Ontario Association for the Supervision of Physical and Health Education (OASPHE), the Canadian Intramural Recreation Association – Ontario (CIRA), and the Ontario Federation of School Athletic Associations (OFSAA) recognizes the importance of using neuropsychological testing.

The OPHEA guideline states that **"A concussion is more successfully evaluated if the student/athlete completes a neuropsychological baseline evaluation prior to beginning the sport season."**

Therefore, whereas school boards are committed to providing the highest standard of care possible for its student-athletes, it stands to reason that the policies and guidelines will include neuropsychological testing of some kind since this has been identified by the OPHEA as being something that will help with the identification of concussions among student-athletes. A program that does not include neuropsychological testing is not going to be as successful as one that does include this form of cognitive assessment.

ImPACT BASELINE AND POST-INJURY ASSESSMENT

ImPACT (Immediate Post-Concussion Assessment and Cognitive Testing) was created in the early 1990's and has become the most-widely used and most scientifically validated computerized concussion evaluation system.

At the present time it is being used for concussion management services at more than 7000 high schools, colleges, amateur sports teams and professional clubs around the world and has become a standard tool used in comprehensive clinical management of concussions for athletes from as young as ten (10) to adulthood.

It is also available in 17 different languages. It is also being used by professional teams in the National Hockey League, the National Football League, The National Basketball League, the Major Baseball Leagues, among others. This is also the test that was being used by Sidney Crosby, who has become the "poster boy" for sport-related concussions.

ImPACT is a computer-based battery of tests developed specifically for assessing sport-related concussion. The computer program measures multiple aspects of cognitive functioning, including attention span, working memory, sustained and selective attention time, response variability, and several facets of verbal/visual memory. This will register a "baseline" record of abilities of student-athlete with which to test against should they suffer a possible brain injury during the season.

It is important to note that this test was developed to provide useful information to assist qualified practitioners in making return to play decisions for people who have suffered from concussions. It was never intended to be used as the sole criteria for making these decisions, but was always understood to be a tool that could help ensure that the best decision possible was going to be made.

In fact, CMP recommends that there is no one single source that should ever be relied upon to make the decision about the identification or the recovery of a student-athlete when it comes to concussions. This is even true of a medical practitioner who is examining an injured student-athlete.

The decision to return to play should not be based solely on the results of an examination by a medical practitioner. Rather, one must take into consideration the recommendations of the doctor, the results of the ImPACT test, the observations of the parents/guardians, classroom teachers, coaches and the self-declarations of the student-athlete him/herself.

Only when you factor into consideration all of the partners will you be confident that the decision you make is the right one.

MAIN FEATURES OF ImPACT TESTING

1. ImPACT provides an evidence-based measurement of player symptoms;

2. It measures verbal and visual memory, processing speed and reaction time;

3. ImPACT measures reaction time to $1/100^{th}$ of a second;

4. It produces a comprehensive report of test results that can only be accessed by the Consulting Neuropsychologist or one of his trained assistants;

5. The results are presented in a PDF file which can be emailed if necessary to a treating physician who is treating the student-athlete;

6. ImPACT automatically stores data from repeat testing so that all results are kept in the same safe and secure storage area;

7. The test is administered online individually so that it can be done virtually anywhere;

8. It is compatible with both PC and MAC computer systems;

9. ImPACT testing procedures are non-invasive and pose no risks to the student-athlete.

10. The test is now available in over 17 different languages, with the results being produced in English in order for our consulting neuropsychologists to be able to do a proper assessment.

RELIABILITY

Neurocognitive testing has come under a great deal of scrutiny in recent years by researchers who are attempting to discover more information about concussions and brain function in general. Because ImPACT is a comparison of post-injury test results with a baseline, or pre-injury test result, there is bound to be some variability in the results. This is why it is so important for us to ensure that all assessments of tests submitted through the Student-Athlete Concussion Management Program are done under the supervision of a consulting neuropsychologist.

Even the baseline test should be examined to see that it falls within the normal range for a person the age and sex of the student-athlete. If it is outside of this normal expectation, then you must find out why and if necessary have the test done over again. When the results return to or near baseline levels, a licensed neuropsychologist should examine the results to see if the student-athlete has returned to acceptable levels.

The ImPACT test even consists of a near infinite number of alternate versions which randomly vary the stimulus array for each administration of a test. This is a special feature that was built into ImPACT in order to minimize the possibility of student-athletes producing a result that is affected by what is known as the "practice effect". This is why ImPACT is more reliable than some other neuropsychological tests that are available on the market.

Even under the intense scrutiny of experts around the world, ImPACT is still considered among the best neuropsychological assessment tools available, which explains why it is used so widely.

WHAT DOES ImPACT MEASURE?

ImPACT only takes about 20 to 25 minutes to complete. It can be administered by one of the School Leaders or School Head Coaches. The important thing about administering the test is that the supervisor must make sure that all student-athletes maintain silence in the room and pay attention to their own computers. This "classroom control" is what teachers have been trained in and therefore they should have no trouble with student-athletes coming up with unreliable scores. The test tracks information such as memory, reaction time, speed, and concentration. However, we want to make it perfectly clear that ImPACT is not an IQ test.

The computer program measures multiple aspects of cognitive functioning, including:

- attention span,
- working memory,
- sustained and selective attention time,
- response variability, and
- several facets of verbal/visual memory.

All student-athletes who are part of the Student-Athlete Concussion Management Program should be required to take one of these tests at least once every two years. This will register a "baseline" record of their abilities with which to test against should they suffer some form of brain trauma during the season. It just gives us one other tool by which to determine whether or not a student-athlete has suffered a concussion and is experiencing some form of dysfunction.

Studies have shown that concussed athletes score poorly on these tests when compared with their own pre-concussion baseline scores. The tests have helped identify many concussions that would have otherwise been missed, mainly because of the lack of obvious signs and symptoms that often accompany a serious trauma to the body or head.

The testing also identifies a concussion in players who are reluctant to report symptoms in order to remain in the game. It is hard to hide visual or memory dysfunction from an ImPACT test.

This is why the Student-Athlete Concussion Management Program includes the immediate removal of a player from competition even in the absence of self-reported symptoms or obvious signs if the blow to the body was so great that there is suspicion that damage may have been done. The ImPACT score will help confirm that there is no concussion, or it will produce evidence that there has been some functional damage.

TEST SCORES REVEAL RECOVERY PROGRESSION

When a player records a score on ImPACT that is lower than his baseline score, it signals that recovery is incomplete. When recovery is incomplete one of more of the following three deficiencies are common:

- a player's reaction time is longer;
- his ability to concentrate is diminished, and;
- more time is required for thought processing.

Any one of these three deficiencies alone would render a player at risk if he returns to play in this state.

Research has shown that the performance testing that is done through ImPACT requires the type of cognitive functioning that will show up if there is damage to the brain that will affect reaction time, concentration and thought processing. The neurons in the brain are interconnected; therefore if it takes a student-athlete a bit longer to visually recognize a stimulus and then react to it, one can conclude that there is some dysfunction along that network.

We acknowledge that ImPACT may not be able to measure every possible area of dysfunction, but it certainly catches most of the major areas that are commonly injured in concussions.

Therefore, a Student-Athlete Concussion Management Program should include the return to baseline levels on an ImPACT test as one of the conditions that must be met before a player is given clearance to begin Physical Training that involves exertion.

Nevertheless, in keeping with what most of the experts have stated about the ImPACT test being used as one of a variety of assessments, we also recommend written clearances from a family physician, the student-athlete's parent/guardian, the student-athlete's coach, the school principal, and even the student-athlete him/herself.

By requiring all of the above clearances we feel comfortable that by combining information from all possible sources we should be able to arrive at the right decision. If any one of those clearances are not forthcoming, then it is important that the student-athlete be kept from returning to physical activity.

The factors that go into the final decision about returning to play must also include:

- symptom reporting,
- medical history,
- concussion history,
- medication use,
- type of sport and
- position played.

SIGNIFICANT VARIABILITY FACTOR

One of the main reasons we recommend a pre-injury baseline test for student-athletes is due to the fact that there is significant variability in neurocognitive functioning among athletes at the best of times. Therefore without baseline assessments which are administered before the athlete is injured, it is difficult to determine if a low score on a post-injury test is the result of the trauma or just reflective of his/her normal capabilities.

With brain function, a person's ability is a person's ability. Student-athletes who produce a valid baseline test score will simply be giving us an indication of what they are able to do when they are healthy and everything is functioning in a normal state. There is no pass or fail in this test.

For example, we may want every student in our class to achieve a mark of 80%. However, if we find that the best mark a particular student has ever received is 60%, then we must take this into consideration. We cannot blame a student for only achieving a mark of 60% if that is all he was ever capable of. However, if a student has always achieved scores of 80%, and then drops to a 70%, we must assume that there was something wrong that generated that deficient result. For the weaker student, a mark of 70% would be a great accomplishment. For the stronger student, a mark of 70% would indicate a problem. That is how the ImPACT test works and is why it is important for us to have that baseline assessment prior to any injury.

IMPORTANCE OF AN ACCURATE BASELINE SCORE

We cannot emphasize enough how important it is for a student-athlete to put forth his/her best effort when completing the baseline ImPACT test. The School Leaders or School Coaches who administer the tests will be well-trained in how to make sure that the conditions are just right for taking the test.

Student-athletes should take the test in a computer lab where there is space between them and others taking the test. There should be absolutely no distractions. The computers should be modern and up to date and functioning at a high speed. They should be using a mouse that is connected to the computer by a cable and avoid using a wireless mouse or keypad. And the test should be taken during a time of day when the student-athlete is fresh and clear of mind. We want to create an optimum environment so that the test scores will be valid and accurate. We also want to make sure that when a student-athlete is injured, he/she takes a post-injury test under the same kind of conditions that the baseline test was taken.

When CMP Concussion Management Partners Inc. is working with a school board or organization, Dr. Michael Czarnota, our Consulting Neuropsychologist will make sure that our test evaluators are well trained to review the baseline tests and identify any that are not within the normal expectation for the age of the student-athlete. This is something that a school board, post-secondary institution or minor sport organization must check on. The evaluators are critical to the use of neuropsychological tests, no matter which model you choose.

Those tests that are not within the norm will be checked to see if there are any reasons for the low scores. For example, a student-athlete may indicate that he/she has a learning disability.

If there are no obvious reasons for the low score, the test evaluator will request that the student-athlete take the test again, this time making sure that all of the conditions are ideal for the testing.

If that score once again comes out low, the test will be forwarded to a neuropsychologist for review in order to determine if the student-athlete may have a concussion which was not previously identified. We may even recommend that the student-athlete see a local doctor for a check up and clearance. This is our way of ensuring that we have the best chance of reducing the risk of further damage to student-athletes.

It is also extremely important for us to have a valid baseline score because when we suspect that a person may be concussed, the post-injury ImPACT test is expected to give us an indication of which functions have been affected and how much dysfunction exists.

It is entirely possible that dysfunction may only show up in one or two of the sub-tests. But that tells us that the player is suffering from a concussion and we must put in place a rehabilitation program that will give the brain time to heal. If we do not have a reliable baseline score, then the comparisons may not tell us the true picture.

BASELINE & POST-INJURY EVALUATION

The ImPACT tests for student-athletes who are part of the Student-Athlete Concussion Management Program will be administered by a School Leader or a School Head Coach at the school. The instructions on how to administer the test can be found later on in this chapter.

As part of the Student-Athlete Concussion Management Program, the School Leader will be given a special "code" that will enable him/her or designate to have access to the record of the student-athletes from the school who have completed an ImPACT Baseline Test. This record will consist of a print-out listing of the students who have completed the test which will be used as a cross-reference to ensure that all student-athletes who took part in the testing did in fact have their test uploaded into the system. This is merely a way of checking to see that the baseline tests were uploaded. The last thing we want is to find out after an injury that a student-athlete does not have a baseline test on file.

BASELINE TESTS

Qualified First-Level Test Evaluators working for CMP, under the supervision of Dr. Michael Czarnota, are responsible for ensuring that all Baseline tests submitted are valid. If any Baseline tests are flagged as being significantly different from standard norms, those tests will be reviewed and if necessary, the student-athlete will be asked to retake the test.

Therefore, we have the administrator checking to make sure that the baseline test was in fact uploaded into the system, and then we have a qualified first-level test evaluator checking to see that the baseline test falls within a normal standard of expectation for similar student-athletes. We are doing everything possible to ensure that we have a valid baseline score just in case we need to do a post-injury comparison.

We recommend that any school board, post-secondary institution or minor sport association using neuropsychological testing ensure the same level of care from your test evaluators.

POST-INJURY TESTS

Post-Injury tests that are submitted will first of all be evaluated by Qualified First-Level Test Evaluators. If the results of the test indicate that there are still obvious concussion-like symptoms or that the neurocognitive portion of the test is significantly deviated from the baseline, then the School Leader will be informed of the results and advised that the student-athlete is not yet ready to resume physical activities or training according to our results.

If the results of the post-injury test are determined by the Qualified First-Level Test Evaluator to be close to or approaching the baseline level, then the results will be reviewed by Dr. Michael Czarnota or another Licensed Associate Neuropsychologist. When it comes to the moment when we may be confirming that the results are back to baseline levels, then we want to make sure that this determination is made by a neuropsychologist and not a first-level test evaluator.

If the test results are back to baseline levels, then Dr. Czarnota will send a letter to the School Leader indicating that the baseline has been achieved and the student-athlete is permitted to begin the physical training segment of the rehabilitation program. This is a process that all groups should adopt.

TEST COMPONENTS

The ImPACT test is divided up into several different components. You can easily visit the main corporate web site at www.impacttest.com to view the sections. We will try to give you a brief overview in the paragraphs that follow.

The test can be administered by a School Leader or School Coach who has successfully completed the training requirements of the Student-Athlete Concussion Management Program.

Post-injury tests should be administered by either a School Leader or a School Coach who is not associated with the student-athlete's current team. This policy is recommended in order to avoid

the perception of any possible conflict of interest on the part of the coach who may be suspected of trying to help the student-athlete pass the test in order to return to play.

DEMOGRAPHIC BACKGROUND INFORMATION

The first section of the test asks the student-athlete to answer questions regarding height, weight, sport, position, concussion history, history of learning disabilities and other important descriptive information.

This information is extremely important and may be reviewed carefully when determining the validity of the test results. For example, it is important to know if the student-athlete has any learning disabilities that may affect the outcome of any part of the test.

ADMINISTERING THE TEST

A baseline test can be an extremely valuable tool in the concussion management program. It can provide an objective measure of a student-athlete's cognitive functioning level prior to an injury. But the baseline test "must" be done in the right setting in order for the results to be valid. The guidelines that follow are designed to ensure that the results of the baseline tests that are done under your supervision have the best chance of being reliable in the event that any of your student athletes suffer a concussion.

1. When you are ready to facilitate the testing for your student-athletes, you should assemble them in one of the school computer labs during a time when they are least likely to be disturbed by class changes, announcements, etc. We want to eliminate as many external distractions as possible while the student-athlete is doing the test. It is also important for you to select a time to do the test when they are less likely to be tired or distracted internally. Do not do the test immediately following a practice or at a time before a major test or exam. You want the student-athletes to focus on the task at hand.

2. The conditions in the room should be comfortable from a temperature stand point and as quiet as possible. It is important that all of the student-athletes understand that this is a serious exercise that requires complete silence. It is to be considered the same as an exam.

3. Student-athletes should be sitting at every second computer, if possible, in order to eliminate distractions from noise and actions of those near them. If that is not possible, remind them that if their test does not come back valid because they were not able to maintain focus, they will not be permitted to attend try-outs until they do the test over again and that may mean they miss out on some training time.

4. Make sure that the students are using a mouse that is attached to the keyboard. Do not use a wireless mouse if at all possible. The results may not be that much different, but keep in mind that the program measures reaction time to the $1/100^{th}$ of a second, so the slightest

delay will be recorded.

5. Remind your student-athletes of the importance of this test and the need to focus on their own performance, ignoring whatever else is going on in the room. ***The motivation level is critical with the baseline test***. It is understandable that the student-athletes may not be fully motivated to do the baseline test, especially during the pre-season. However, it is imperative that they put as much effort into the baseline test as they will if they need to do a post-injury test. We know that if a student-athlete is injured and forced to take a post-injury test, he/she is going to be extremely motivated to do his/her best. In addition, the post-injury test will be done in a quiet room with no others to cause distraction under ideal conditions. The results of the baseline test must therefore be as close a measure of the student-athlete's true abilities as possible in order to be accurately compared with post-injury test results.

6. When all of the testing is completed, you will obtain a special code that has been provided to your School Leader which will give you access to a list of all of the student-athletes from your group who have successfully completed their ImPACT test. The procedures for checking on this will be provided to the School Leader by Dr. Michael Czarnota.

It is important that you cross reference the printed list with the names of the student-athletes who take the test in order to verify that a valid ImPACT test has been uploaded.

If a name or two does not appear on the list, then you are to contact CMP immediately by email so that we can see why it is not on your list. It is possible that your student-athlete did not register under the right school, or it is also possible that there was some sort of computer glitch that prevented the upload. Remember, do not allow the student-athlete to take part in any try-outs or competition until we confirm why the name was not on your printed list. If we do not find his/her test, then the student-athlete will have to do another baseline test.

CONCLUSION

We cannot emphasize enough the importance of "baseline assessment" as an integral component of an effective student-athlete concussion management program. A concussion changes the way the brain functions. In order to be able to identify and then provide proper rehabilitation, you must know how much change has occurred in order to know what kinds of accommodations and rehabilitation strategies should be employed. Without a baseline, you don't know when you have returned to "normal conditions".

Finally, we want to point out once again that it is not just enough to rely upon the "structural baseline assessment" of a medical doctor. Nor is it enough to rely upon the computerized baseline assessment of a program like ImPACT. You also need to have a baseline assessment done by the parent/guardian, the classroom teacher and the coach in order to be confident that you have provided your student-athletes with the highest standard of care possible.

CHAPTER ELEVEN

SIGNS, SYMPTOMS & BEHAVIOURS

WHAT IS A CONCUSSION?

Concussion is a word that is used to describe a brain injury which has been caused by violent and sudden shaking of the brain inside the skull. This shaking usually results in the brain striking against the rough inside surface of the skull with significant impact and often includes a twisting motion caused by rotational forces from the movement of the head. This causes a brief deformity in the shape of the brain and with a wide variety of biomechanical changes causing a temporary loss or impairment of brain function which produces physical, cognitive and/or emotional symptoms. This impairment can be relatively mild or it can leave the person in a state of unconsciousness. It should be pointed out that the majority of concussions do not involve a loss of consciousness.

It is generally accepted that while a concussion results in functional deficiencies or symptoms, this may in fact be the result of "structural" damage to the axons and synaptic connections which transmit signals between the neurons. Therefore, while the symptoms may be functional they may be caused by "structural" damage that is too microscopic to be detected by most normal scanning technology. Therefore the only way of knowing that most concussions have occurred is by spotting and recognizing the signs, symptoms and behaviours that are consistent with concussion. That being said, one of the difficulties with brain injury is that it is not always easy to identify the signs, symptoms and behaviours. This is one of the main reasons why we are going to spend so much time examining the signs, symptoms and behaviours consistent with concussion.

Nevertheless, it must be pointed out that a concussion may also be accompanied by structural damages such as a fractured skull, increased intracranial pressure caused by the swelling of the brain, ruptured blood vessels inside the brain and damaged muscle tissues to the neck area. Some of these structural damages may be life-threatening and need to be either ruled out or attended to immediately. They are usually easily identified by a medical practitioner who has access to imaging machines or who is familiar with such injuries. This is why it is so important for anyone with a suspected concussion to see a medical doctor as soon as possible.

A concussion is also often referred to as a mild traumatic brain injury (mTBI), a traumatic brain injury (TBI), or an acquired brain injury (ABI), so when you see those terms used they all mean pretty much the same. However, we wish to point out that the use of the words mild, moderate or severe as a way of classifying this type of injury is quickly disappearing since there is really nothing mild about a concussion and the severity of the injury is extremely hard to determine. Hence, it is said that all concussions are serious since they are all brain injuries.

A CONCUSSION IS A BRAIN INJURY!!!!

Before we get into the specific signs, symptoms and behaviours consistent with concussion, I think it is important for us to have a clear understanding and to totally accept that a concussion is an "injury" to the brain. Many people would like to drop the term "concussion" and simply call it a "brain injury". Then everyone might take the injury more seriously.

A concussion is one of the injuries that falls under the general category of a "head injury". For example, when we say a person has a head injury, he/she may have a laceration to the face; an injured eye; a broken nose; a fractured jaw bone; damaged teeth; a bleeding nose; a fractured skull; a bump on the skull; muscle damage in the neck region; or a brain injury. So if you say that you have a head injury, you really haven't told me anything. You have to be more specific by identifying exactly which part of your head was injured and describe the signs or symptoms.

This is no different from how it is with a leg injury, a shoulder injury or a back injury. You must point out which part of the leg is injured and then detail the injury in order for us to understand the extent of the damage. If you just say you have a leg injury, I may pass it off by default as a minor pain or discomfort. If you may say you have injured your knee, then that makes it more serious and I may suspect that you will have trouble moving around. Nevertheless, it could be a torn cartilage, a bruise, a strain, etc. so I may once again pass it off as a minor knee injury that doesn't have much of an affect on your movement. The natural tendency is for us to assume that an injury is minor unless you tell me otherwise. I automatically assume that if you had a broken leg, you would have said you had a broken leg and you would not have just said you had a leg injury. If you say you hurt your hamstring, I will assume that you have a slight pain or stretching of the muscles. I will assume that if you had a torn hamstring you would have told me that since it then establishes the level of seriousness.

The problem with brain injuries is that they are unlike any other kind of injury you can experience anywhere else on your body. A brain injury is indeed a type of head injury. However, a brain injury may have an impact on other areas of your body that were not injured in the first place. And to make matters worse, a brain injury may have been caused by a force that does not have to have been applied to the head. All that is needed to cause a brain injury is for the brain to have been sufficiently shaken or twisted to the point where it struck the inside surface of the skull or was somehow temporarily deformed, causing stretching and shearing of axons and synaptic connections which then disrupt the chemical balance and communication system that is so critical to the functioning of the brain, our central nervous system. And, to make it even more confusing, some studies are demonstrating that the chemical and electrical surges which cause the damage to the brain's communication system may be caused by a major trauma to another area of the body that produces an abnormal shock wave which travels along the axons through the spinal column and back to the neurons in the brain as a reaction to the pain that has been caused by the injury. So if you think of it, a badly sprained ankle, or a broken arm, may produce a similar biochemical reaction in parts of the brain as would be caused by shaking the brain. The damage may not be as widespread in the brain, but the communication system may be affected.

The consequences of damage to the brain may be far reaching and could affect coordination, balance, vision, reaction time, etc. that render us somewhat disabled in areas that were not injured in the first place.

Unfortunately, when a person says he/she has a concussion, we tend to assume that it is a minor injury that will resolve in a few days because that is what usually happens. We once again assume that it is minor. If you say you were unconscious, then it raises our image of the injury to a higher level. The fact is that being rendered unconscious is no indication of the severity of the concussion. Some people who lose consciousness recover from their injury faster than those who do not. Such is the nature of traumatic brain injury.

But despite everything else we still have a tendency to assume the "least damage" position and expect that everything will be fine in a week or so. To put it in context, if someone approaches you and simply says they have a leg injury, you may ask them if they would like to go on a hike with you in a few days. However, if that person is on crutches and says they have a broken leg, you will likely not invite the person to go on a hike. So if someone tells you they have a concussion, but otherwise they look healthy, it is hard to understand what limitations that person is under. It is even hard for the person with the concussion to understand why he/she must avoid activity if he/she feels well enough.

The other problem with an injury to the brain is that it turns the body into a "minefield". It is very difficult to know exactly how a brain injury is going to present itself. The symptoms are unpredictable and every concussion is different. They are like snowflakes – no two are alike! You will often hear the saying, "If you've seen one concussion…..you've seen one concussion."

Once you go beyond the usual headache, dizziness, and fogginess, the damages to the neurons, axons and synapses, coupled with the chemical imbalance and the interruption of normal communication between the neurons, a brain injury may prevent you from performing functions that you once took for granted. And you won't be aware of these problems until you try to perform those particular functions.

For example, until you try to tie your shoelaces, you may not be aware that you cannot remember what to do. You may not be aware that the brain injury has changed your ability to recall material for exams until you write an exam. You may not be aware that your brain injury has affected your ability to catch a baseball until someone throws a baseball at you and routine catch becomes a real challenge.

The other problem with a brain injury is that some of the symptoms take a long time to evolve. While your brain is in recovery or rehabilitation mode, you are more vulnerable to further damage, not necessarily to the area of the brain that was damaged in the first place, but to other parts of the brain that escaped the first injury. Imagine if you twisted your left ankle and decided to rest that ankle until it felt better. Then imagine that once it felt a bit better you tried walking on it before it healed fully. You find that you can walk very gingerly but you know that the ankle has not healed yet. Now imagine that while you were testing your ankle your wrist suddenly broke for no apparent reason. There is no connection between your wrist and your ankle, but you now have a strained ankle and a broken wrist, so you are even more disabled than you were in

the first place. You realize that if you would have waited a bit longer for your ankle to heal fully your wrist wouldn't have broken.

That is how it is with a second brain injury that occurs before the first brain injury has healed. In the ankle example, you would have understood if the ankle became more painful and your injury was confined to the original location. That means that your functional disabilities would continue and your actions would be limited due to the ankle injury. But if your wrist breaks because you tried to test your ankle, then you have a whole other set of symptoms that are going to cause much more widespread dysfunction. Now you've got an injured ankle and a broken wrist. This time you are definitely going to take longer to heal and you are going to be a little more hesitant to try to return to normal too quickly for fear of causing some other damage to another unknown part of your body.

Keeping with the analogy of the injured ankle and the wrist, imagine if you were resting your ankle and while you put pressure on your wrist by lifting a heavy object, your ankle started to hurt again. That is what happens with a concussion. The only way to make sure that your ankle doesn't suffer any further damage is for you to do nothing – to go through a period of time when you are at complete physical rest. So when you have a concussion, the only way to be sure you won't do any further damage to the injured parts of your brain is for you to do nothing – physically or mentally.

To help you understand what is happening inside your brain after a concussion has occurred, imagine a major fire breaking out in a part of the city which requires virtually all of the firefighters to be called out to battle the blaze. While they are fighting the first fire, it puts the rest of the city at greater risk. If another fire breaks out on the other side of the city while the fire crews are fighting the first fire, not only will it take longer to get to the other fire, but the attention that is available to give to the first fire will be reduced and the damages will be greater to both areas. Therefore, the entire city must take greater precautions not to risk another breaking out while the first one is burning.

Now imagine what happens in the brain when a student-athlete suffers his/her first brain injury and no one spots the signs, symptoms or behaviours consistent with concussion. The student-athlete may inadvertently go back into the game and receive a second brain injury which has much more serious consequences because of the vulnerability of the brain from the first injury.

This is what happened to Sidney Crosby in January 1, 2011 when he received his first concussion near the end of the 2nd period of the now famous Winter Classic NHL game which was played on the outdoor rink in Pittsburg. Crosby took a vicious shoulder to the side of the head. He displayed all of the signs that are consistent with a possible concussion as he skated slowly to the bench, dazed and bewildered. However, during the intermission he seemed to recover and even took the first shift of the third period. After the game he could not remember what had happened, another sign of a concussion. He played the next game, a few days later, and in what most observers would describe as a minor jolt, he struck his head against the glass and would be out of the game for almost a year and a half before recovering from the concussion that has rocked the sports world forever – not only in hockey, but in all sports activities from professional to minor sports.

That is why it is so important to identify that first injury. The Sidney Crosby case is a classic example of what can happen if "another fire breaks out in your brain while the firefighters are dealing with the first fire".

Keep in mind that your brain is the central nervous system of your entire body. When you disrupt the communication system you are causing problems that are widespread in scope and it is very difficult to know exactly what symptoms that disruption is going to cause. And if a second disruption occurs while the brain is repairing the first damaged areas, then all of the other connections are at risk.

Consider yet another example. Suppose you buy an airplane ticket to fly from Toronto to Japan, with a stop-over in Vancouver. Imagine how frustrated you would be if it is sunny in Toronto and sunny in Japan, but there is a storm in Vancouver. Since you were supposed to stop in Vancouver on your way to Japan, the storm in Vancouver will delay your flight from Toronto and you will not be able to get to Japan. You will have to wait until the storm clears up in Vancouver before flying out. But then, once the storm clears up in Vancouver, it may still be a while before you can take off from Toronto because there may be a back up of flights that have to get to Vancouver before you.

Your only other choice is to see if there is another way to get to Japan, so you may try to get a flight to San Francisco and then go to Japan from there. It is definitely an option, but it may take a bit longer for the flight and you may need to wait to get a ticket to San Francisco to make the connection to Japan. You may decide that you will use the San Francisco route to Japan from now on because of your bad experience with the weather in Vancouver, but that means that future flights may be longer and more costly. Eventually, you may try to go back to your normal route through Vancouver. However, if enough people thought the way you did about establishing a new connection through San Francisco, the airlines may have decided to cancel the route from Toronto to Japan through Vancouver and you will have no other choice but to follow the new path forever.

That is what happens in the brain to the connections between neurons as a result of a brain injury. New connections are formed and strengthened as the brain tries to restore the functioning that was affected by the injury. The more these new connections are used, the stronger they become. However, the level of functionality is never the same as it was before the injury. And so, before a concussion, a hockey player may have had superior skills in one particular area. For example, he may have excelled at "one-timing" the puck by being able to time his movement so perfectly that when a pass was made to him he could coordinate his actions to get that show away quickly and accurately. After recovering from the concussion, he may find that his timing is now off ever so slightly, but just enough that he is never quite able to return to his superior skill level. He may still be good at the "one-timing", but not quite as good as before the injury. Now he has to adjust his play to accommodate this "deficiency". It should be noted that it is possible for him to "re-learn" the skill and with practice get his pre-injury level back up, but it may require a great deal of practice. This is normal when a player recovers from a concussion. He/she may have to start from the basics and learn some of the skills all over again.

HOW IS A CONCUSSION CAUSED?

We are obviously focusing our attention on sport-related concussions, but we should remember that a concussion may be caused by any kind of activity that causes the head to move rapidly and change speed or direction. This sudden change in speed and/or direction of the head is what causes the brain to shift inside the skull. The brain is a soft, jelly-like substance that is suspended in cerebrospinal fluid, so if you move the "container" rapidly enough, the brain will push through the protective cushion provided by the fluid and will smash against the surface of the skull, crushing and deforming its normal shape. Or it will twist out of shape from the rotational forces. It will momentarily bounce and twist until the movement of the head ceases. All of this can happen in a split second.

It is important to note that this rapid movement of the head does not necessarily have to be the result of a blow to the head. In fact, the actual contact can be made anywhere on the body. If that contact with the body causes the head to change direction rapidly, then damage to the brain inside the skull may result. Admittedly, the blows to the head are the ones that cause the most damage, but any blow to the body should be cause for concern when it comes to identifying the signs, symptoms and behaviours consistent with concussion.

No matter what definition you use, the fact remains that a concussion changes the way the brain functions. What is not known at this time is how long the damage will remain or where the damage is concentrated. This is what is known as a diffuse injury because the damage is distributed over a wide area of the brain.

Many people refer to a concussion as a "mild Traumatic Brain Injury" or a temporary TBI. You will often see the definition include reference to the "rapid onset of short-lived impairment of neurological function that resolves spontaneously". However, there is great debate going on now as research points that the impairment of neurological function may not repair as rapidly as once thought and the resolution may not be as spontaneous either.

This temporary impairment may be true for the most obvious symptoms such as headache and dizziness, but the long-term impact of a concussion may result in impairment of emotional and psychological functions as a result of the changes that occur in the brain. Some of the biochemical damage may take years of continuous activity before symptoms evolve. For example, if you drop acid on a rope, the rope may remain strong for a long time while the acid continues to eat away at the fibres. Eventually enough fibres will have been weakened and the rope may snap well after the acid was dropped on the rope.

In fact, there are studies that have found middle aged adults who suffered concussions while in college exhibiting premature brain aging and deficiencies in concentration, balance and motor control many years after suffering their concussions. It is most likely that most people who are suffering from these kinds of functional deficits may simply attribute them to normal aging and getting older, not even relating any symptom or deficit to their history of concussions. And yet, there may be things they could have done during rehabilitation that might have reduced or eliminated these functional deficits, thus impacting on their quality of life many years after the

injury. Our goal in developing the most effective student-athlete concussion management program possible is to reduce the long-term consequences of sport-related concussions.

A CONCUSSION IS A PROCESS – NOT AN EVENT

Evidence is being produced by researchers which proves clearly that a "concussion is a process". It is not an event. And this process does not simply involve "healing and recovery". Many symptoms of concussion do not present themselves for hours, days, weeks or months. In fact some people admit to experiencing concussion-like symptoms for many years following an injury.

We will concede that there may well be a rapid onset of short-lived impairment of neurological function in some areas that resolve spontaneously, but what about the long-term impairment that does not resolve. What about personality changes? What about anxiety and mood disorders? What about interpersonal relationship skills? What about one's attitude towards life? These are all recognized as signs and symptoms of concussion but they are also unfortunately accepted by most people as part of growing up and normal development. They may not be that normal after all.

Admittedly, we all change our personality slightly from time to time. We all have periodic bouts of anxiety and we are all moody from time to time. We all have some difficulties with relationships and our attitude towards life is often affected by our environment and the people around us. But for young people who suffer a concussion, are these changes part of their natural evolution, or are they consequences of their brain injury? And is there something we can do to reduce the risk of life-altering consequences?

Symptoms of a concussion may also not be evident until you are required to perform a specific task. For example, you may not even know that you are no longer able to recall math facts until you are asked to recite your times table. You may not realize that you get dizzy riding a bike until you have a chance to ride a bike. You may not know you have problems adjusting your vision when things are being thrown quickly in your direction from the side until this actually happens. These symptoms take time to present themselves and they will only be noticed if you have people around you who are looking for signs and symptoms of concussion. That is why we recommend using the "partner approach" to concussion management.

WHAT HAPPENS DURING A CONCUSSION?

A concussion is an extremely complex process. This Program Development Guide is not intended to prepare you for medical school, but we will try to help you understand some of the basics of what happens during a concussion.

I will assume that you have read Chapter Nine – Understanding the Brain, and are familiar with the terms that I will be using below.

First of all, axons, which are the primary communication “cable” through which neurons send signals, get their shape from internal structures called microtubules which look like a string of

sausages strung together. As the shape of the brain gets temporarily deformed from the twisting or rapid acceleration and/or deceleration, the axons may stretch or break. Normally, since your brain is constantly jiggling like a mold of jello, axons are often stretched gently with no damage to any of the internal skeletal structure that is found inside axons. This is what is often referred to as a "slow stretch" and has no impact on communication between neurons.

If the axons are stretched too quickly, they tend to stiffen up causing their internal skeletons to become destroyed and the axons will shear, causing a total interruption of signals. In most cases, concussions are mild traumatic brain injuries where the axons do not actually shear, but rather are stretched with enough force that they don't quite rip apart but still sustain significant damage to their internal skeletal structure.

For example, if the axon is stretched hard enough, the microtubules that act like a pipeline carrying nutrients from one end of the axon to the synaptic connections in its network may break at some point. When this pipeline is broken, the supplies that are being carried will continue to flow but they will basically "fall off" at the break and will collect inside the axon. (Imagine a pipeline carrying oil. If the pipeline breaks or comes apart, but the oil continues to flow, the oil will simply pour out at the break and pile up at the break point.).

So if the microtubules break at some point, this causes a "bulb" of nutrients to form inside the axon. More importantly, it may prevent the part of the axon beyond the break from receiving the nourishment and supplies it needs to survive. Eventually, the part of the axon that is not receiving nourishment will wither away and die, thus disconnecting from the original axon. That means that signals that would normally have gone along that axon will no longer get through. This then causes the axons with the bulbs of protein to also shrivel up and die because they can no longer do what they are supposed to do and the neuron will die as well. All communication that was conducted that one neuron will then cease.

There are some injuries where the damage is beyond repair, but the communication is still continuing in a faulty manner. The signals are getting through but they are not clear. In this case the damaged connection may end up corrupting the entire system with static communication. Think of what happens while you are on a cell phone call and the signal is weak. You hear some of what the person on the other end is saying, but at times it is not enough to understand the message.

Dr. Douglas Smith of the University of Pennsylvania and a number of his colleagues have done extensive research on concussions and axonal damage. What they found is that if you stretch an axon gently the first time, it produces an increase in the number of tiny pores that line the outside skin of an axon. These pores allow sodium and calcium to come inside. If you stretch the axon gently a second time shortly after the first time, these tiny pores became enlarged and sodium and calcium came rushing in.

Other scientists had previously discovered that increased levels of calcium in an axon created an enzyme that actually ate away the internal structure of the axon. Therefore, the implication is that if a person suffers a seemingly minor blow to the head or body, there may not be any obvious symptoms of concussion present, but the stretched axons will be extremely vulnerable if there is

another minor blow. That is why some people are surprised when they receive serious concussion-like symptoms from what seemed like a very small force. It's because the axons were vulnerable at the time from the stretching caused by the first blow.

"THE METABOLIC CASCADE"

When the brain suffers from a force as a result of a blow to the head or some other part of the body, it experiences a "power surge" producing an extreme amount of chemical neurotransmitters, effectively "lighting" up the entire brain with electrical charges. This surge only lasts a minutely brief period of time and seems like a mini-seizure. The physical movement causes neurons and axons all over the brain to be pulled, twisted and stretched. Doctors call this a "diffuse axonal injury" because it causes injury to axons from a number of different places in the brain. It doesn't affect a single area of the brain.

The neurons send out signals through the axons to allow sodium and calcium to enter through the tiny pores on the outer skin that have been enlarged by the twisting and stretching. At the same time potassium is allowed to rush out of the neurons through the axon openings. The problem with too much sodium is that it also brings in water which can cause swelling of the axons and thus dangerously increase intracranial pressure. Calcium produces an enzyme that eats away at the internal structure of the axons.

Once the initial power surge is over, the brain immediately attempts to restore the equilibrium and get things back to normal levels. The first thing the neurons do is send a signal to pump potassium back into the axon and pump sodium back out. The potassium counteracts the effects of sodium by neutralizing its electrical charge. This process requires a lot of energy which is usually produced inside the neuron by something called the mitochondria, which acts like an internal power plant for each cell. This is like the firefighters being dispatched to put out the original fire in the city.

The mitochondria require fuel in the form of glucose to produce energy. Glucose is carried to the neurons by the blood flow in the brain. The demand on the cell for energy causes a drain on the supply which causes the brain to lose power and operate on a slower speed. The brain then demands for an increase in blood flow in order to bring in more glucose to the mitochondria to repair the damaged areas. However, the message somehow is disrupted and the blood flow to the brain is actually slowed down. No matter how many signals the neurons send out for more fuel, there is no increase in blood flow and the cells are in danger of dying. Because of this the brain releases high quantities of potassium in order to try to calm things down even more. To follow through on our firefighter example, this would be like the firefighters demanding more water to fight the blaze. However, for some reason, the water pressure is reduced. They need more water, but they get less than they need, so it will take longer to put out the original fire. Heaven help them if another fire breaks out and they need to use some of that water and energy to fight in another area.

It is common for student-athletes who have suffered a concussion to complain about feeling groggy or fatigued. This is because the brain is placing such a high demand on the energy being produced by the body. Consider that under normal circumstances, almost 25% of the energy

being burned up in your body is being used by the brain. When the brain suffers a trauma, the demand goes up even higher, but the body refuses to provide that energy, actually reducing the flow to the brain. Hence, you feel very tired and disoriented.

Since each dendrite or axon may be part of a communication line that carries impulses to thousands of nerve cells as it winds its way around the brain, any damage to an axon or a synaptic connection can impact many areas of the brain in the network other than just the area where the original damage was caused. This domino affect can cause symptoms that may seem unusual based on the point of impact, but neurons in one part of the brain connect to neurons in other parts of the brain and may be part of a communication link with many other functions.

This is why we often see a variety of symptoms when a person suffers a concussion. The damage can affect your cognitive, physical, emotional and psychological functioning and it can play havoc with your sleep patterns and relationships.

HOW DO YOU TREAT A CONCUSSION?

The best treatment for a concussion is to reduce the stimulation of the neurons. This can only be done through physical and cognitive rest that is sufficient enough to give the brain time to repair the damage through a natural healing process. The amount of time that is sufficient can never be determined. It is different for each injury. Remember from before: 'If you've seen one concussion…..you've seen one concussion."

If we fail to identify the signs, symptoms or behaviours consistent with concussion, a student-athlete may be put at great risk of suffering serious long-term and/or life-altering consequences if he/she is injured again before the original symptoms have resolved.

There is general agreement among experts that the symptoms of "most" concussions, if treated with appropriate physical and cognitive rest, will resolve within two weeks, but the recovery time may be longer in children and adolescents. It should also be noted once again with emphasis that there is no way to predict how long it will take a student-athlete to recover from a concussion. Each person is different. No one can look at a person with a concussion and make a prediction that "you will be better in seven days". That is a statement that no parent/guardian should accept. It is better to wait until you hear "it appears to be seven days since you were last observed to have any symptoms".

Our goal as parents/guardians, school leaders, coaches, and classroom teachers is to reduce the number of concussions that are not identified by being more diligent in our efforts to recognize the signs, symptoms and behaviours consistent with concussion and then implement an effective rehabilitation protocol in order to give the brain time to recover from the injury. If we can prevent concussions from going undetected, there is less chance of a student-athlete returning to play while his/her brain is in a vulnerable state from symptoms of the first concussion.

The best way to make sure that we properly identify the signs, symptoms and behaviours that are consistent with concussion is to make sure that we have done a good job of preparing student-athletes, parents/guardians, classroom teachers, coaches, and school and minor sport

administrators. This means that we must create a training and awareness program that is more than just a sheet of paper with a lot of symptoms listed in a column. We must make sure that everyone understands how the brain works; how a concussion affects the functioning of the brain; how to spot the signs, symptoms and behaviours consistent with concussion; and how to provide a high standard of care and rehabilitation for a student-athlete who suffers a concussion.

THE CHALLENGE OF HIDDEN SYMPTOMS

The greatest challenge when it comes to identifying a concussion is that so few symptoms are visible to the casual observer. Many times the symptoms of a concussion may not be identified until there is increased exertion which causes symptoms to worsen. It may be something as simple as the ringing of a bell to change classes or the ringing of a phone that triggers a symptom. Or it may be the student-athlete returning to play in a game within the next several days that causes the symptoms to present themselves.

Studies have shown that as many as 4 out of 5 professional athletes do not even know that they have been concussed so imagine how difficult it is for an adolescent or young adult to be able to understand what is going on in his/her brain? Imagine, they do not even realize they have a concussion, but they often show signs of the injury. In other words, the people around them may be more aware of the concussion than the person him/herself.

This is why one of our goals is to make sure that all adults who are involved in any way with student-athletes are as prepared as possible to look for the signs, symptoms and behaviours consistent with concussion and then take appropriate action to remove the player from further play to avoid the possibility of further damage. We must all become “concussion symptom detectives” when dealing with student-athletes. We cannot leave this responsibility in the hands of any one person. We must belong to a “concussion management team” where each individual has equal responsibilities for the identification of concussions when they occur.

We recommend that even if there are no apparent signs and the student-athlete reports no symptoms, if a coach, teacher, the parent/guardian and/or the School Leader has a strong suspicion that a particularly hard blow to the body or head area may be cause for concern, then it should be at the discretion of any one or more of them to initiate the protocols and request that the Coach remove the player from further action. This may not always sit well with the student-athlete who feels fine after the hit and argues that he/she is all right. It may even be seen as over reacting, but this is something that all partners must agree with and understand right from the beginning.

You should always err on the side of caution. Even if it means going through the steps of the rehabilitation protocols to find out that there is no evidence of concussion, it is worth the inconvenience for a week to be sure that there is little risk of long-term damage to the student-athlete.

One should never be upset with a person who initiates the protocol. It will be clearly understood that you are acting out of care and concern for the student-athlete and if it turns out to be a false alarm, we won't be upset. We will be happy that there is no damage.

There is, however, absolutely, positively no excuse for ignoring obvious signs and symptoms. We feel that with so many "partners" looking out for the safety of the student-athlete, someone will see a sign or recognize a symptom if it comes up. The last thing we want anyone to say is that they "should have noticed" or "should have paid attention" to signs and symptoms. Concussions are brain injuries. Your brain controls everything that goes on in your body and your mind. Permanent damage may change your life forever, so we won't take any chances.

RECOGNIZING SIGNS, SYMPTOMS & BEHAVIOURS

We are going to provide you with a comprehensive review of the most universally accepted signs, symptoms and behaviours consistent with concussions. Some of them require more explanation than others. Most are pretty straight forward. At this time we are not so concerned about the proper classification of the signs, symptoms and behaviours consistent with concussions. Whether it is a sign or a symptom or a behaviour is not important. Whether it is a physical symptom or an emotional symptom is not important.

What is important is that no matter whether you are a parent/guardian, a school leader, a coach, a classroom teacher, a health care provider or a student-athlete, you should be aware of the signs, symptoms and behaviours that are consistent with concussions so that you can take appropriate action in order to reduce the chance of receiving a second concussion before the symptoms from the first one have resolved.

According to the Consensus Statement that came out of the Zurich 2012 conference, "The diagnosis of acute concussion usually involves the assessment of a range of domains including clinical symptoms, physical signs, cognitive impairment, neurobehavioural features and sleep disturbance. Furthermore, a detailed concussion history is an important part of the evaluation both in the injured athlete and when conducting preparticipation examination."

Therefore, the diagnosis of a concussion can include one or more of the following:

1. Symptoms of the body such as headache, dizziness, etc.

2. Symptoms that are more about how you are feeling, such as not feeling yourself, or feeling foggy, etc.

3. Symptoms that are emotional in nature, such as being irritable, depressed, etc.

4. Physical signs such as a loss of consciousness, starring, slurring speech, amnesia, etc.

5. Cognitive impairment such as decreased test scores on neuropsychological assessment, inability to understand what you read, etc.

6. Sleep disturbances such as sleeping longer, shorter, waking up often, etc.

SIGNS TO LOOK FOR

If you notice any of the following signs immediately or shortly after an incident in a game or practice, then you should suspect a possible concussion. We should remind you that a concussion is a brain injury that can occur anywhere, not just in sports. Therefore, while we will be focusing on signs, symptoms and behaviours consistent with concussions that are sport-related, these are the same signs, symptoms and behaviours that can be found in concussions caused by any other means.

With respect to sport-related activities, we recommend that you remove the student-athlete immediately from play if he/she:

- *appears to be dazed or stunned immediately after the incident*, even if only for a few seconds. This might be evidenced by the student-athlete trying to get to his/her feet and falling down or stumbling around for a few seconds. Usually the person will catch his/her breath, take a few moments and then regain his/her senses. However, it will be clear that there was something wrong immediately after the incident;

- *seems to be confused about his position or assignment during the game or on the bench*. This will often be noticed by the coach or a line mate when the student-athlete discusses the incident or the coach talks to the player about his/her assignment. If a player is hit pretty hard during the shift, a coach should come up and start up a conversation to check on the response of the player;

- *is not sure of the score, the period, the opponent, the time, etc. when questioned by coaches.* This is a quick test that can be done during the game. It may sound silly, and I know that there are many players who under normal conditions may not be able to tell you the score of the game at any given time, but the player should at least know the period and who he/she is playing. If the player cannot answer those simple questions, then you must take that as a sign. And if the person gives you the correct answer later, don't just assume that everything is fine again;

- *seems to move clumsily on the field/ice or around the bench/dressing room, displaying balance issues*. It is easy to pass this type of motion off as being normal, but if it is being displayed shortly after a blow to the body or head, then we must assume it is a possible concussion. A person who is carefully observing the movement will be able to determine whether or not it is a natural movement. Remember, dizziness is one of the most common signs of concussion, so any balance issues must be taken seriously;

- *seems to have reduced co-ordination*: If the student-athlete seems to be having difficulty with his/her coordination following a hit during the game, this may be a sign of something going on. The vision and balance issues that are common will often result in coordination problems, so this is a sign you cannot ignore;

- *responds to questions with a bit of hesitation or not at all, demonstrating a delay in processing information.* If it takes the person an uncharacteristically long time to answer

questions, especially if he/she stars blankly as if thinking about the answer. You must know the player when you are observing this particular sign or symptom. Some players characteristically take a long time to respond, but if it is unusual, then you must accept this as a sign that something may be wrong and then do some other tests before allowing him/her to continue playing;

- *seems irritable or displays uncharacteristic mood/personality changes which are out of the ordinary.* This may happen right after the incident or it may be something that is noticed in the hours and days following. Parents will often notice that their child is easier to get upset, more argumentative, less tolerant of siblings, etc.; It is too easy to pass this off as being emotional after losing a game, or from being hit during the game. Do not ignore these behaviours. The part of the brain that controls these functions is connected to just about every other part of the brain. So if the behaviour is uncharacteristic it is an excellent sign that something is not working properly. This may present itself as being much more irritable than normal, but it is also common for the student-athlete to appear very sad or very nervous. If these are not normal emotional responses for the student-athlete, then it is pretty clear that a traumatic brain injury must have occured;

- *can't recall the play where he got injured, even if he says he is fine*. Memory loss at the time of injury is common due to the chemical cascade that is produced. Don't just ask a simple question like "do you remember what happened?" and accept the answer "he hit me from behind". Take a couple of minutes and become a detective. Have the player give you details and even ask him/her to repeat the details to see if there is consistency;

- *can't recall what happened after he got injured*. Once again this will require some prompting to ask what the player did after he got hurt. And you must be careful not to give him clues or put words into his mouth. Of course you must also know what he did after he got injured or you won't know if he is correct. This can simply be about being helped off by a couple of players, the referee, or the trainer. It might be that his helmet fell off. See what he can remember and if he can't recall then this is another sign;

- *seems easily distracted with poor concentration*. Unfortunately, it may take a while for you to notice this. One of the ways of testing concentration is to take the player aside and start explaining something to him in the dressing room. See if he/she is more distracted than normal by what is going on around the room. You must know what the player was like in these areas before the injury. Some student-athletes are always easily distracted, so this has to be something that is uncharacteristic;

- *has a vacant stare or seems to have glassy eyes*. This is a sign that should be hard to miss. If the player simply stares off into space or is fixated on the play in an uncharacteristic manner, then don't pass it off. Once again, it is important for coaches to be looking for this sign immediately after an incident. It is also something that a parent/guardian may notice at home following the game;

- *is slurring his speech.* Keep listening for this sign while talking with the player to test his memory of the incident. It is important to do this before the player goes back into the

game following the incident in question. This may be difficult to do during the heat of the game, but nevertheless, it is important to take the time;

- *seems to be having minor convulsions or seizures.* This is serious and should be easy to spot, but they may be minor in nature. However, this kind of reaction is cause for going to the hospital right away;

- *seems fatigued or says he/she feels like sleeping*. This is a very common sign that something is wrong. A coach or parent/guardian should be able to recognize unusual fatigue during or following a game, especially among adolescents who usual have plenty of energy;

- *has slower than normal reflexes*. A person with a concussion takes longer to react to normal activities, so if you toss a ball at a person with a concussion he/she may have trouble reacting fast enough to catch it. This is a good test that can be administered on the sidelines or even at home.

Parents/guardians are reminded that some of the above signs may not be evident during the game, or you may notice only one of the signs. However, if you notice that the student-athlete is complaining about feeling fatigued while driving home, ask some questions that may provide you with further evidence of a concussion. Don't just allow your child to pass it off as being tired from playing a hard game. For example, once you are home you can ask your child what the score of the game was; who he/she was playing; what happened when the injury occurred; etc.

If your child is unable to recall or hesitates with the answering of obvious questions, then you know that you must make sure he/she completely shuts down for the rest of the night and you should be prepared to initiate the appropriate protocols. You should also let the coach know immediately if you feel that protocols should be initiated.

SYMPTOMS TO LOOK FOR

Besides the "signs" that may be evident, if the student-athlete reports any of the following symptoms, the School Coach or the Community Volunteer Coach must remove the player from further play. Symptoms will usually be identified by the student-athlete but he/she may not articulate the symptom clearly. We must be able to "read' the student-athlete.

The following self-admitted symptoms are absolutely serious enough to assume a concussion has occurred and the Concussion Identification Protocol should immediately be put into action. We remind coaches, parent/guardians and teachers that you may have to prompt these responses with questions to the student-athlete.

If the student-athlete:

- *complains of headache or pressure inside the head, even if it is only a slight pain.* Keep in mind that headaches are one of the most common symptoms of a traumatic brain injury. Migraines may be experienced following a concussion and if the student-athlete

had migraines before the injury they may be much worse following the injury. Headaches are often a sign during rehabilitation that excessive stimulation is being experienced by the brain as a result of cognitive and/or physical exertion and therefore is a signal to reduce the progression;

- *complains of dizziness or trouble keeping his balance*. This is another very common symptom after a concussion is experienced. The student-athlete may feel off balance, especially during activity or immediately following and it will usually be temporary. However, during rehabilitation, if dizziness returns it is a signal that more rest is needed before continuing the recovery progression;

- *complains about feeling nauseous or feels like vomiting*. This nausea or what some describe as a kind of motion sickness is another common symptom after a traumatic brain injury.

- *complains of vision problems*; Damage to the neurons that control vision is common in concussions. The vision affects balance, response time, etc. So any complaint about vision is serious and could indicate a concussion. Many athletes will complain about having blurry vision following an injury;

- *complains about feeling sluggish, foggy or groggy*; This could be caused by the increased demands being made by the brain for energy to repair damaged areas, but it will also be due to the fact that the energy demand is not being met.

- *states that he is unusually sensitive to light or noise;* This is another symptom of concussion that will present very early in the process. The brain is unable to cope with the stimulation that is caused by bright light or loud noise. And an arena or playing field is usually quite bright and noise;

- *complains that things seem to be moving in slow motion:* This is a complaint that says a lot about the condition of the student-athlete. The brain is often unable to process stimulation at normal rates of speed, so the student-athlete may feel as if he/she is in a slow-motion movie;

- *complains about having trouble sleeping or falling to sleep;* Most student-athletes who suffer from a concussion will experience some sleep disruption for at least several days following the injury. Some sleep more; some sleep less; some sleep during the day; some need frequent short naps during the day; some wake up frequently during the night; some feel fatigued, both mentally and physically regardless of the amount of sleep they receive. It will take some time following an injury for a person to return to pre-injury levels of energy and student-athletes will often have trouble maintaining energy levels once they return to school.

- *says he/she is feeling confused*; This disorientation is common following a traumatic brain injury and is a reflection of the damage that may have been caused to the communication network inside the brain;

- *says he/she is just not feeling right*; Many times a student-athlete is unable to articulate exactly the symptoms, but he/she will know that something is not right. Any time the student-athlete admits that something just doesn't feel right is cause for concern and should be taken

seriously;

- *says he/she is seeing stars;* Bright lights flashing inside a person's eyes is typical and is a definite symptom.

- *complains about a ringing in his/her ears*; It is common for a person to say that he/she got their "bell rung" after a forceful collision. If a student-athlete complains about hearing bells, or a buzzing in the ears, then this is another sign.

- *is unable to recognize people or places;* The ability to link faces with names or places is common after this type of injury.

- *complains of a weakness or numbing in the arms or legs*; This is a rather serious complaint and is cause for taking the student-athlete to the hospital for an immediate check up.

- *is more emotional than usual*; Once again, this is common following a concussion, so if the player is more emotional or his/her behaviour is not normal, don't just pass it off as part of the game. Remember that any drastic change following a blow to the body or head is cause for concern;

- *complains about having trouble balancing*; This is a common symptom of a concussion that is often one of the first ones that presents itself.

Once again, we remind everyone that these symptoms may not present themselves right away. It may be minutes, hours or days before the symptoms occur. It is also possible that a parent/guardian may not even be aware that their child was injured in the game if he/she was not in the stands. However, because your child participates in a sport where the risk of concussion is high, if he/she suddenly begins to complain about feeling confused, or there is a sudden change in the child, you really should not pass it off as nothing. You should communicate your findings to the appropriate authorities so that the rehabilitation process can be initiated. Remember that it is always better to be safe than sorry.

EMERGENCY WARNING SIGNS & SYMPTOMS

We recognize that it may be very difficult to get in to see a doctor right after a game or practice. Therefore, it is going to be up to the parent/guardian and/or coach to make a judgement call with respect to the urgency of seeking medical attention. There is no hard and fast rule to guide you in this matter. You are going to have to consider the nature of the symptoms and decide if they seem serious enough to go to the hospital immediately or wait until the next day.

The following should be helpful:

- *If the student-athlete was knocked unconscious,* even for a short period of time, then it is important to go to the hospital and get checked out. This is especially critical if the student-athlete was hit in the head and perhaps has a large bump as a result. You want to make sure that there is no fracture to the skull or internal damage. For a blow to be forceful enough to cause a person to lose consciousness, it must have been significant.

- *If the student-athlete begins to go into convulsions* or has some seizures in the dressing room or later on during the night, then by all means, get to the hospital immediately for a check up. These symptoms are not all that common and could indicate serious complications.

- *If one pupil is larger than the other:* One sign that generally indicates something could be seriously wrong is that one of the pupils of the eye is larger than the other. This is the black part in the middle of the eye. Of course it takes a medical doctor to know for sure, but if you look at your child's eyes and notice that one of the pupils is larger than the other, don't hesitate. Go to the emergency department right away. Don't panic. But go as soon as you can.

- *A headache that keeps getting worse* as the time passes is a signal that perhaps something serious is going on inside the skull and you should have a doctor take a look immediately. The student-athlete's original headache should ease up as time passes, so if it is intensifying it could be a sign of internal pressure or bleeding;

- *If the student-athlete continues to get more and more confused or restless* as time passes then immediate attention is warranted. Once you stop the physical and cognitive activity, symptoms should begin to get better. If even after resting the symptoms continue to get worse, then that is a sign that there may be complications. It is not always the case, but it is something you should not pass off and ignore.

- *If there are breathing complications or difficulty waking up:* When you get home there is nothing wrong with allowing your child to go to sleep, however you should check him/her through the night to listen for breathing problems or to see how he/she is sleeping. If you have any concerns wake your child up and examine for more signs and symptoms. If you have trouble waking your child up do not hesitate to bring him/her to the hospital immediately to be checked out.

- *If there is excessive vomiting:* Vomiting is not unusual following a traumatic brain injury, however, if your child *continues to vomit during the night*, then this is another indication that there may be something more serious going on. I would recommend that you bring your child to the hospital for a quick examination.

We want to acknowledge that symptoms of a brain injury may get worse during the hours and days following the incident. However, it is fairly easy to tell if the worsening of the symptoms should be cause for concern. A parent/guardian usually can tell when something is not right with their child. Go with your intuition and don't second guess yourself. It is well worth the time in the waiting room to get an examination if you are concerned.

EXECUTIVE FUNCTIONS

The frontal cortex of the brain, which is located in the forehead area, has been accepted as the region of the brain that is most involved in behaviour, personality, and decision making. This is what we call executive function, or a set of mental processes that helps one connect past

experiences to perform activities such as organizing, planning, remembering details, and managing your time and space. It allows one to differentiate between good and bad, better and best, same and different, consequences of actions, goal-setting, predictions of outcomes and expectations and perhaps most importantly for classroom teachers, the ability to suppress socially unacceptable urges that could lead to negative consequences.

The neurons in the frontal cortex extend throughout all areas of the brain, so if one suffers a brain trauma it is quite likely that there will be areas of the frontal cortex that will be affected. Even if the actual damage is found in some other part of the brain, the communication between those directly affected functions and the frontal cortex will be disturbed.

While a student-athlete is going through the rehabilitation process following a concussion, teachers and parents/guardians may find that the problems with executive function aggravate the symptoms and result in all sorts of behavioural and personality disorders. For example, common everyday things might just be more difficult to do. Working memory may be seriously affected and it might be difficult for the student-athlete to do what once came natural.

SIGNS OF EXECUTIVE FUNCTION PROBLEMS

A student-athlete who is recovering from a concussion may have difficulty with one or more executive functions. It is important for parents/guardians to watch for some of the following changes in children who are participating in high risk sports. We want to emphasize that you should continuously monitor for any of the following issues at all times during the season, not just when you suspect a concussion. It is very important to remember that some of the signs, symptoms and behaviours consistent with concussion do not present themselves immediately and may take days to evolve:

If a classroom teacher or a parent/guardian notices any of the following signs, symptoms or behaviours, especially if they come about suddenly and are quite different from what has been previously observed as normal, then it is important that further investigation be done to determine if this may be a sign of a brain injury.

A student-athlete may have difficulty with one or more of the following if they are suffering from the effects of a concussion.

- Short-term and long-term planning of projects and assignment;
- Keeping track of time-lines and completing projects and homework on time;
- Communicating orally or in writing in an organized, sequential manner;
- Memorizing and retrieving information from memory;
- Initiating activities or tasks, or generating ideas independently;

- Remembering information that is used in a conversation, even while speaking;
- Remembering the phone number or email address while dialing or texting;
- Engaging in group discussions, even around the kitchen table or with family members;
- May begin to shout out answers in class;
- May be reluctant to ask for help in class;
- Will have trouble keeping track of several things at once – multi-tasking
- Have trouble paying attention or remaining on task, even with simple matters
- Be slow to respond to questions or to retrieve information during a conversation:
- May begin shifting his/her attention from one task to another or from one subject to another in school;
- Keeping his grades up in certain subject areas;
- Refraining from impulsive behaviours that are inappropriate;
- With mood changes that occur spontaneously without warning or reason;
- Avoiding feeling depressed or unhappy;
- With his/her attitude towards authority and may become defiant;
- Maintaining a clear mind and may seem confused.

These are generally behaviours that one must observe over a period of time in order to look for patterns. They may be more helpful during the rehabilitation process to determine when the symptoms of concussion are resolving. In other words, a student-athlete who is suffering from a concussion may all of a sudden begin to have trouble with one or more of the above executive functions. However, if the classroom teachers make appropriate accommodations these problems should gradually clear up and the student-athlete will return to normal, pre-injury levels of performance. It is critical that accommodations be made during the rehabilitation stage in order to help the brain recover from the injury.

The section below on the possibility of concussion being a “spectrum disorder” has significant implications when executive function deficiencies present themselves.

IS CONCUSSION A SPECTRUM DISORDER?

Some studies on concussions are beginning to show evidence that we may be dealing with a spectrum disorder when we examine the cognitive deficiencies of traumatic brain injury. For example, let's consider that at the lower end of the spectrum a person has minimal brain damage from brain trauma, while at the higher end a person has a maximum amount of damage and has serious life-threatening symptoms.

It has been customary to describe a concussion as being mild, moderate or serious, so in a way concussions have always been considered to be part of a spectrum.

The spectrum disorder theory explains the degree of concussion by imagining a "continuum" where the "degree needle" is constantly moving between points in mild and serious stages as the brain experiences new trauma and recovers from previous injuries.

There are times, for example, when the brain may be subject to a very small force which causes minor damage. No symptoms of concussion are produced, but the "degree needle" moves a little further from the absolute lower end of the spectrum. Over time the "needle" will move up or down the spectrum, depending on the number of what we may call sub-concussive blows received. A sub-concussive blow would be one that produces no observable signs, symptoms or behaviours consistent with concussion.

If there is sufficient cognitive and physical rest following a sub-concussive blow, the needle may begin moving back towards the lower end of the spectrum. However, if there hasn't been enough time for recovery before the next sub-concussive injury is experienced, the needle may end up being moved further up the continuum towards the upper level of the spectrum.

After the accumulation of a number of sub-concussions, the needle will move into the "tipping point" area, causing signs, symptoms or behaviours consistent with concussion to emerge. When that happens, we say that the student-athlete has suffered a "concussion" and must rest until he/she recovers to the point where the symptoms have disappeared. In a short period of time the symptoms will subside and the student-athlete will be said to have recovered from the concussion and be what we call "asymptomatic" or without symptoms.

However, questions are now being raised about whether the concussion has really healed once a person is asymptomatic. In fact, it could be that the "needle" has moved far enough towards the lower end of the spectrum so that the symptoms no longer present themselves. Any further trauma to the brain will cause the needle to begin moving along the continuum towards the upper level until it reaches the point where signs, symptoms and behaviours consistent with concussion occur again.

The spectrum disorder theory explains why once a student-athlete suffers their first concussion, he/she is much more vulnerable to suffering second and subsequent concussions from even less force than was needed in order to cause the first. This may be explained by understanding that it takes a while for the "degree needle" to move from the lower end of the continuum to the point where symptoms emerge. However, after a rehabilitation period which includes cognitive and

physical rest, the "degree needle" only moves to the point where symptoms subside and everyone concludes that the absence of symptoms mean that the concussion has healed. In fact, the healing is still going on and may not have reached the original starting point. Therefore, it will take fewer sub-concussions to produce symptoms of a second concussion and so on. A significant enough force may end up moving the needle to new levels never before experienced, thus making the recovery period even longer and slower. Eventually, the "needle" will move so far along the spectrum that the symptoms may never disappear and the student-athlete will suffer from life-long post-concussive symptoms. This may help explain why there are so many adults in their 50's and 60's with post-concussion symptoms.

If the spectrum disorder theory is valid, then the signs, symptoms and behaviours consistent with executive function disorders may be a warning sign that the student-athlete is approaching a danger zone. They may become "warning signs" and in much the same way as scientists can predict earthquakes, we may be able to predict potential concussions and then take appropriate action to reduce the risk of a full scale injury from happening.

This will require a whole new approach to dealing with traumatic brain injuries. It means that we may have to initiate concussion management protocols even prior to the occurrence of an incident during a game or practice. It is hard to imagine how hard it will be to keep a student-athlete out of a game because of the increased possibility of concussion. Right now we are having problems keeping them out of action even after there is clear indication of a concussion.

However, if we accept the spectrum disorder theory, we must also accept the principle that all student-athletes may indeed have some degree of traumatic brain injury, with most having a degree of injury that hasn't quite reached the "tipping point".

EMOTIONAL OR PSYCHOLOGICAL SYMPTOMS

It is not uncommon for a person who has suffered a traumatic brain injury to display symptoms that are emotional or psychological in nature. When this happens, the care givers, including parents/guardians, classroom teachers and coaches must do whatever they can to overcome or alleviate these psychological issues since they can cause or exacerbate other symptoms.

- *Anxiety is an issue that is common following a traumatic brain injury*. The student-athlete may admit to having flash-backs about the injury if it was particularly traumatic. He/she may also worry about losing his/her school year or position on the team. In this case it may not be so much the injury that is causing the anxiety, but more from the stress of experiencing the injury in the first place. It is important to remember that everyone is going to experience some level of anxiety, but it becomes a concern when it interferes with other normal, day to day functioning. This is why it is critical that appropriate accommodations be in place with respect to returning to normal activities at school and at home. You must avoid increasing stress levels which will lead to further anxiety.

- *Depression is common with injured student-athletes*. There is, however, a difference between depression and unhappiness or sadness. For adolescents, playing on the school team means everything. It is what defines them in the eyes of their friends. When

suffering from an injury that others cannot understand or see, it is often extremely depressing for the student-athlete and can interfere with the rehabilitation process.

- *Irritability often accompanies a traumatic brain injury*. Student-athletes become short-tempered and have difficulty with their relationships which then makes it even more difficult to recover. People must give concussion victims "more rope" and not react negatively to some of the comments and arguments that ensue. It is not the same person, but in time that old friend will return.

- *Personality changes often accompany traumatic brain injury.* A person may find that things that usually were of interest and enjoyable are no longer so. This might not seem like the same person because it isn't. These are signs and symptoms that you must recognize if you are a parent/guardian or classroom teacher because they could be signals that the student-athlete has suffered a concussion.

BALANCE IMPAIRMENT

There are a number of simple tests that can be done at school, on the sidelines or at home that will determine if the student-athlete has any problems with balance. One of the common symptoms of concussion relates to balance, so these tests can certainly uncover evidence of a traumatic brain injury. The best source of these tests is the SCAT2 (Sports Concussion Assessment Tool).

1. Have the student-athlete stand up straight with both feet together and hands on his/her hip. Then ask the student-athlete to close his/her eyes for 20 or 30 seconds. See how steady the student-athlete stands. It is always a good idea for the parent to do this test before the season begins in order to get a baseline performance to compare with once an injury occurs and a concussion is suspected.

2. Have the student-athlete do the same drill but raise and bend the left leg first for 30 seconds and then do the same with the right leg for another 30 seconds. Once again close the eyes and you can see how well the person does with this test.

3. The final balance test is to have the student-athlete stand toe to heel one foot behind the other, with hands on hips and eyes closed for 30 seconds. Repeat the procedure by switching feet. Observe how well the student-athlete does with this test.

Everyone will have their own sense of balance to begin with and it is unlikely that anyone will be able to pass these tests without moving. That is why it is important to do a baseline set of tests as part of the Preparation Stage. Make observations about how well the student-athlete performs the balance test while not injured. Then compare the results after the injury. If there is a significant deficiency, then you should seriously suspect a concussion and follow established protocol.

COGNITIVE IMPAIRMENT

It goes without saying that the best cognitive assessment is through a neuropsychological test such as ImPACT. However, if a parent/guardian suspects that his/her child may have a concussion, there are some simple little tests that can be performed at home at the kitchen table.

1. First, simply ask a number of questions that your child should be able to answer easily.
   What is the date today?
   What is the day of the week today?
   What year are we in?
   What is your birthday?

2. You can ask your child to perform a couple of tests that will demonstrate concentration skills.
   List the days of the week backwards starting with Saturday.
   List the months of the year forward and backward.

3. You can then test memory by reading your child a list of words and asking him/her to repeat them back to you in any order. Do this with a few different lists.

4. You can do the memory test with digits from 0 to 9.
   List a string of three digits and ask your child to repeat them backwards.
   Do this for a string of four and five digits.

Once again, if possible, you should do this kind of test before the season in order to establish a baseline. Your child may already find it difficult to say the months of the year in reverse order. Therefore, unless you have a baseline to compare with, it may be hard to determine if there is any significant decline.

If you are concerned with the answers, then your child may have a concussion and you should take appropriate action to initiate the concussion management protocol.

CONCLUSION

There are many signs, symbols and behaviours consistent with concussion.

All it takes is one of these for a person to be suspected of having a concussion.

If you spot one, the chances are that there are others that are going to present themselves over the next several days.

This means that the concussion management protocols should be implemented immediately and everyone begin the rehabilitation procedures so that the damage from the first concussion is contained and allowed to recover before any further damage is caused.

We know what to look for. Now we need to take action when we see the signs, symptoms or behaviours! And we must put in place procedures and protocols that make sense for this type of injury, keeping in mind the following:

1. Diagnosing a concussion on the sidelines during a game is extremely tricky since it relies on the student-athlete being honest about revealing symptoms such as headache, nausea, dizziness, and blurred vision. It relies on the person evaluating the player recognizing signs of concussion. All of this is used to help a person determine if a student-athlete has a concussion.

2. Determining whether a person has a concussion right after he/she takes a hit is further complicated because symptoms do not always show up immediately. Some of them present themselves over time, even days. That is why neuropsychological testing is done several days after the incident to give the symptoms time to develop. Because conditions can change, it is too risky for a person on the sidelines to make an informed decision. There is just too much risk that the student-athlete may appear normal while on the bench and then be put back into the game only to find out that he/she sustains a much more serious second concussion.

3. It is impossible to determine the severity of a concussion at the time of the injury. Whether a concussion is mild or severe will be determined by the extent of the symptoms that evolve and by how long they take to resolve. And you can never tell at the time of the injury just how long it is going to take to heal. Therefore, you have to wait until the person completely recovers before you can make any statement about the severity of the injury.

4. This is why we must do more than just have the student-athlete examined by a medical doctor. We must do more than have a health care provider or concussion expert on the sideline to examine a player suspected of having a concussion. We must have the parents/guardians observe for signs, symptoms and behaviours consistent with concussion at home. We must have the classroom teachers observe for signs, symptoms and behaviours consistent with concussion at school. We must use neuropsychological computer testing to compare baseline with post-injury cognitive functionability. We must involve the student-athlete in rehabilitation programs to prepare him/her for return-to-play, return-to-learn, and return-to-normal.

This is why we will always recommend that as soon as a single sign, symptom or behaviour consistent with concussion is spotted, the student-athlete must immediately be removed from play and the full extent of the concussion management program be initiated and followed through to the end. Only then will we be sure that we have done everything possible to reduce the risk of repeat concussions which could have life-altering consequences on the student-athlete.

CHAPTER TWELVE
The Ontario Physical and Health Education Association (OPHEA) Safety Guidelines

INTRODUCTION

We've decided to conclude this chapter with a special section devoted to the Ontario Physical and Education Association (OPHEA) Safety Guidelines for interschool athletics. These are activities which occur outside of the student's instructional time, involve a specific school team or group, and involve a competition against another outside team or group.

It is important to note that the guidelines were established in partnership with the Ontario School Boards' Insurance Exchange (OSBIE), the Ontario Association for the Supervision of Physical and Health Education (OASPHE), the Canadian Intramural Recreation Association – Ontario (CIRA), and the Ontario Federation of School Athletic Associations (OFSAA).

The safety guidelines that have been established are considered to be the minimum guidelines to be used by coaches and administrators and are "mandatory". It is clear that no event, activity or competition is to occur unless there is complete compliance with the conditions outlined.

The main reason we have included the OPHEA guidelines is because, according to the disclaimer on their document, the guidelines are ***"to the best of Ophea's knowledge, based upon the most current knowledge and experience available in Canada."*** This is why we strongly recommend that each school board, post-secondary institution or minor sport organization continuously review and revise their own concussion management program to bring it up to date with the most recent developments and advice. It is relatively easy to do continuing research to keep up to date.

Another important point is made in the disclaimer, namely***, "Implementation of safety guidelines should in all cases be preceded by a close review of these guidelines and appropriate modification on the part of each school board in order to meet the specific requirements and circumstances of their respective schools and programs."*** This is precisely why we recommend that a steering committee be established to develop a customized program based on our own recommendations as well as the OPHEA guidelines and any other resource available. All of this is to be done taking into consideration the individual needs and concerns of the school board.

The final part of the disclaimer is a clear indication that school boards, post-secondary institutions and minor sport organizations are on their own with respect to risk management and liability. It is stated that ***"Ophea accepts no responsibility for the implementation and customization of these guidelines."*** You are on your own as far as the development, implementation and customization of the guidelines are concerned.

We are spending considerable time going over this introduction and the wording of the disclaimer to drive home the point that each school board, each school, and each coach, each parent/guardian, each student-athlete, and indeed each person involved in athletics at the post-secondary institution level and each minor sport organization is ultimately responsible for the safety and well-being of their own student-athletes. This is not something you can brush off because you followed the "guidelines that were put out by OPHEA or your own athletic association.

Despite all of this, the OPHEA guidelines with respect to concussion injuries are mandatory and are the minimum standards that must be followed by school boards. As such, we will assume that the standards would also apply to non-school teams as well.

INTENT OF OPHEA GUIDELINES

We are going to examine the statement of intent that is contained in the OPHEA Guidelines. We feel that these statements are so important we are going to quote them exactly and we are going to list them sentence by sentence.

1. ***The primary responsibility for the care and safety of students rests with the school board and its employees.***

2. ***An important aspect in fulfilling this role is to recognize that there is an element of risk in all physical activity and to take action accordingly.***

3. ***To this end, the safety guidelines writing team and physical educators across Ontario have identified and analyzed reasonable foreseeable risks and have developed this guideline which includes procedures that help minimize, to the greatest extent possible, the risk of a preventable accident or injury.***

4. ***A guideline alone does not eliminate risk, regardless of how well it is written or how effectively it is implemented.***

5. ***Safety awareness, practised by the teacher/coach, based on up-to-date information, common sense observation, action, and foresight, is the key to safe programming. The intent of the Interschool Safety Guidelines is to focus the teacher's/coach's attention on safe procedures for sport in order to minimize the inherent element of risk.***

6. ***By implementing safe coaching practices, such as appropriate skill progressions, facility and equipment safety checks and appropriate supervision and officiating, the potential for injury will be minimized.***

7. ***It is hoped that this document will assist educators in fulfilling their obligation to provide the safest possible environment in which all students, regardless of physical, mental, emotional abilities/challenges or cultural background, can participate in interschool athletics.***

RISK MANAGEMENT

We have devoted an entire chapter in this Program Development Guide to the topic of Concussions and the Law. Liability and risk management are beginning to become much more of a concern with respect to concussions as we become increasingly aware of the complexities and long-term consequences of not treating initial injuries properly.

Consider what the OPHEA guidelines say about the elements of risk that must be taken into consideration by a coach. And for the record, let's understand that while the OPHEA guidelines apply to school boards, they will most certainly be used as the minimum standards acceptable for coaches of teams at the post-secondary level and in minor sport organizations.

1. ***"The competition is age-appropriate for the students' physical/mental abilities and behavioural patterns."*** This is a huge problem when it comes to school teams. The difference in size of secondary schools means that larger schools have more players to choose from and hence their players may be much more skilled and much more physical than players from smaller schools. Therefore, a coach must make sure that he/she is not simply selecting players in order to fill a roster. Every student-athlete who is selected for a team "must" have the ability to perform at that level. And because all student-athletes who try out for a team feel that they personally have the ability, it is up to the coach to make the proper determination. Note that the OPHEA guideline does not just mention the student-athlete's physical abilities, but also his/her mental abilities and behavioural patterns. We are not sure how you would measure mental abilities and behavioural patterns in order to determine if the student-athlete is in an age-appropriate level of competition, but a coach must be able to defend each selection.

2. ***"The coach/supervisor has the knowledge/experience and certification (where applicable) in accordance with the safety guidelines to coach/supervise the activity safely".*** This is another one of our recommendations. When appointing a coach for a school team, the School Leader must make sure that the coach is qualified for the position. When it comes to minor sports, there are plenty of certification requirements for coaches. But at the secondary school level there often are no requirements. We feel that more care should be taken with the training and qualifications of coaches.

3. ***"In addition to the supervision ratios outlined in the safety guidelines, the activity must meet Board standards for physical activity supervision ratios."*** This is something that minor sport organizations do somewhat better than school boards. There should be a minimum number of coaching staff members at each practice and/or game. Additionally, each of those coaches should have specific qualifications. For instance, one of them should have first-aid training.

4. ***"Consideration must be given to environmental factors (e.g., extreme weather, changes to site being used [e.g., extreme change in wind conditions at cross country running practice])."*** This is one area that I feel most coaches are already doing a good job. However, it is not unusual to play football or soccer in wet, rainy conditions where the footing creates dangerous playing situations. Most of the time the game will go on

without incident. However, a coach who allows his/her players to perform in adverse weather conditions should be prepared to defend his/her decision if ever questioned by a neutral third party.

OPHEA CONCUSSION GUIDELINES

Common Symptoms and Signs of Concussion

We have taken considerable time in various locations of this Program Development Guide to deal with signs, symptoms and behaviours consistent with concussion. At this time we will provide you with the OPHEA guidelines about the symptoms and signs of concussion. The OPHEA statements are in bold print. Our comments, if any are in regular print. We are also going to separate each sentence so that you can clearly see what is being said by OPHEA.

1. ***It is important to know that an athlete does not need to be "knocked out" (lose consciousness) to have had a concussion.***

2. ***After the concussion, the student may experience many different kinds of symptoms, and it is important to remember that some symptoms may appear immediately and later.***

3. ***Students may be reluctant to report symptoms of concussion because of a fear that they will be removed from the game, or jeopardize their status on a team.***

4. ***But it is important to consider the permanent repercussions of a concussion.***

5. ***Without proper management, a concussion can result in permanent problems and even death.***

Concussion should be suspected in the presence of any one or more of the following symptoms and signs: You will recognize that this is a consistent message that we repeat throughout this Program Development Guide. The presence of a single sign, symptom or behaviour consistent with concussion is enough to suspect a concussion. There should be no second guessing or searching for second or third signs to confirm the first. That is why it is so important to have a written program in place which clearly designates the responsibilities of each of the partners involved. You will note that all of the items in the list below are included among the ones we have identified in Chapter Twelve – Signs, Symptoms and Behaviours.

Thinking Problems

Does not know time, date, place, period of game, opposing team, score of game
General confusion
Cannot remember things that happened before and after the injury
Knocked out

Student's Complaints

Headache
Dizziness
Feels dazed
Feels "dinged" or stunned; "having my bell rung"
Sees stars, flashing lights
Sleepiness
Loss of vision
Sees double or blurry
Stomach ache/pain/nausea

Other Problems

Poor coordination or balance
Blank stare/glassy-eyed
Vomiting
Slurred speech
Slow to answer questions or follow directions
Easily distracted
Poor concentration
Strange or inappropriate emotions, (e.g., laughing, crying, getting mad easily)
Not playing as well.

The OPHEA Guides also specify that all student-athletes must consult with a physician after a suspected concussion. We strongly agree with this point.

OPHEA GUIDELINES – INITIAL RESPONSE

We are now going to examine the OPHEA Guidelines with respect to the initial response if a concussion is suspected. We have gone into much more depth in our Program Development Guide dealing with what we call the Identification Stage, but the elements outlined by OPHEA are consistent with what we are recommending.

If there is a loss of consciousness, the OPHEA Guidelines call for:

1. ***Call immediately for an ambulance;***
2. ***Assume there is a possible neck injury and, only if trained, immobilize the student before ambulance transportation to hospital, Otherwise, do NOT move athlete or athletic equipment e.g. helmet.***

If there is no loss of consciousness, the OPHEA Guidelines call for:

1. ***remove the student/player from the current game or practice;***
2. ***do not leave the student alone;***
3. ***monitor signs and symptoms;***
4. ***do not administer medication;***
5. ***the player needs to be evaluated by a medical doctor;***
6. ***the player must not return to play in the game or practice that day;***
7. ***inform the parent/guardian about the injury and of the importance of seeing a medical practitioner***

As for how long it takes for the student-athlete to get better, here is what OPHEA states:

1. ***The signs and symptoms of a concussion often last for 7 – 10 days, but may last much longer.***
2. ***The exact length of this period is unclear, but the brain temporarily does not function normally, and during this time it is more vulnerable to a second head injury.***
3. ***In some cases, students may take many weeks or months to heal.***
4. ***Significant cognitive symptoms may result from concussion including (e.g., poor attention and concentration, reduced speed of information-processing and impaired memory and learning).***
5. ***There may also be a significant negative effect on educational and social attainment as these functions are critical for learning new skills and attending to school work.***

OPHEA GUIDELINES – PHYSICIAN VISITS

The OPHEA Guidelines are more specific when it comes to what is expected of the physician and what should transpire during visits. The OPHEA Guidelines provide a sample "Request to Resume Athletic Participation: Concussion Related Injuries Form" but it is our understanding that many doctors have their own already. Elsewhere in our Program Development Guide we provide a sample form of our own which can be used. The sample OPHEA suggested is:

Sample Request to Resume Athletic Participation Concussion Related Injuries

The athlete must complete the following contacts with the physician and follow physician's instructions below:

Initial contact:
No concussion – athlete may return to play
Physician signature and date:
_____

Concussion - no activity until symptoms and signs have gone
Physician signature and date:
_____

Second contact:
Concussion symptoms and signs have gone – athlete may return to non-contact activities:
Step 1: Light aerobic exercise, such as walking or stationary cycling, for 10-15 minutes.
Step 2: Sport specific activities (e.g. skating in hockey, running in soccer) for 20-30 minutes. No resistance training or weight lifting.
Step 3: On field/court/ice activity such as ball drills, shooting drills and other activities with NO CONTACT (i.e. no checking, no heading the ball etc). May add light resistance training and progress to heavier weights.
Physician signature and date:
_____

Note: If a student athlete has received a physician's approval to return to non-contact exercise drills etc., he/she must return to the physician, when appropriate, for physician's final approval to engage in full activity contact.

Third contact:
Concussion symptoms and signs have gone – return to on field/court/ice with activity contact.
Physician signature and date:
_____
Comments:_____
_____
_____
_____

As noted above, the OPHEA guide requires three different visits to the physician if a concussion is diagnosed. We find that while this is commendable, it is not always practical and we question whether or not this requirement may lead to a lot of concussions going unreported. It is at times difficult for a person to get in to see a doctor for a single visit in Ontario, so we are not sure how strictly this requirement is enforced.

With reference to the Physician Visit #1, this appears to be an opportunity for the doctor to determine if the student-athlete has a concussion or not. If not, then the doctor's signature is all that the coach would require to allow the student-athlete to return to play. If the doctor indicates that the student-athlete has suffered a concussion, then he/she signs a form indicating that there is to be no activity until signs and symptoms have gone.

Specifically, the guideline states:

1. ***Doctor checks the box 'Concussion - no activity till symptoms and signs have gone' and signs and dates the form.***
2. ***Student/athlete returns the completed form to teacher/coach to be informed that the student/athlete is not to participate in all activities until symptoms and signs are gone.***
3. ***Form is returned to the student/athlete as this form is to be used at the next two doctor assessments.***
4. ***Student/athlete monitors symptoms and signs under the care of the doctor until symptoms and signs are gone.***

While this standard of care is to be commended, we feel that there will be very few situations in school boards where this kind of access to a doctor, or even any kind of health care provider is possible. Most secondary schools do not even have access to an athletic trainer or physical therapist, let alone a doctor who can monitor the symptoms and signs, so we feel that this is one of the weaknesses of the OPHEA protocol.

What is most likely taking place is that the Physician Visits #1 and #2 are being combined in cases where the doctor determines that the student-athlete suffers a concussion. In other words, when the student-athlete meets the doctor the first time, if the doctor does not find any evidence of structural damage to the skull, increased intracranial pressure, internal bleeding or muscle damage to the head, then the doctor will likely give the student-athlete permission to return to non-contact activities, allowing the coach to begin the progressive training as outlined on the form above:

Non Contact Activity:
Step 1: Light aerobic exercise, such as walking or stationary cycling, for 10-15 minutes.
Step 2: Sport specific activities (e.g. skating in hockey, running in soccer) for 20-30 minutes. No resistance training or weight lifting.
Step 3: On field/court/ice activity such as ball drills, shooting drills and other activities with NO CONTACT (i.e. no checking, no heading the ball etc).
May add light resistance training and progress to heavier weights.
Note: Each step must take a minimum of one day. If symptoms or signs of the concussion return (e.g. headache, feeling nauseated) either with the activity or later that day, the student

needs to rest for 24 hours, be re evaluated by a physician, and return to the previous step. A student should never return to play if symptoms persist. The time needed to progress from non-contact to contact exercise will vary with the severity of the concussion and the player.

Once again, we commend the requirement to be re-evaluated by a physician every time symptoms return, however this will be very difficult and we question if it is being done. Our recommendation is that if symptoms return while training, then the resistance should be turned down a notch to the point where symptoms did not return and then the student-athlete gradually build back up again. The only time we would recommend being re-evaluated by the doctor would be if symptoms returned and they did not subside or became very severe. Otherwise, we agree with the step-by-step progression.

The OPHEA Guidelines require the student-athlete to visit with the Physician a 3rd time in order to receive permission to return to contact practice and competition. It is during this 3rd visit that the physician will declare that all signs and symptoms of the concussion are gone. We feel that it is fair to ask a doctor to declare that all signs and symptoms which he/she is able to examine for are gone, but to declare that all signs and symptoms are gone may be going too far. After all, there are many signs, symptoms and behaviours consistent with concussion that a doctor will be unable to observe or examine. Much of what a doctor knows will be self-admitted by the student-athlete, and a doctor won't be able to tell if the student-athlete is being entirely honest. Also, with up to 80% of concussed athletes being unaware of their injury, it is hardly fair to expect a doctor to be able to make such a declaration after a ten minute examination.

We recommend that the doctor should be expected to declare that the student-athlete is free of any evidence of structural damages such as a fractured skull, increased intracranial pressure, internal bleeding, or damaged neck muscles. If there are other signs and symptoms that can be tested for in a clinical setting, then that would be fine as well. Our main concern is that the doctor determines if there are any life-threatening conditions that are present.

Doctor assesses that all symptoms and signs of a concussion are gone:
Using the 'Request to Resume Athletic Participation: Concussion Related Injuries Form'':
Doctor checks the box 'Concussion – return to on field/court/ice with activity contact' and signs and dates the form.
The student/athlete brings the completed form to the teacher coach.
The teacher/coach has the student/athlete participate in:

Contact Activity:
Step 4: 'On field' practice with body contact.
Step 5: Game play.
Note: Each step must take a minimum of one day. If symptoms or signs of the concussion return (e.g. headache, feeling nauseated) either with the activity or later that day, the student needs to rest for 24 hours, be re evaluated by a physician, and return to the previous step. A student should never return to play if symptoms persist.

Note: Teacher/coach files the completed form 'Request to Resume Athletic Participation: Concussion Related Injuries' from the doctor in student's O.S.R.

The OPHEA guidelines are absolutely fine in our opinion, however we are concerned that because of the shortage of doctors available in Ontario, especially doctors who are experienced in managing concussions, these requirements are going to be a real challenge for parents/guardians to meet. Our concern is that unless a student-athlete suffers a very severe concussion and is experiencing highly observable symptoms at the game or practice, it will be too easy for a parent/guardian to send their child back to the coach the next day or so and indicate that there were no symptoms and declare that the student-athlete did not have a concussion. At that point a coach is likely to accept the parent/guardian's word.

The critical point is that there is no need to suspect a concussion unless there are "clear signs or symptoms" evident after the game or practice. If the coach is the only person looking for these signs or symptoms, and they are missed, then there is no responsibility for anyone else to step in and force the student-athlete to see a doctor. The parent/guardian is placed in a very awkward situation if he/she tries to claim their child is injured and the child argues otherwise. Now you must decide if you want to sit for hours in a waiting room to have your son/daughter tell the doctor that there is nothing wrong and then to have the doctor say to go home and rest and see if everything remains fine. A parent/guardian can do that on his/her own without wasting time in the emergency room or taking time off work to take his/her son or daughter to the doctor the next day, if an appointment can be made at all. Ultimately, the student-athlete goes home, goes to bed early and continues on with life as if nothing happened. Unfortunately, from what we know about concussions, the chemical reactions in the damaged neurons and axons may be continuing to cause further problems that could eventually produce symptoms in a few days or if there is another blow to the body. This could be avoided if the student-athlete rested physically and cognitively to give the brain time to counteract the negative influences of the chemicals.

OPHEA GUIDELINES – CONCUSSION MANAGEMENT

The OPHEA Guidelines include several recommendations with respect to concussion management. We feel there is a whole lot more to be said, as evidenced by the comprehensive nature of our Program Development Guide, but we will address the three that are included in the OPHEA Guidelines at this time.

Education & Awareness

We are particularly supportive of their comments with respect to the education of student-athletes and parents/guardians.

A student's safe return to physical activity after a concussion is enabled when the student/athlete and the parents/guardians are familiar with the symptoms and treatment. Summaries (appropriate hand-outs) of this information are available on the ThinkFirst website:

Parent Information: http://www.thinkfirst.ca/documents/concussion-parent.pdf

Athlete Information: http://www.thinkfirst.ca/documents/concussion-information-athletes.pdf or

General Public Information: http://www.thinkfirst.ca/documents/concussion-card.pdf

Our only concern is that this particular section is not consistent with another recommendation in the OPHEA Guidelines, namely,

"Implementation of safety guidelines should in all cases be preceded by a close review of these guidelines and appropriate modification on the part of each school board in order to meet the specific requirements and circumstances of their respective schools and programs."

While we agree that the handouts found on the Think First web site are very well done, it is far too easy for coaches to direct parents/guardians and student-athletes to the web site and ask them to become familiar with the documents, calling this their awareness and education policy. We still advocate for the requirement of each school board to develop their own guides for parents/guardians and student-athletes and then have some process whereby there is an actual evidence-based delivery of this information. The fact that the OPHEA Guidelines are mandatory means that it is easy for a school board to follow the guidelines to the letter and provide the Think First information as "appropriate hand-outs" in accordance to what is written in the guidelines.

Neuropsychological Evaluation

We are pleased to see that OPHEA has pointed out that a concussion can be more successfully evaluated by using neuropsychological assessment. We continue to maintain that ImPACT is the most reliable assessment since it is computer based and does not rely as much on self-admitted information or observation to determine baseline and post-injury levels.

A concussion is more successfully evaluated if the student/athlete completes a neuropsychological baseline evaluation prior to beginning the sport season. For more information about concussion and sample Sport Concussion Assessment Tools, see:

ThinkFirst - http://www.thinkfirst.ca/documents/SCAT-v13-1.pdf

ImPACT Concussion Management for further information, contact: – www.impacttest.ca.

Our concern is that with so much emphasis on risk management, there are still so many school boards, post-secondary institutions and minor sport organizations that have not included neuropsychological evaluation as part of their concussion management program. This despite the fact that OPHEA has indicated the evaluation will be much more successful with this type of baseline testing. This statement even implies that a doctor's evaluation would be more reliable with a baseline evaluation.

Risk Management

When it comes to risk management, the statements included in the OPHEA guidelines are certainly accurate and one could not argue with their importance or truth.

1. ***Any time a player is involved in a contact sport, there is a chance of sustaining a concussion.***

2. ***Approximately 85-90% of concussions are not reported until after the practice or game.***

3. ***Therefore, it is important to take a preventative approach when dealing with concussions.***

4. ***Students need to be educated in the proper sport techniques (e.g., correct body checking in hockey)***

5. ***The rules of the sport need to be enforced.***

6. ***The principles of head-injury prevention (e.g., NO hits to the head) need to be implemented.***

7. ***Appropriate protective equipment needs to be worn and properly fitted.***

8. ***All protective equipment needs to be certified and well maintained.***

9. ***Athletes need to respect the rules of the game and practise fair play.***

CHAPTER THIRTEEN

CONCUSSION MANAGEMENT & THE LAW

There are a number of obvious reasons why more and more Provincial and State governments are introducing legislation requiring school boards to develop a formal concussion management policy for their schools. It is imperative for school boards to change the way concussions have been treated in the past in order to ensure the well-being and safety of student-athletes. School Boards and post-secondary institutions are also going to have to demonstrate in a very specific, concrete manner that they are complying with universally accepted principles when it comes to risk management in this area. As it stands now, most jurisdictions have very general protocols with respect to concussion management. The provincial and state governing bodies are therefore taking steps to make sure that school boards and post-secondary institutions have formal policies in place that will enable them to meet their legal and legislative responsibilities with respect to concussion management programs covering their student-athletes.

While much of this chapter will make reference to school boards, it should be noted that anyone who is in a position of responsibility for a young person will be expected in the eyes of the law to have taken all reasonable precautions whenever there is a head injury to a child. This means that minor sport organizations will have to ensure that the standard of care being provided by volunteer coaches is "more than that of a reasonable and careful parent" when it comes to suspected concussions. Therefore, whatever we mention below with respect to requirements of school boards should be taken to also mean minor sport organizations.

Legal Review of Local Program Recommended

Regardless of what kind of protocols a school board, post-secondary institution or minor sport organization adopts, it is strongly recommended that legal counsel be asked to review the program and provide an opinion as to the risk of liability and perhaps offer suggestions on what should be done to further reduce any risk. We all know that it is impossible to absolutely prevent concussions, especially with high-risk sports. However, what makes this kind of injury so precarious is that concussions can occur anywhere, and it is quite possible that a coach will place a player in a game without knowing that he/she may have suffered a previous concussion in some other activity. Returning to play too soon can be extremely dangerous, but it is hard to expect a coach to be able to read minds. Nevertheless, there may be some precautions that a coach can take that will be good risk management strategy and therefore should be considered.

A Very Serious Injury That May Not Have Been Properly Treated In The Past

Medical and scientific researchers from around the world are coming up with clear and undisputable evidence that a concussion is a very serious brain injury that has for the most part not been treated as effectively as it could have been in the past. This realization is coming to light because of the tremendous advances in technology that are now allowing us to study the

consequences of brain trauma much more closely. Concussion-like symptoms that are still present in older adults are being linked to multiple concussions that were received from sport-related injuries suffered when they were very young. And in many cases, it is felt that failing to take sufficient time to allow for the damage from earlier injuries to heal properly and also failing to follow effective rehabilitation procedures may have resulted in life-altering consequences which changed the entire direction of their life.

Participation In Competitive Sports Is Growing Rapidly

During the past several decades we have also witnessed an incredible growth in the number of people of all ages participating in competitive sports activities at the amateur, recreational and professional levels. As well, the growth of minor sports has created tremendous opportunities for children to take part in competition at all levels all year long.

This is a testament to the success of decades of major promotional initiatives designed to encourage more people to participate in sports and to be more active. The result is that children are entering organized sports at a very young age and are playing many more games and practices than they ever have. It is not unusual for a hockey season to begin in August and finish up the following April with players taking part in well over one hundred games and practices.

Children are also encouraged to participate on competitive teams which play more games and are much more intense. This is not just for hockey but sports such as football, basketball and soccer as well. There is really no "off-season" for student-athletes so it is hard for the brain to recover from repeat concussions or sub-concussions. The damage may not be sufficient to produce signs, symptoms or behaviours consistent with concussion, but researchers are coming up with evidence that may eventually prove that concussions are more likely to be caused by a series of sub-concussive damage accumulating over time, thus rendering the brain more vulnerable and less able to cope with trauma. Therefore, by the time signs, symptoms and behaviours consistent with concussion are observed, the brain may have sustained permanent, wide-spread damage.

School Boards Are Under Pressure To Provide More Sports Options For Students

School boards are also under pressure to increase the amount and variety of sporting activities available to their students in order to promote and motivate a lifestyle consistent with personal healthy living and fitness. It is a known fact that personal fitness and health promotes more successful learning experiences in classrooms.

School sports are thus experiencing unprecedented growth, especially as many parents see the advantages of their children taking part in sporting activities where there is a healthy balance between athletics and academics. Community organizations will continue to thrive, but there is a growing trend towards secondary school students choosing to play for their school rather than for their local sports association. And in order to provide an attractive alternative to student-athletes who might otherwise continue to play on their community teams, schools are increasing the number of games, tournaments and practices so that student-athletes end up playing almost as many games for their school team as they would on a community club.

Of particular note is the fact that schools are able to offer a much wider variety of options for students who are looking for activities that are different from the traditional hockey, soccer, football and basketball. Hence, we find synchronized swimming, water polo, gymnastics, flag football, wrestling, and lacrosse name a few. Unfortunately, traumatic brain injuries are occurring in all activities, and it may surprise people to learn that synchronized swimmers are at a high risk for concussions because of the kicking that they receive while swimming in close proximity to team members.

Over 50% of Student-Athletes Will Receive At Least One Concussion By The End of High School

Because of the increase in participation, intensity, training and competitiveness of both community and school sports, it is not surprising to hear reports of as many as 50% or more of all student-athletes receiving at least one sport-related concussion before they leave high school. Many experts feel that this is a conservative estimate. Imagine the concern parents would have if they were told that over 50% of student athletes would break at least one leg before they leave high school? Or would need a knee operation before the end of high school? It is likely that there would be a great deal more attention to safety if that were the case. Unfortunately, since concussions often go unreported, many student-athletes go through their entire high school years thinking they were concussion-free, when in fact they may have had their life altered as a result of brain trauma that was not treated properly.

Underreporting of Concussions is A Serious Challenge

The underreporting of concussions is going to have serious ramifications going forward. We must all do something to make sure that concussions are reported and documented when they first happen. It is a fact that head injuries that result in concussion do not normally have serious long-term consequences. However, repeat concussions that happen while a person is still recovering from a previous injury can have catastrophic life-altering consequences. Many student-athletes are being allowed to play while their coach is unaware of a recent concussion. This results in a “time bomb” situation where the coach may end up being held responsible for something he/she was not even aware of to begin with.

To put the problem of unreported concussions into perspective, consider that in an article that appeared in the December 2011 edition of Living Safety, a publication of the Canada Safety Council, it was found from a survey of non-elite male youth hockey players that the number of estimated concussions or suspected concussions outnumbered the number of official injury reports by 40 to 1.

This means that when we examine the database of the Ontario School Boards Insurance Exchange and see that in 2011 there were a total of 634 incident reports that were labelled as concussions or possible concussions, it means that there may have actually been over 25,000 if we included the unreported concussions or possible concussions. That is a huge discrepancy and it means that many of our students are living with functional disabilities that may have long lasting consequences and serious implications for their academic success.

School Boards Are Being Given A Great Deal of Leeway

The storm of media attention that has risen during the past few years about the dangers of returning to play too soon after suffering a concussion is of such concern to government leaders that many are responding by introducing legislation which requires school boards to take action to protect our student-athletes from this type of injury. One of the challenges for school boards is that they are being told that they must have a concussion management policy, but they are not being given much direction on the specifics. Things are pretty wide-open to interpretation so we don't think much has been done other than to create anxiety among parents who are now beginning to wonder if they should even allow their children to participate in certain contact sports and among school board administrators with respect to their legal liabilities.

What must be kept in mind is that school boards have always been held to a higher standard when it comes to the care and well-being of the children attending the schools operated by the board. Advances that are being made in sports medicine research will soon force physicians to update and modify their outdated sports medicine guidelines with respect to the treatment of student-athletes who display signs, symptoms or behaviours consistent with concussion. The guidelines and practices will need to be more consistent with what the law expects of them in light of those advances in research.

Experts in this field are certain that at some point in the near future researchers will establish an evidence-based medical guideline for making return-to-play decisions for athletes after concussion in order for physicians and athletic trainers to be more informed about the standards that will be expected of them in law. The test will be what lay jurors feel would constitute reasonable conduct by a practitioner. Outdated procedures and practices will not be recognized as a defence for people in the medical field who are generally held to a higher standard to begin with.

This expectation of a higher standard is also expected to be applied to schools. Therefore, despite the minimum requirements outlined in legislation, schools will be expected to follow a much higher standard when it comes to the treatment of concussions. With respect to traumatic brain injury, any legislation that is put forward is bound to modify what has been traditional common law standard. In other words, new legislation will most likely require a school board employee, acting in a coaching role or as a classroom teacher to be more than a "reasonable and careful parent" when dealing with student-athletes who have suffered a concussion. This will likely apply also to volunteer coaches who work with minor sport association teams. The expectation will be that school boards and minor sport organization leaders will make sure to provide suitable training to their employees and coaches so that they will be able to meet these higher standards. The training and education of all adults who are responsible for student-athletes participating on teams for schools or minor sport organizations must be given the highest priority moving forward.

One thing we should always keep in mind is that when legislation is passed outlining minimum requirements for school boards, this legislation is a result of what was politically capable of being accepted by the majority of politicians who voted on the bill. After hours of debate and committee study, what is left on paper in the legislature is usually a much watered-down version

of what experts would like to see in order for "something" to be passed into law. A political standard may not be sufficient in light of modern research which may tell us that schools should adopt a much higher standard. Therefore, it will not be enough to simply comply with the provisions of legislation. School Boards and minor sport organizations will be held to a much higher standard than the minimum standards that are a product of political manoeuvering. This is a good place to repeat what was mentioned above for the medical professionals. The test will be what lay jurors feel would constitute reasonable conduct by a teacher or coach in light of what we now know about the nature of sport-related concussions.

SERIOUS IMPLICATIONS FOR ADOLESCENTS

What is going to make this process extremely difficult for law makers and school board administrators is that researchers are presenting conflicting points of view when it comes to concussions that occur in younger children, adolescents and young adults.

The good thing is that concussions are now being acknowledged as a brain injury that actually changes the way the brain functions. The more we find out about how the brain works, the more we realize how little we've known about the brain. However, this new knowledge is allowing us to better understand what we must do to protect against repeat concussions.

It is pretty evident that injured student-athletes who are given enough time to rest, both cognitively and physically, recover much more quickly as those who are returned too soon. It is also being proven that student-athletes who do not wait until their original injury has had time to heal may suffer from post-concussion symptoms for up to a year or more and actually may have their personal developmental trajectory altered due to the significant physical, emotional and cognitive stress that is caused by the injury and subsequent injuries.

Unfortunately, the absence of concussion symptoms doesn't necessarily mean the brain has fully recovered, so it is extremely difficult to determine when the healing process is complete and it is safe to return to normal levels of activity. To make it even more confusing, there are now two schools of thought emerging on the impact of concussions on young brains and both have valid arguments.

ON THE ONE HAND…

First of all, research has found that teenagers who suffer sports-related brain trauma have more widespread injury and prolonged brain swelling than adults. This may be related to the fact that the developing brain in a teenager has double the number of neural connections than that of an adult, so an injury will impact a much larger region of the brain because of this interconnectivity.

We also know that the immature brain is approximately 60 times more sensitive to the chemical substances that are produced following an injury. And since an injury to the brain creates a massive power surge of electrical energy that produces a cavalcade of chemicals released into the brain in areas where the chemicals may not normally be found, this increased sensitivity may very well have serious consequences on a young adolescent brain. Especially since the number

of synaptic connections in a teenage brain is double that of an adult, thus allowing for the release of a much greater amount of chemicals during one of these "power surges".

Because of the increased sensitivity to the chemical changes following an injury, coupled with the inadequate blood flow to help with the repair process, complete physical and mental rest is absolutely critical to prevent further damage. Therefore, many experts feel that high-school athletes might well be expected to have a slower recovery than older adults and to be more susceptible to severe neurological deficits should they be re-injured during recovery.

This is why we recommend that a school board Student-Athlete Concussion Management Program emphasize the importance of being completely satisfied that all signs, symptoms and behaviours consistent with concussion have been resolved before returning to physical activity which may generate additional stress and stimulation on the brain. It is also why we recommend that a partnership approach be taken, involving not only a medical health practitioner, but also the parents/guardians, the classroom teachers, the school coaches, a neuropsychologist and the student-athlete him/herself. Everyone associated with the student-athlete must be involved in observing for lingering signs, symptoms and behaviours consistent with concussion before the School Principal, who is ultimately the one responsible for the well-being of the students at his/her school, and the School Leadership Committee feel confident enough to allow a concussed student-athlete to return to competition.

This is a point that we will mention time and time again because the symptoms of a concussion will usually disappear well in advance of complete healing. For example, the part of the brain that is injured may cause headaches as a symptom. As the healing process is taking place, the damaged area may stop producing headaches because the stress is reduced. This does not mean that the injury has healed. It just means that it has either healed enough to stop the pain or the student-athlete is at rest so that the particular neurons are not being called upon to do any work. If there is no electrical activity going on in that area of the brain, then there won't be any symptoms while the healing process is in progress. Nevertheless, just because the symptoms have disappeared, we cannot assume that the damaged area has healed. In fact it is more likely that the damaged area is still very vulnerable and susceptible to further injury. Therefore, there is great danger in assuming that just because the headache is gone the concussion has healed.

This above point is why it is necessary to follow a progressive Return-to-Play and Return-to-Learn program in order to gradually increase the stress and stimulation and thus recondition the brain to be able to handle the normal routines. If you try to return to normal functioning as soon as the symptoms have disappeared, you may end up worse than you were when the injury occurred in the first place.

ON THE OTHER HAND…

Some experts argue that teenage student-athletes should have a greater potential for recovery after a concussion because of their greater capacity for reorganization of the neural connections in the brain compared with adults. The fact that the developing brain has double the number of neural connections of an adult means that the excess connections should allow for easier neural rerouting during the recovery period.

This means that if the usual communication pathway has been damaged or blocked because of a concussion, the brain may be more easily able to find another route to restore the communication to near normal functionality. This leads some experts to conclude that this functional plasticity may in fact mean that teenage athletes never completely recover from their original injury, but that they actually reacquire near normal functionality because of the reorganization of the communication network through new pathways that are closely related to the original. In other words, the teenage brain discovers a new way of accomplishing approximately the same results, but will never be exactly the same as before.

What is not completely understood is whether or not the reorganization and rerouting can ever accomplish the exact same results because of the widespread impact of the original injury on so many other regions of the brain. To better understand what this means, think of what happens when you are trying to draw a straight line between two points. If you are slightly off line at the beginning, by the time you get to your destination point you will have missed by a lot. The original error magnifies over time, so this is what many people think happens to the brain during recovery. The place where the original damage occurred may be repaired to a state that is "close" to normal, but by the time you proceed to the millions of neurons in the communication pathway leading from that damaged area you may end up changing the functioning of so many other parts of the brain.

Another concern is that there may be areas of the brain where reconstruction is delayed simply because they involve functions that may not be commonly drawn upon by the student-athlete. If the connections are not needed, then electricity will not require the routes, so the damage remains unresolved and eventually gets weeded out by the brain as something that is not needed. For example, the teenage brain has approximately 1000 trillion neural connections. By the time a person is in his/her late twenty's, this has been reduced to approximately 500 trillion connections. The brain goes through a "pruning" or "decluttering" process whereby it eliminates parts of the brain that are not being used and which are not likely to be used during the person's lifetime. If a particular area of the brain has been damaged, and if that part of the brain has been used in the past by the student-athlete, then the brain may feel that the person has decided that it no longer needs these connections if an injury has not had a chance to heal. In fact, while going through this pruning process, the brain may actually decide to eliminate the damaged areas to begin with. When doing this, the brain will usually find another connection that will allow the student-athlete to do basically the same function, but it may not be at the same level as before the injury.

This may explain some of the changes we see in behaviour or personality after a brain injury occurs in a student-athlete. The new behaviour is what is being reinforced and strengthened, replacing the old behaviour. Therefore, when a coach is beginning to rehabilitate an athlete through training that will rebuild the skills of the player, he/she must also pay attention to the motivation and reviving of attitude and passion to the game so that both areas are brought back to pre-injury levels. The change in attitude may not be noticed until the following season and may be passed off as the student-athlete just experiencing a change in personal interests, when in actual fact this may be a post-concussion symptom.

Therefore, it may be the case that student-athletes need to limit the amount of physical, emotional and cognitive stress much longer than first thought in order to give the brain time to repair the damages to the original connections to avoid the brain from rerouting or restructuring. This may be the best way of allowing the brain to return to pre-injury status.

Another fact to consider is that the reconfiguring that takes place in the brain during a controlled rehabilitation period may be able to "recover" most of the functionality that was impaired as a result of the injury, but the affected areas of the brain may remain weaker and vulnerable to future injury with less intense trauma. Think once again of an athlete who receives a bad ankle sprain for the first time. Even after the sprain has healed, the athlete may find that he now has a "weak ankle" and is much more easily injured, thus suffering the inconvenience of future ankle sprains from less intense trauma to the ankle. The same may be found for injuries to the brain. Once you get your first concussion, you are much more vulnerable to getting future concussions, possibly because you now have a weak area of the brain that is more easily injured from less intense trauma. The problem is that communication from a number of different functions may go through the damaged area and may be forever affected without the student-athlete even being aware of the change.

To illustrate, let's say that a student-athlete loves math and finds it easy to be successful in his academic studies. If that student-athlete suffers a concussion which is not allowed to heal properly, he/she may begin to struggle in math and his/her marks may begin to drop. Parents and teachers may get on the student-athlete to try harder and improve his/her study habits, but the brain may have forced the student-athlete to change his/her attitude towards math and this is leading to poor grades.

Instead of applying more pressure on the student-athlete to study harder or get a tutor, a classroom teacher who has knowledge about concussion management may decide to "start from the beginning" again and bring the student-athlete back to the basics. Gradually, the student-athlete may begin "remembering" how much he liked the subject and his attitude towards math will improve as new connections are being constructed in the brain using some of the former connections. The key is to make sure that classroom teachers know how to accommodate student-athletes who have suffered a concussion.

HELPING SCHOOL BOARDS MEET THEIR LEGAL RESPONSIBILITIES

So what does all of this mean for school boards and post-secondary institutions? Well, for one thing, as we learn more and more about concussions we are finding that repeat concussions are occurring at alarming rates. This is causing many insurance carriers to reconsider the risk of providing coverage for this type of injury. In fact there are some professional teams that simply cannot get insurance for athletes who are unable to play because of concussions. Some are only allowed one concussion per career, and then after that the team must pick up the full cost of the contract.

We do not worry about coverage to replace salaries for student-athletes, but since 50% or more of the student-athletes in high school will likely have had at least one concussion in their life,

school officials must be concerned about the life-altering consequences of repeat concussions.

SCHOOL BOARDS ARE RESPONSIBLE FOR THE SAFETY OF STUDENTS

Provincial and State legislation imposes upon teachers, principals and school boards a responsibility to ensure the safety of all students in their care. This duty of care applies to sport activities as well as all other activities that are run by the school. If we continue to encourage a greater participation rate among student-athletes in school-sponsored sport activities, we need to have written procedures in place that deal with concussions which are bound to occur. Since up to 80% of all concussions go unreported, we also don't know what kind of true concussion history exists for most student-athletes, so we may be placing some of our students in grave danger without knowing it in the first place. That is why a strong and effective student-athlete concussion management program is more important now than it has ever been.

INCREASED KNOWLEDGE MEANS INCREASED DUTY OF CARE STANDARDS

Because of what we are discovering about the human brain, it won't be long before the issue of negligence is brought up with school boards and minor sport organizations when it comes to brain trauma injuries suffered by student-athletes. There may not be much change in the level of risk of negligence when it comes to student-athletes receiving their first concussion. After all, as long as the coaches have trained the players and have provided a reasonable level of care, injuries in competition will be treated as the nature of the game. Anyone who participates in school sports understands that there is an inherent risk of injury.

However, when it comes to the return to play of a student-athlete who has suffered a concussion, we now know a lot more than we knew a few years ago. We know the potential consequences of returning a player too soon. The duty of care may rise to a higher standard because of this.

We know that the chance of a repeat concussion is high, especially if the first concussion didn't have sufficient time to heal. And since approximately 50% of all student-athletes will have suffered at least one concussion before the end of high school, if they were not allowed to rest long enough following the first one, they are at least four times more likely to have a second concussion.

The importance of having an effective concussion management program in place at every secondary school, post-secondary institution and minor sport organization is why it is becoming a legal requirement in many school jurisdictions today. School Boards must have a specific written protocol in place. That being said, there are some concussion management protocols that were developed many years ago and are in need of serious upgrading. And with the advances that are being made with respect to brain trauma and concussions, it would be extremely hard for a school administrator to defend some of the ineffective protocols when more effective ones are readily available.

Whereas schools owe student-athletes a duty to take reasonable care to avoid knowingly putting them in situations where they may be injured or suffer life-altering consequences that will damage their future, the Student-Athlete Concussion Management Program that school boards

develop should contain such a comprehensive scope of coverage that it would be virtually impossible for anyone to claim that the school was negligent in caring for a student-athlete who has suffered a concussion.

We were diligent when formulating the identification and rehabilitation protocols that have been included in the framework model we recommend in this Program Development Guide. We have established so many safety-nets within the program that there is very little chance of returning an injured student-athlete to play prematurely. That doesn't mean that he/she will never get a repeat concussion, but it certainly shouldn't be because of the negligence on the part of the coach or any of the partners involved in the program if our recommended protocols are adopted.

This is why we will always recommend clearances when it comes to return to play from at least a medical practitioner and the parent/guardian. It is why school boards that utilize neurocognitive assessment should require an evaluation from a licensed neuropsychologist familiar with sport-related traumatic brain injuries indicating that the student's results are back to baseline. It is why the student-athlete him/herself should be expected to sign a declaration that there are no more known symptoms from the injury. It is why we strongly recommend a final clearance from the School Leadership Committee, upon consulting with the child's classroom teachers prior to giving permission for the student-athlete to return to physical training. And finally, after all of the above, it is why we recommend that the School Head Coach review the results of the training program with the School Leadership Committee to get a final clearance to resume practice with full contact and eventually return to competition.

It would be hard for anyone to find the actions of a school which has incorporated the main elements of the Student-Athlete Concussion Management Program recommended in this Program Development Guide to be negligent in the care and duty owed to its students. If anything, a school board will have gone over and above the requirements that could be imposed by any level of government.

EXPECT AN INCREASE IN NUMBER OF REPORTED CONCUSSIONS

All that being said, we caution that school administrators should not be too alarmed if they find that once they implement a Student-Athlete Concussion Management Program into their school, the number of athletes suffering from concussions may increase by anywhere from five to seven times. This is an indication of how many concussions go unreported without the program. Student-athletes who are under a proper Student-Athlete Concussion Management Program will not likely be able to hide their symptoms and with so many partners on the look-out for signs of concussion, it means that you will be able to provide a much higher degree of protection against serious injuries that can result from receiving a second concussion while still recovering from the first.

Many experts indicate that there will never be a way of finding the exact number of injuries that take place, but the closer we look the more we will find. This means that as coaches, parents and student-athletes themselves are better educated on how to spot signs and symptoms of concussion, the numbers are bound to increase.

UNIVERSALLY ACCEPTED PRINCIPLES

After examining legislation that has been already introduced in some areas of Canada and the United States, and taking into consideration what we feel are the universally accepted components of an effective student-athlete concussion management program, we are now going to examine some of the elements that we expect will be included in most provincial and state legislation in the years to come.

First, we would like to point out that in preparing our framework model CMP Student-Athlete Concussion Management Program we were cognizant of these expectations and have therefore recommended protocols and procedures that we feel would be compliant with the highest standards that could possibly be legislated anywhere on the continent. This means that any school board which adopts the basic elements of the CMP Program into their own concussion management policy will be able to rest assured that they should have no problem meeting the requirements of all existing or future legislation. As we work together with the school board concussion management steering committee, we will make sure to add other provisions and procedures that will address any additional requirements and we will have our legal consultant provide an opinion on any of the terms and provisions that are added.

BASIC PHILOSOPHY

The first thing we wish to point out is that just from what we already know about the nature of concussions and traumatic brain injuries, the underlying philosophy of any student-athlete concussion management program, whether it is designed for a school board, a post-secondary institution or a community sports organization must clearly demonstrate a concern for the long-term health and personal well-being of the student-athlete. The protocols and procedures must not be seen to favour getting a student-athlete back into the "game" at the risk of his/her health.

Everything we do should also be done from the point of view of "assuming the worst". If anything, we will always try to err on the side of caution. We do not want to do anything that may have any chance of doing harm to the student-athlete. We are learning now that if we do not manage this type of injury to the brain properly, there could be serious consequences much later on in life.

Therefore, when it comes to "identifying a concussion", we must make sure that the student-athlete concussion management program includes identification procedures that are based on the "reasonable presumption" of a concussion. In other words, all we need is a "feeling or opinion" that a concussion "may" exist as the determining factor in the identification of a concussion.

We must also clearly establish that all a person needs as evidence in forming that opinion is any of the universally accepted signs or symptoms that would lead a reasonable person to assume that a concussion may exist. In many situations the law requires a "balance of probabilities" as a measure of justice, but when it comes to concussions, we recommend that we adopt the principle of "reasonable probability". And reasonable probability exists if there are "any" signs or symptoms, or if there is "any" suspicion that a student-athlete may have suffered a concussion.

We do not require clear and conclusive proof of the existence of a concussion because in many cases, student-athletes are not even aware they have a concussion until symptoms present themselves hours or days later. So if anyone observing a student-athlete feels, based on a "reasonable presumption" that the student-athlete may have a concussion, we will take that "reasonable presumption" as our definitive identification that a concussion does indeed exist. If we adopt this principle, the chances of "missing" a concussion should be greatly reduced.

In order to determine that a concussion was not received or that a concussion no longer exists, the burden of proof must meet the test best described as "beyond a reasonable doubt". In other words, we must present evidence that would allow a reasonable person, in this case the School Principal or Institution Athletic Director, to conclude "beyond a reasonable doubt" that the student-athlete is no longer experiencing the effects of a concussion. This pretty well means that all persons involved must declare that they are unaware of "any" signs or symptoms that would indicate a concussion. This declaration can only be made after careful observation of the student-athlete and possibly the inclusion of neuropsychological testing which would compare post-injury with baseline assessments.

To sum up, when it comes to identifying if a student-athlete has a concussion, all we need is the slightest hint of evidence or assumption from any "one" person who is observing the student-athlete. That means that any one of the coaching staff, parents/guardians, school leaders, classroom teachers, or the student-athlete him/herself has the authority to "identify" a concussion and can do so with the "slightest" bit of evidence or assumption.

However, when it comes to determining that the student-athlete has recovered from a concussion, we need "everyone" who is involved with the student-athlete to declare that there are no known symptoms or signs of concussion evident. We need "all" people signing these clearances or declarations, including the doctor, the parents/guardians, the student-athlete and the classroom teachers. We also need to know that the post-injury neuropsychological assessment is back to baseline levels. Only then, if the School Leader is satisfied "beyond a reasonable doubt" that the student-athlete has recovered, will he/she be able to give clearance for the student-athlete to return to physical training supervised by a School Coach.

If the concussion management program adopts this basic philosophy in all aspects of the program, then all people involved will feel absolutely confident that they are doing everything possible to ensure the well-being of the student-athletes in their care. We must make it extremely easy to "identify" a concussion and thus initiate the protocols and we must make it extremely difficult to determine that a full recovery has taken place. If we do this, then we will be reducing the risk of making an error that may affect the student-athlete.

DISTRIBUTION OF INFORMATION

It's a pretty safe bet that every province and/or state will soon require school boards to accept responsibility for distributing information about the prevention, identification of symptoms, and management of concussions to school staff, coaches, parents/guardians, student-athletes and volunteers. School boards will likely have some discretion with respect to the content of the material that is to be distributed, but the challenge will be to make sure that the information is up

to date, relevant and contains a consistent core message about universally accepted concepts about concussion management.

In preparation for the new legislative requirements, we recommend that school boards develop appropriate "brochures or guidance forms" for parents, teachers, principals, coaches, and student-athletes. These guide books should be available online and may also be provided in print form. Each school operated by the board should be responsible for making sure that the guide books are distributed to all partners each year so that they can be updated as new information is provided. This will ensure that parents/guardians, coaches, teachers and student-athletes are aware of the school board concussion management procedures.

We suggest that there be some sort of recording system set up so that the schools have proof that the material was at least "received" by the target groups. It is not enough to simply distribute the information. We recommend that at the very least the parent/guardians be required to sign something that indicates they have received the information and understand the content. It may be advisable to have one of the School Leaders collect this signed declaration or actually "hand out" the information package to the parents/guardians.

One of the things we recommend is a parent/guardian permission form that must be signed prior to a student-athlete participating in try-outs for a school team. The permission form contains a declaration by the parent/guardian that he/she/they have read and understood the procedures and protocols of the concussion management program and are in full agreement and in full support of the program. This gives you something on file if there is any question about the parental support later on in the season.

This means that a school board's Student-Athlete Concussion Management Program will also have to include some sort of built-in renewal process so that the material can be reviewed and updated each year. It will also mean that the material will have to be written so that it can be understood by a wide range of age groups and demographic backgrounds. This is one of the on-going continuing education components that we will provide when a school board incorporates the CMP Program Guide into their own local program. It's not just enough to provide the initial training. The important part is providing continuing education to keep the knowledge level current.

In developing the curriculum for the CMP framework model Student-Athlete Concussion Management Program we went to great lengths to search out the most accepted universal principles that we could find. We also made it a point to enhance basic information by going just a bit more in depth than most other models we could discover. We feel that it is going to be extremely important for a school board to feel confident that the information contained in its Program Guide is accurate and recognized by most of the top experts in the field of concussion management. Therefore, once we blend the contributions from the school board steering committee with the content of the CMP Program, we feel the school board will end up with a Student-Athlete Concussion Management Program that is as broad in scope as any in the world.

PREVENTION MEASURES

We expect that this is one area where provincial and state law makers will provide very limited direction since this is an area generating much debate and confusion. Many experts will have you believe that prevention is linked to equipment, and yet with the current budget restraints that school boards find themselves under, governments may need to inject funding to allow school boards to purchase better quality equipment. At the present time school boards must comply with acceptable standards with respect to equipment, but when it comes to marketing of products that are supposed to be able to protect against concussions, the bar is raised pretty high. We will agree that there is no way sub-standard or unsafe equipment should be allowed to be used by student-athletes in a school sponsored athletic event, and that being said, school boards will have to be very vigilant about making sure to keep track of maintenance history to prove that they are in compliance with acceptable standards.

It is our opinion, however, that personal sports equipment only goes so far towards providing protection to student-athletes and that protection is mainly against structural injuries such as a fractured skull. A concussion is a brain injury caused by the rapid acceleration, deceleration or twisting of the brain when the body experiences a severe force that also may cause the brain to strike against the bony surface of the skull. A better helmet won't necessarily prevent a concussion. It might prevent a fractured skull, but it is unlikely to provide much in the form of protection to the brain inside the skull.

Rule changes are always being put forward for consideration, but this leads to another area that may need to be dealt with carefully and involves many different political challenges. However, we do believe that some rule changes are possible and we encourage school board administrators to push for rule changes that make sense. For example, eliminating the "kick-off return" in football would prevent many serious impacts since the players are being hit with such tremendous force on this type of play. Also with football, instituting a "play clock" which requires a quarterback to get rid of the ball within 7 seconds or so of receiving the snap while preventing defenders from tackling him/her would possibly reduce a lot of injuries to quarterbacks who are being hit from behind while they are passing the ball. Rule changes such as these may not receive much consideration at the college or professional levels, but there is no reason why they can't be instituted at the secondary school level.

The truth is that despite what we do with equipment or rule changes, concussions will never be completely eliminated. We may be able to reduce the risk of injury, but concussions can occur anywhere anytime, even during accidental contact with team mates, during non-contact sport or in any number of recreational activities. The focus should therefore be on the prevention of subsequent concussions that occur because a student-athlete is returned to physical activity before the original concussion has healed. And the big challenge with the prevention of second concussions is that up to 80% of all student-athletes who suffer a concussion are either not aware of their injury or they do not report the injury to their coach or parent. That is why we strongly recommend a Partner Approach to concussion management so that there are a number of people watching the student-athlete to spot signs and symptoms of concussion. With so many pairs of eyes on the student-athlete, it is hard to believe that a concussion would be missed. The

responsibility is spread among a number of people instead of being placed squarely on the shoulders of a medial doctor.

So we are pretty sure that while legislation may not say much about preventative measures for original concussions, we are absolutely certain that all Student-Athlete Concussion Management Programs will be required to address in some manner the issue of prevention of repeat concussions. The quandary is that most legislative requirements will simply be satisfied with a written clearance to play from a medical doctor. Unfortunately, we don't think that is enough to satisfy the courts if legal action is initiated by a parent/guardian. This is why we strongly recommend that any school board we are working with develops a program that also requires the parent/guardian, the student-athlete and the school Principal to give their clearances before returning to activity. In addition the school board should require, through neuropsychological assessment, objective evidence that the student-athlete has returned to pre-injury functionality. It's all about returning the student-athlete to whatever levels of functioning were considered normal prior to the injury. When that has happened, then it is as safe as it can be to return to physical activity.

We do also recommend that school boards take definite steps to ensure that coaches are well qualified and trained in their respective sport and that play-safe protocols be part of the pre-season training of student-athletes. By showing student-athletes how to avoid placing themselves in danger during competition, we may be able to prevent some of the injuries. This may require the school board to pay for sport-specific training and qualifications sessions, but the investment will be well worth the cost.

Consideration may also be given to the number of competitive games and practices that are held during the season. For example, there is nothing wrong with playing one or two games a week. It is not necessary for teenagers and young adults to play four or five highly competitive games per week. It is also recommended that there be several days in between games and/or practices. This would allow a few days for minor sub-concussions to heal before being subjected to additional force that may lead to escalation of the injury into a full-blown concussion.

Coaches may also wish to consider policies such as no-body-checking or body contact during practices. This will reduce the risk of injury during practices which can often become pretty intense. In addition practices should never be scheduled the day after a game.

Finally, the whole issue of participating in tournaments needs to be given consideration with what we now know about concussions. A tournament may involve up to five or six games in a matter of a few days. That is a tremendous amount of highly competitive athletic competition in a short period of time which means that if the brain is vulnerable to injury, something is going to happen.

REMOVAL FROM ALL PHYSICAL ACTIVITY

It goes without saying that one of the provisions that must be included in any school board concussion management policy is that if a student-athlete is suspected of having sustained a concussion, he/she must be removed from further physical and/or cognitive activity immediately.

This has become the standard procedure that is being recommended throughout the world. The key word here is "suspected".

It is also easy to speculate that one of the provisions that you won't find in legislation is a clear indication of who will be responsible for making the decision to remove a student-athlete from the game or activity. That would be leaving the person responsible open to liability.

Therefore, when it comes to the development of a Student-Athlete Concussion Management Program policy for school boards and post-secondary institutions, it is very important to spell out very clearly which people will be given the authority to make the decision, and not single out specific people who must make the decision.

That is a very important distinction. We feel that if we give the authority to school coaches, school leaders, and parents/guardians, and if we allow any one of them to initiate the protocol, then we will be spreading out the responsibility and be giving the authority to a number of people, thus reducing the likelihood of missing a concussion. We just need to make sure that our training establishes the criteria that are to be used to establish suspicion of having sustained a concussion and then make sure that everyone is well aware of them. Besides giving people the authority to make a decision, we must provide them with a level of expertise to help them when it comes time to exercise their authority.

To begin with, I think we would all agree that identifying a concussion can be extremely difficult. The school board policy therefore must clearly indicate that "any suspicion" will trigger the protocol. There cannot be a "degree of suspicion" or it will leave the decision open to interpretation, and since most of these decisions must be made quickly during a practice or game, there should not be any confusion or debate as to whether the suspicion is warranted. When it comes to concussions, you either have one or you don't. You don't "almost" have a concussion and you certainly don't have the "beginning" of a concussion.

To use a comparison that is often used in other matters, a woman can't be partly pregnant. She is either pregnant or she is not. Once a woman becomes pregnant the embryo grows into a baby. So it is with a concussion. You either have a concussion or you do not. A minor concussion can easily turn into a major life-altering injury if it is not managed properly.

Using the same example, we can also demonstrate one of the reasons why concussions are so dangerous. We all know that a woman can be pregnant before she has any obvious symptoms or before she does a test to determine pregnancy. Therefore, she can be pregnant without knowing she is pregnant. So too, you can have a concussion before you are actually aware you have a concussion and before you notice any of the universally accepted symptoms. So it is quite possible for a person to have a concussion without knowing it and then continue playing with a "time bomb" inside his/her skull ready to explode if the wrong move is made.

Therefore, while we may all agree on the basic concept of sitting out a player who is suspected of having a concussion, the criteria we use to arrive at the answer may not be quite so simple. And yet if a school board or post-secondary school policy includes the requirement that a student-athlete be removed from play if he/she is suspected of having a concussion, then we need

to make sure that there is some criteria that will help determine when the suspicion takes effect. At the end of the day, if a judge has to decide the outcome of a liability claim, the question as to whether there should have been suspicion will certainly come up.

There are universally accepted signs and symptoms that indicate the likelihood that a concussion has been sustained, but we need to know who is going to be given responsibility and/or the authority for making that call and what signs are going to be determining factors. Is there a "degree" of dizziness? Does the student-athlete have to be a little bit dazed or clearly dazed? Will it merely take a check to the head that initiates the protocol? Will simply doing a sideline test be enough to disregard the initial suspicion, or will the player need to be cleared by a physician? The main challenge here is that there are so many opinions and theories surrounding the identification of concussions that it is going to be difficult for any group of individuals to come to a consensus.

There are many who feel that a medical doctor is the only person who can diagnose a concussion. However, someone else is going to have to determine if there is enough evidence to warrant suspicion of a concussion so that the student-athlete is removed from play and taken to see a doctor in the first place. If everyone ignores the signs and symptoms, then by the time the student-athlete sees a doctor the damage may be life-altering.

We feel the best way to be sure that we are catching all of the signs and symptoms is to give everyone, including parents, teachers and coaches, the authority and the implied responsibility to be on the lookout for these signs and symptoms and then give all of them the authority to make the determination without having to justify or debate the merits of their decision. It is important that they understand that with the authority comes the "responsibility" and they cannot shirk their responsibility. They cannot stick their head in the sand and ignore the obvious signs hoping that someone else will step forward to make the decision. A concussion won't go away just because we deny its existence. We must be accountable for both our actions and our inactions when it comes to the safety and well-being of student-athletes.

We also feel that there has to be a process in place to make sure that a student-athlete who is removed from play with a suspicion of concussion is also prevented from taking part in intramural games or physical education classes. Furthermore, the student-athlete must also be prevented from playing on his/her community minor sports team. That will then become the responsibility of the parents/guardians to communicate with the minor sports coach. This is something that must be made perfectly clear in the Student-Athlete Concussion Management Program adopted by the school board.

RETURN TO PLAY

We know that all legislation will include some sort of requirement that school boards include a section in their policy with respect to when a student-athlete will be permitted to return to physical activity. At the present time, the accepted practice is to have a doctor give this clearance. However, studies are providing evidence to support the fact that a concussion is a process that involves a variety of functional deficiencies that include not only physical, but also cognitive, mood and visual areas of the brain.

We strongly suggest that when establishing policies and guidelines respecting the return to physical activity, school boards should not only require clearance from a physician, but also at the very least clearances from the parent, the school, and the student-athlete him/herself.

We expect that the law may only require a doctor's clearance before returning to play is permitted. However, unless clearances are also required from at least the parent and the school, we still may be putting the student-athlete at risk of returning before the first concussion has healed. A doctor cannot determine if all functionality is back to normal based on a ten minute visit. The doctor can determine if there are any bone fractures, internal bleeding or swelling of the brain. But a doctor cannot tell from observation or even from an interview if the student-athlete is having trouble sleeping or if he has a mood disorder that is different from before.

We also recommend the inclusion of a very specific step-by-step progression when it comes to return to play decisions. The Student-Athlete Concussion Management Program must establish guidelines for School Coaches, Student-Athletes and Parents/Guardians which deal with how quickly a student-athlete should be prepared for returning to competitive play and direction on what to do when symptoms return during the training phase. Our CMP Program Development Guide spells out these guidelines and we recommend that the school board program will include those or similar guidelines. We also feel that each school will have to design their own progression based on the facilities available. For example, if the school has a fitness area, then the progression may include so many minutes per day doing supervised training that is gradually building up resistance and endurance. This training should be documented so that there is evidence of what was done at this stage of rehabilitation.

ROLE OF SCHOOL LEADER

The ultimate responsibility for the safety of student-athletes still rests with the school. Therefore, the School Principal is the person who must ultimately accept this responsibility. We recommend that the concussion management program identify the School Leader or School Principal as the person who must give final clearance for a student-athlete to return to physical activity or competition. We understand that many programs specifically indicate that student-athletes require written clearance from a medical doctor in order to return to play, but our recommendation is that this medical clearance be only one of several clearances that are required. Hence, the medical clearance is not something that should be just handed to the coach and then the player put back into action.

The School Principal is responsible for overseeing all programs in his/her school, so if the student-athlete has received medical clearance to return to play, we accept that this is an important consideration. However, the School Principal must also take into consideration what is happening in the classroom and at home before allowing the student-athlete to put him/herself at risk for another concussion. Once clearances have been obtained from all parties, it is still up to the School Principal to weigh all of the facts before signing his/her name and allowing the student-athlete to return to play. It is after all, the School Principal who is responsible for the well-being of the students in his/her school.

RETURN TO LEARN

We expect that legislation is going to specifically mention "returning to learning" in addition to "returning to play". This is going to be particularly challenging but because this is a functional injury to the brain there are going to be cognitive implications that will impact academics.

We feel that the parent/guardian should be the person who first decides when symptoms have subsided enough to permit their child to return to school. This will usually be within a day or two of the injury. However, once the student-athlete has returned to school, it will be necessary for teachers to have access to a very comprehensive guide that deals with the accommodations that may be necessary during the rehabilitation period. These accommodations are designed to prevent further injury and to reduce the return of symptoms from activities in the classroom.

It may take weeks or months before a student-athlete is ready to return to physical activity, but we do not recommend that the student-athlete stay out of school for the entire period of time. We feel that the student-athlete should be able to begin returning to his/her full academic level of responsibilities by gradually increasing the cognitive demands of the classroom. This must be a gradual, step-by-step progression much the same as the step-by-step physical activity progression that is followed when returning to competition.

In fact, there are studies that support the use of controlled cognitive stimulation to speed up the healing process. The stimulation of the brain cells in the damaged areas helps increase blood flow to those areas and helps the neural connections become re-established or restructured. Therefore, as soon as the symptoms subside, it is a good idea to begin taking small steps to return to normal activities in the classroom. That being said, care must be taken not to over do it and if symptoms return, then it is important to take a step back. The accommodations that are listed in Chapter Five – A Guide for Classroom Teachers should provide some excellent guidance for Teachers and we strongly recommend that they be part of a school board's concussion management policy. We also provide similar suggestions to Student-Athletes in their guide which can be found in Chapter Six.

We anticipate that when reference is made to "returning to learning" the intent is returning to pre-injury learning levels and expectations. In that case, it will be the classroom teacher who is the best judge as to when the student is able to handle the normal rigours and workload of the classroom, including testing, homework, assignments, etc. Up until that time the classroom teacher will allow the student-athlete to function at a lower level of expectation than normal and also to be accommodated without the fear of losing his/her academic year. A concussion is a temporary learning disability and should be treated as such by classroom teachers.

DESIGNATION OF RESPONSIBILITIES

School Board policies will have to be very specific with respect to " who" will be required to assume responsibility for the implementation of the various elements of the program. This means that in all likelihood the state or provincial governing body will give this responsibility to the Director of Education who will then delegate the task to one of the senior supervising officers.

We feel that it is best for the Student-Athlete Concussion Management Program to identify the School Principal, in the case of a school board, or the Athletic Director, in the case of a post-secondary institution, as the School CMP Leader taking charge of overseeing the implementation of the program at each individual school operated by the board. This will establish a chain of command so that if anything goes wrong or if there is a need to communicate, the links will be clearly established and everyone will know who makes the final decision.

We also suggest that the School Principal establish a School Leadership Committee consisting of the Vice-Principal, Phys. Ed. Department Head, and any other person who the Principal feels is qualified to assume a leadership role in the implementation of the program. This will give clarity as to who is in control of the program at any school and who has the responsibility for making final decisions with respect to the well being of student-athletes. It will also help share the workload for supervising the teams and activities that are being covered by the program at the school.

An Athletic Director should appoint key individuals in his/her Athletic Department as members of the School Leadership Committee for a post-secondary school situation.

In addition we feel that all coaches, including teacher-coaches and community volunteer coaches, should be trained by one of the School Leadership Committee members. This will once again give everyone confidence that the standards are going to be consistent and compliant with both legislation and school board policy. Some surveys indicate that upwards of 40% of coaches are not aware of a school board's concussion management policies, so training and verification of training is extremely important when it comes to any program implementation. If a coach has attended a training session, then that coach can never say that he/she is unaware of the policy.

For each school team or activity, one of the trained School Coaches should be designated as the School CMP Head Coach, and that person will be responsible for ensuring that the program is implemented accordingly for the team. The School CMP Head Coach should also responsible for training all student-athletes on the team and for administering the neuropsychological testing. Once again, this gives some consistency to the program and clearly establishes a chain of command with respect to the concussion management program.

We feel that school boards are going to be required to be very clear and meticulous about elaborating on the roles and responsibilities of each of the partners in the concussion management program and we anticipate that any legislation will be just as methodical. Unless these responsibilities are clearly spelled out the entire identification and rehabilitation process may become paralyzed as people hesitate to step forward to take charge. In order to be an effective program everyone must know their job and must then be willing to execute those responsibilities accordingly.

Everyone will have a very important role to play in the Student-Athlete Concussion Management Program and when everyone does what they are supposed to do, the process will work well. The "partner approach" is dependent upon everyone knowing their responsibilities and then following through.

RESPONSIBILITIES OF NON-EMPLOYEES

Secondary schools rely upon community volunteers to assist with many of their sport programs, so any policy will need to address what roles community volunteer coaches have in the whole process. We are certain that legislation is going to address the role of non-employees or volunteers.

The Student-Athlete Concussion Management Program should make it clear that community volunteer coaches may work in any capacity with the team, but it is our recommendation that they should not be authorized to provide the training or supervise the neuropsychological testing of student-athletes. Those tasks should be done by the School CMP Head Coach or one of the School Coaches who is also a licensed, certified teacher on staff. The person doing the training should be accountable to the school board as an employee and should be a trained, professional educator in order to make sure that the person is qualified to teach what needs to be taught.

The legislation may also be specific as to what is expected from medical practitioners, athletic trainers, and other health care providers with respect to providing medical and clinical consultation reports.

It is entirely possible that the provincial or state legislation will require community volunteer coaches to be trained and/or qualified in some very specific manner in order to be able to work with the student-athletes. We felt that since school principals must accept responsibility for the well-being of all students while they are involved in school-sanctioned activities, community volunteer coaches should be required to take the same level of training as teaching staff coaches. We feel that the School Leader should also be able to require that community volunteer coaches hold some sort of sport-specific credentials when working with a school team.

NEUROPSYCHOLOGICAL TESTING

We anticipate that legislation will recommend the use of neuropsychological testing by school boards, but we do not believe that this is going to be a mandatory requirement.

For example, in Ontario, we have comprehensive Physical Education Safety Guidelines developed by the Ontario Physical and Health Education Association (OPHEA) in partnership with the Ontario School Boards' Insurance Exchange (OSBIE), the Ontario Association for the Supervision of Physical and Health Education (OASPHE), the Canadian Intramural Recreation Association – Ontario (CIRA), and the Ontario Federation of School Athletic Associations (OFSAA). In that guideline it is stated that "A concussion is more successfully evaluated if the student/athlete completes a neuropsychological baseline evaluation prior to beginning the sport season."

If a school board is to provide the highest standard of care possible for pupils enrolled in secondary schools, then it stands to reason that the policies and guidelines will require neuropsychological testing of some kind. At CMP we feel that the most reliable form of such a test is a computer based test done by ImPACT.

ImPACT is a computer-based battery of tests developed specifically for assessing sport-related concussion. The computer program measures multiple aspects of cognitive functioning, including attention span, working memory, sustained and selective attention time, response variability, and several facets of verbal/visual memory. This will register a "baseline" record of abilities of student-athlete with which to test against should they suffer a possible brain injury during the season.

While there are other neuropsychological tests on the market, the important thing for any school board to consider is "who" will be assessing the results of the tests. The professional most qualified to do this is a neuropsychologist who is familiar with sport-related concussions. The legislation will likely make it clear that simply using neuropsychological tests is not enough. The results must be assessed and evaluated by someone who is properly qualified.

We have incorporated detailed information about how to include neuropsychological evaluation into a school board's student-athlete concussion management program. We will be recommending that the school board steering committee give serious consideration into the inclusion of this element into their program. In order to show how this evaluation works, we will be recommending that it be implemented in a "Demonstration School" for a year.

Neuropsychological evaluation is going to eventually become a necessary element of all school board student-athlete concussion management programs if for no other reason than for the fact that it provides evidence of the recovery of a student-athlete who has received a concussion.

DEADLINE FOR DEVELOPMENT OF POLICY

Most legislation is going to give school boards time to develop their own policies and guidelines. However, given the serious nature of concussions, we would expect that the deadline is going to be sooner rather than later. We all know that it takes time to develop policies, but there is a sense of urgency with respect to concussions.

Unfortunately, with up to 80% of concussions going undetected, this means that a lot of our student-athletes will be in grave danger of suffering long-term life-altering serious consequences from brain trauma while the experts are sitting around the table trying to come to a consensus. Therefore, individual school boards will serve their own students best if they come up with a solid program on their own and then make any necessary adjustments once the Bill is passed and the Ministry develops their policies, guidelines and regulations. There is no point in waiting for the government to spell out your responsibilities. School Boards and Post-Secondary Institutions have more than just a legal responsibility to their students.

This is one of the main reasons why we have developed our comprehensive CMP Student-Athlete Concussion Management Program as a framework model for individual school boards and post-secondary schools. We feel that if we begin meeting with a steering committee and can start with our CMP Program Development Guide, then it will take us much less time to add new provisions and amendments that will be considered satisfactory instead of starting out with blank pages. The CMP Program Development Guide will become the foundation upon which to develop the completed program and then we can implement it in a "Demonstration School". This

should speed up the process and allow school boards to implement a board-wide program for all schools within a year or two at the most. Post-Secondary Institutions will be able to establish the program for all of their varsity teams in a relatively short period of time. Time is of the essence when it comes to concussion management.

FREEDOM FROM LIABILITY

One of the most important sections of most legislation that we expect to be forthcoming from provinces and states is in the area of personal liability. We expect that legislation will make it clear that as long as a person acts "reasonably in the circumstances, in good faith and in accordance with the school board policies" that person will not be held liable in a civil proceeding for any act or omission. This will be pretty good immunity for anyone involved in sport-related activities at a school.

However, it is also a pretty clear warning to school boards that unless the board complies with "all" aspects of the legislation, then their employees and volunteers might be at risk for civil liability. The legislation will set the "standard" by which all legal cases will be measured. It will imply that due to the seriousness of brain injuries and the ever increasing public awareness that is being generated, there may be civil cases coming forward for acts and/or omissions when it comes to concussion identification and management.

This is one of the main reasons why we think this legislation is going to come sooner rather than later in most provinces and states. It also has implications for private schools which must comply with the directions from the Ministry of Education. Their own policies and guidelines will be judged according to the Act, regulations and any policies and guidelines that fall under the Act and regulations.

EVIDENCE TO SUPPORT COMPLIANCE

We are certain that most legislation will require some form of evidence to verify compliance. In anticipation of this we recommend that the Student-Athlete Concussion Management Training Program be a mandatory requirement for all School Leaders, School Coaches and student-athletes. The training should also be facilitated and witnessed by a qualified instructor and all who participate should be registered on a special data base operated by the school board. This means that if anyone has a question about the level of training, the school board will have clear proof of when and where the training took place as well as who did the training. We do not feel that this should be simply left to chance and we think we are going to have to do more than just take a person's word for this. We recommend the use of video to ensure that there is consistency of training at all individual schools. This will again provide evidence as to the nature of the core curriculum of the training which we will ensure is going to be compliant with the legislation on its own.

A Local Registry will also help School Coaches determine if any of their players have not yet taken the course. When the players begin try-outs the School Coaches will at least know that every single student-athlete has received the same basic training about concussions.

School Board and Post-Secondary School policy should also require that all student-athletes receive a neuropsychological test every two years. It will be relatively easy to produce a listing of all student-athletes who have taken a valid baseline test, but only Dr. Czarnota will be able to access the records.

We feel confident that if a school board or post-secondary school incorporates the elements we have put together in our CMP Student-Athlete Concussion Management Program framework model, it will have ensured that there will be ample evidence and tracking of all activities that fall under the school board concussion management program. We also believe that this will be of great benefit to the school board and will be in the best interests of all student-athletes.

RECOMMENDATIONS FROM INSURANCE COMPANY

Do not expect to receive any form of recommendation from your insurance company when it comes to procedures or the use of neuropsychological testing. Insurance companies will provide coverage, but they generally do not want to get involved in any of the decision-making or policy development for fear that they may be held accountable for any consequences. This lack of recommendation does not necessarily mean that they disapprove of the use of testing, for instance. It just means that they want to keep their opinions to themselves.

This means that when you are designing your own program, you must be satisfied that it meets the strictest of tests with respect to risk management that you could possibly require. You must be absolutely confident that your policies will be compliant with existing legislation and expectations.

For example, there are some insurance companies that state that if the law does not require you to include neuropsychological testing, then it is best not to include it. Not because your program will be more effective without it, but simply because you then must ensure that the testing be used consistently and properly by all schools. That is why we recommend that schools allow the CMP Consulting Neuropsychologists to be responsible for all of the assessments and reports on baseline and post-injury testing. If the school board is merely responsible for administering the tests in accordance with our specific guidelines and procedures, then there is very little, if any risk on the part of the school board and the use of the program will be definitely applied on a consistent basis meeting the highest of standards. A school board that wishes to purchase their own program and then do their own training may find it more difficult to avoid responsibility if this test for consistency fails.

ROLE OF GAME OFFICIALS

When it comes to safety of athletes during competition, game officials have a tremendous responsibility placed upon their shoulders. While they must ensure that the rules of play are followed, they must also be aware of the condition of players who are engaged in the competition. If they feel that a player is significantly injured, they must stop the play and signal to coaches and trainers to come onto the playing surface to attend to the injured player. When it comes to concussions, game officials may find themselves particularly challenged.

We are all aware that a concussion is a traumatic brain injury that is caused by a force to the head or body which is strong enough to cause movement of the brain which in turn leads to some form of functional impairment. There are universally accepted signs that indicate a person has a concussion, but during the course of a game, some of those signs may not be evident.

We recommend that the school board concussion management program should make it perfectly clear that when game official points out a sign or symptom that may indicate one of the players may have a concussion, then the concussion management protocols should be immediately implemented. This will establish "probability" that a concussion exists. That means that the student-athlete is taken out of the game and will require clearances from a doctor, parent, the student-athlete him/herself, and a neuropsychological assessment that indicates he/she is at baseline levels. Only then may the school principal sign a clearance for the student-athlete to return to physical training supervised by the coach.

We strongly recommend that even if the local athletic association rules permit a player to be returned to the same game if an off-ice health professional determines that a concussion exists, the student-athlete should never be allowed to return to play that game. It should take about 7 days at the minimum in order to make sure that there are no longer any concussion symptoms observed by any of the persons involved with the student-athlete.

As a final note, coaches should understand the position that game officials are put in when they must ask a player to leave because of concussion-like symptoms. These are signs and symptoms that should be noticed by the coaching staff first. Game officials do not like being forced to make decisions that should be the responsibility of the coaching staff. If a game official finds it necessary to ask a player to leave the game, then there should be an investigation done by the league to determine why the coaching staff did not make the call. The onus should always be on the coaching staff to ensure the safety of his/her student-athletes.

We hope you understand that we are not taking anything away from medical professionals who may be at the game. Remember our basic philosophy is that we act on a "presumption of concussion" when identifying a concussion, but we need to apply the test of "beyond a reasonable doubt" when we decide to return a student-athlete with a suspected concussion to play again. This means that all "partners", including the medical professional, the parents/guardians, the school coach, the classroom teachers, the student-athlete, and the School Leader all must be absolutely certain that the student-athlete is free from symptoms and safe to return to physical activity.

CHAPTER FOURTEEN

A Special Review of Bill 39, Education Amendment Act (Concussions), 2012

Bill 39 2012, An Act to amend the Education Act with respect to concussions, was introduced by the Ontario Minister of Education, Laurel Broten, on March 6, 2012. Once it is put into law this Bill will amend the Education Act by adding a section under Part XIII.1 dealing specifically with Concussions.

Even though this legislation is applicable only to the Province of Ontario, we feel that most of the elements of the Bill are universal in nature and will eventually find their way in similar form in other Provinces and States in the coming years. Therefore, we have decided to include an in depth review of the proposed legislation as a separate chapter in our Program Development Guide.

Our intent is to examine each of the sections of the Bill and present some of the possible implications and outcomes that should result from its passage. I wish to advise that this review is the "opinion" of CMP Concussion Management Partners Inc. and is being offered to generate discussion and increase awareness among the general public.

The actual wording and language of Bill 39, if and when it is passed by the Ontario Legislature, may contain provisions and clauses that are slightly different from what was presented on March 6, 2012. The comments and opinions provided in this review were based on information that was known to us on March 27, 2012.

A SPECIAL REPORT BY CMP CONCUSSION MANAGEMENT PARTNERS INC.

The actual wording of Bill 39 will be found in enlarged bold print. The comments and opinions from CMP Concussion Management Partners Inc. will be found in regular print and will begin in each case with the word, "NOTE".

PART XIII.1

Concussions

Minister's policies and guidelines

321. (1) The Minister may establish and require boards to comply with policies and guidelines respecting head injuries and concussions in pupils, including policies and guidelines,

NOTE: This means that once Bill 39 is passed, the Minister of Education will have the authority to introduce policies and guidelines at the Minister's discretion, without the need to consult with the members of the legislature for approval. Keep in mind that policies and guidelines are basically "statements of principle" that are to be used to "guide" the decision-making process of a local school board. However, under section (4) below, the Minister is given the authority to establish "regulations" as well without returning to the legislative assembly for approval. Regulations are much stronger than mere "statements of principle". Regulations become the "law" and are expected to be followed as written.

It is therefore most probable that the Minister is prepared to leave this matter in the hands of the school boards and is hopeful that school boards will comply with the "intent" of the policies and guidelines. However, if school boards are not compliant, the Minister has the option to exercise his/her power and be much more forceful through the introduction of regulations. There is obviously a very fine "legal difference" between what one is" obliged" to do through regulations and what one is "expected" to do through policies and guidelines. It is anticipated that school boards will comply with the policies and guidelines rather than force the Ministry to establish regulations.

(a) respecting the distribution of information to pupils, parents, guardians, board employees and volunteers about the prevention of head injuries, the identification of symptoms of concussions and the management of concussions;

NOTE: This means that the Minister may establish policies and guidelines that require school boards not only to distribute information to all of the named partners, but furthermore, may indicate how this information is to be distributed. While it doesn't give any indication that the actual content of the information will be forced upon school boards, it does state clearly that the information will need to address the areas of prevention, identification of symptoms and management of concussions. This is clearly a message that the Minister may be providing school

boards with the basic content that must be known by the various partners and that the Minister wants to make sure that school boards ensure that the message is getting out to the right people.

It is expected that the Minister will leave local school boards with a great deal of discretion with respect to the curriculum that will be provided for the partners. School Boards will always have the opportunity to enhance the material that is determined to be "compulsory", but there will have to be some sort of "standard curriculum" that ensures all partners have the same basic information.

Our expectation is that the Ministry will develop specific "Guide Books" for parents, teachers, principals, coaches, and student-athletes. These guide books should be available online and may also be provided in print form. Each school will likely be required to make sure that the guide books are distributed to all partners each year.

The main challenge in this section will likely deal with the issue of "prevention" of head injuries. This is an area where there is much debate. In fact, in many cases prevention is linked to equipment, and yet with the current budget restraints that school boards find themselves under, the Ministry may need to inject funding to allow school boards to purchase better equipment. Rule changes are another consideration, yet this leads to another area that may need to be prepared carefully.

Prevention will be a long-term goal, so it is hoped that the Ministry doesn't get too focused on this area. Concussions will never be prevented or eliminated. We may be able to reduce the risk of injury, but the reality is that concussions can occur during accidental contact with team mates in non-contact sport or recreational activities. The focus should be more on the prevention of subsequent concussions that occur because a student-athlete is returned to physical activity before the original concussion has healed.

The challenge with the prevention of second concussions is that up to 80% of all student-athletes who suffer a concussion are either not aware of their injury or they do not report the original injury to their coach or parent. Once the Bill is passed and school boards begin to implement a concussion management program, it is expected that the number of recorded concussions will increase at least five to seven times, simply because of our ability to identify concussions more accurately.

Information that is distributed under this section of the Bill must include very specific protocols for the identification of concussions. As well, there must be some very clear direction from the Ministry of Education as to how the entire process is initiated. Section (1) (d) below deals with outlining the responsibilities of each partner in the program. This should be something that is contained in the individual Guide Books.

(b) respecting when a pupil who is suspected of having sustained a concussion is to be removed from or prevented from further participating in intramural or inter-school athletics or any part of the health and physical education curriculum;

NOTE: This section is a fairly predictable part of the Bill. It means that if a pupil is suspected of having sustained a concussion, the Minister can indicate when the pupil is to be removed from play. We all know the answer to this matter. The player must be removed immediately.

This is now going to be stated very clearly in the regulations and guidelines. What will need to be determined is who makes the decision and how the decision is arrived at. For example, what criteria will be used to establish "suspicion of having sustained a concussion"?

Identifying a concussion is very difficult. The Minister will have to indicate clearly that "any suspicion" will trigger the protocol. There cannot be a "degree of suspicion" or it will leave the decision open to interpretation, and since most of these decisions must be made during a practice or game, there should not be any confusion as to whether the suspicion is warranted. Therefore, while the answer is pretty straightforward, the criteria we use to arrive at the answer may not be quite so simple.

There are universally accepted signs and symptoms that indicate the likelihood that a concussion has been sustained, but we need to know who is going to be given responsibility for making that call and what signs are going to be determining factors. Is there a "degree" of dizziness? Does the pupil have to be a little bit dazed or clearly dazed? Will it merely take a check to the head that initiates the protocol? Will simply doing a sideline test be enough to disregard the initial suspicion, or will the player need to be cleared by a physician? The main challenge here is that there are so many opinions and theories surrounding the identification of concussions that it is going to be difficult for any group of individuals to come to a consensus.

There are many who feel that a medical doctor is the only person who can diagnose a concussion. However, someone else is going to have to determine if there is enough evidence to warrant suspicion of a concussion so that the student-athlete is removed from play and taken to see a doctor. The best way to be sure that we are catching all of the signs and symptoms is to give parents, teachers and coaches alike, the responsibility to be on the lookout for these signs and symptoms and then give them the authority to make the determination without having to justify or debate the merits of their decision.

(c) respecting the return of a pupil who has or may have sustained a concussion to intramural or inter-school athletics or to any part of the health and physical education curriculum, or his or her return to learning;

NOTE: This section gives the Minister the authority to be very specific as to when the pupil will be permitted to return to physical activity. That will include which of the partners must be required to give written clearances before the pupil is returned to play. At the present time, the accepted practice is to have a doctor give this clearance. However, studies are providing

evidence to support the fact that a concussion is a process that involves a variety of functional deficiencies that include not only physical, but also cognitive, mood and visual areas of the brain.

Therefore, when establishing policies and guidelines respecting the return to physical activity, the Minister should not only require clearance from a physician, but also clearances from the parent, the school, and the pupil him/herself. At the present time, we expect that at the very least, the regulations will require a doctor's clearance before returning to play is permitted. However, unless the Minister indicates that clearances are required from at least the parent and the school, we still may be putting the student-athlete at risk of returning before the first concussion has healed. A doctor cannot determine if all functionality is back to normal based on a ten minute visit. The doctor can determine if there are any bone fractures, internal bleeding or swelling of the brain. But a doctor cannot tell if the student-athlete is having trouble sleeping or if he has a mood disorder that is different from before.

Another thing that is interesting in this section is that there is a very specific mention of "returning to learning". This is going to be particularly challenging. We feel that the parent should be the person who decides when symptoms have subsided enough to permit their child to return to school. This will usually be within a day or two of the injury. However, once the student-athlete has returned to school, it will be necessary for teachers to have access to a very comprehensive guide for that deals with the accommodations that may be necessary during the rehabilitation period. These accommodations are designed to prevent further injury and to reduce the return of symptoms from activities in the classroom. It may take weeks or months before a student-athlete is ready to return to physical activity, but we do not recommend that the student-athlete stay out of school for the entire period of time. We feel that the student-athlete is able to begin returning to his/her full academic level of responsibilities by gradually increasing the cognitive demands of the classroom. This must be a gradual, step-by-step progression much the same as the step-by-step progression is followed when returning to competition.

In this case, we would anticipate that when reference is made to "returning to learning" the Bill means returning to pre-injury learning levels and expectations. In that case, it will be the classroom teacher who is the best judge as to when the student is able to handle the normal rigours and workload of the classroom, including testing, homework, assignments, etc. Up until that time the classroom teacher will allow the student-athlete to function at a lower level of expectation than normal and also to be accommodated without the fear of losing his/her academic year. A concussion is a temporary learning disability and should be treated as such by classroom teachers.

(d) respecting the responsibilities of board employees, classes of board employees, or other persons who are involved in intramural or inter-school athletics or any part of the health and physical education curriculum in relation to the prevention of head injuries, the identification of symptoms of concussions and the management of concussions;

NOTE: This section is pretty broad in scope. It will likely deal with" who" will be required to assume responsibility for the implementation of the various policies and guidelines in the regulations. For example, throughout this Program Development Guide we recommend that the

school Principal be designated as the School Leader who is in charge of overseeing the implementation of the program at that school. We also indicate that the School Principal is to establish a School Leadership Committee consisting of the Vice-Principal, Phys. Ed. Department Head, and any other person who the Principal feels is qualified to assume a leadership role in the implementation of the program.

We then indicate that all coaches must be trained by one of the School Leadership Committee members. For each school team or activity, one of the trained coaches must be designated as the School Head Coach, and that person will be responsible for ensuring that the program is implemented accordingly for the team. The Head Coach is responsible for training all student-athletes on the team and for administering the neuropsychological testing. We are very clear and thorough in elaborating on the roles and responsibilities of each of the partners in the concussion management program and we anticipate that the Minister will be just as thorough. Unless these responsibilities are clearly spelled out the entire identification and rehabilitation process will be paralyzed as people hesitate to step forward to take charge. In order to be an effective program everyone must know their job and must then execute accordingly.

The CMP Student-Athlete Concussion Management Program has clearly established who does "what and when" in order to remove any potential for confusion. Everyone has a role to play and when everyone does what they are supposed to do, the process works well. In addition, however, we have included failsafe mechanisms that will allow for "backup" in case someone falls short of their responsibilities. The "partner approach" is dependent upon everyone knowing their responsibilities and then following through. We hope that the Bill's policies and guidelines are clear in this regard.

(e) specifying other persons, in addition to board employees, who have responsibilities described in clause (d);

NOTE: This seems to imply that the Minister is going to reserve the right to be very particular in terms of who will be permitted to work with the pupils. For example, what roles will community volunteer coaches have in the whole process? For example, we recommend that community volunteer coaches may work in any capacity with the team, but they should not be qualified to provide the training or supervise the neuropsychological testing of student-athletes. Those tasks must be done by the School Head Coach or one of the School Coaches who are also licensed, certified teachers on staff. The Minister may also want to be specific as to what is expected from medical practitioners and neuropsychologists with respect to providing medical and clinical consultation reports.

It is entirely possible that the Minister will require community volunteer coaches to be trained and/or qualified in some very specific manner in order to be able to work with the student-athletes. Right now volunteer coaches often do not require any qualifications to work with a school team, but school principals must accept responsibility for the well-being of all students while they are involved in school-sanctioned activities.

This section also gives the authority to the Minister to address the use of athletic trainers at the secondary school level.

(f) respecting any other matter that a board's policies and guidelines must address;

NOTE: This is an open-ended "catch-all" statement meaning that the Minister can identify any other matter that he/she feels should be included in a board's policies and guidelines. One would expect that this statement is limited to the board policies and guidelines that deal with concussions; however, this is not what the language states.

In fact, it would seem that the Minister is leaving this open so that if there are any other policies and guidelines that the board currently has in place that must be changed or amended to comply with the conditions of Bill 39 and its regulations, then the Minister has the right to direct the board to make those necessary changes and amendments.

(g) respecting any requirements that must be included in a board's policies and guidelines.

NOTE: This section is another open-ended "catch-all" phrase that permits the Minister to order a board to include specific requirements in its own board policies and guidelines. This may end up dealing with requirements for training and qualification of coaches, student-athletes, etc. Under this statement it won't simply be a matter that must be addressed, as is stated in (f), but rather it will be a "requirement" that must be included.

We are especially pleased to see this statement in Bill 39. For example, when a school decides to implement a Student-Athlete Concussion Management Program, there are very specific requirements that must be adhered to at all levels. If a student-athlete doesn't bring in a signed permission slip from the parent, then the student-athlete is not allowed to play – end of discussion. The goal of Bill 39, as is the goal of this Program Development Guide, is to always ensure the well-being of the student-athlete, and that means that certain requirements must be followed at all times.

This is also the section of the Bill where the Ministry may require school boards to utilize neuropsychological testing as part of their concussion identification and management program. The research is clear that identification of concussions is much more successful if the pupil has been assessed with a baseline neuropsychological test that can be compared to any post-injury test that is done if a concussion is suspected. This is one of those requirements that will have cost implications, so the Ministry will need to be aware of the budget limitations of school boards.

We anticipate that the Ministry of Education is going to recommend the use of neuropsychological testing based on the Physical Education Safety Guidelines developed by the Ontario Physical and Health Education Association (OPHEA) in partnership with the Ontario School Boards' Insurance Exchange (OSBIE), the Ontario Association for the Supervision of Physical and Health Education (OASPHE), the Canadian Intramural Recreation Association – Ontario (CIRA), and the Ontario Federation of School Athletic Associations (OFSAA). In that guideline it is stated that "A concussion is more successfully evaluated if the student/athlete completes a neuropsychological baseline evaluation prior to beginning the sport season." If the Ministry of Education intends the Bill to provide the highest standard of care possible for pupils

enrolled in secondary schools, then it stands to reason that the policies and guidelines will require neuropsychological testing of some kind. The most reliable form of such a test is a computer based test done by ImPACT.

ImPACT is a computer-based battery of tests developed specifically for assessing sport-related concussion. The computer program measures multiple aspects of cognitive functioning, including attention span, working memory, sustained and selective attention time, response variability, and several facets of verbal/visual memory. This will register a "baseline" record of abilities of student-athlete with which to test against should they suffer a possible brain injury during the season.

While there are other neuropsychological tests on the market, the important thing for the Minister to consider is "who" will be assessing the results of the tests. The professional most qualified to do this is a neuropsychologist or a sport medicine specialist who is familiar with sport-related concussions. The Minister should make it clear that simply using neuropsychological tests is not enough. The results must be assessed and evaluated by someone who is properly qualified.

(2) The Minister may specify in a policy or guideline established under subsection (1) a date or dates by which boards must establish policies or guidelines under subsection (3), or parts of them.

NOTE: The Minister is going to give school boards time to develop their own policies and guidelines. Given the serious nature of concussions, we would hope that the deadline is sooner rather than later. However, we would expect that the earliest you will see any policy implemented will be the beginning of the 2013-2014 school year.

The challenge here is with the Ministry. For example, the Ministry is going to have to develop specific policies and guidelines first and then communicate those to the individual school boards. It may take some time for the Ministry personnel to develop their policies, and then they are going to have to give the school boards time to develop theirs. Deadlines will need to take into consideration time for pilot programs and evaluation.

Unfortunately, with up to 80% of concussions going undetected, this means that a lot of our student-athletes will be in grave danger of suffering long-term life-altering serious consequences from brain trauma while the experts are sitting around the table trying to come to a consensus. This is why we are encouraging school boards to implement a program similar in scope to the CMP Student-Athlete Concussion Management Program immediately as an interim step so that students can be protected without delay. We are confident that the elements of the CMP program will be extremely compliant with the Ministry policies and guidelines. In fact, we are certain that our program will establish a higher standard than the Ministry will be coming up with. Therefore, individual school boards will serve their own students best if they come up with a solid program o their own and then make any necessary adjustments once the Bill is passed and the Ministry develops their policies, guidelines and regulations.

Board's policies and guidelines

(3) Every board shall establish policies and guidelines respecting head injuries and concussions in pupils, and the policies and guidelines must,

NOTE: This simply means that there won't be any choice. Every board shall be required to establish their own set of policies and guidelines that deal with head injuries and concussions in pupils. We would expect that the School Board Associations or even the Ministry of Education will offer a basic template from which to follow so that the process will be much easier to complete.

(a) be consistent with the policies and guidelines established by the Minister under subsection (1) and with any regulations made under subsection (4); and

NOTE: This means that the school board must make sure that its own policies and guidelines are in line with the intent and meaning of the Ministry policies, guidelines and regulations. It also means that there will likely be some sort of evaluation process so that the Ministry can approve board policies and guidelines. This is why we feel that some kind of "template" would be helpful so that the basic elements are included at all school boards.

(b) address the matters listed in clauses (1) (a) to (f) and include any requirements described in clause (1) (g).

NOTE: Once again, this simply states that the board policies and guidelines must include "everything" that will be contained in the Ministry policies and guidelines and not simply be "consistent with". Of course one would expect the wording to be different, but this seems to be another way of telling school boards that they are expected to follow the Ministry direction in this regard.

What is interesting is that the Bill differentiates (1) (g) from the rest of the obligations of the board with respect to policies and guidelines. The Board policies and guidelines must merely "address" the matters mentioned in (1) (a) to (f). However, they must "include" requirements described in (1) (g). We are not sure why this has been stated again since it was pretty clear that this was already an expectation of the Bill.

Minister's regulations

(4) The Minister may make regulations governing all aspects of head injuries and concussions in pupils, including regulations relating to any matter listed in clauses (1) (a) to (e).

NOTE: There is a very open-ended mandate for the Minister to establish regulations that deal with "all" aspects of head injuries and concussions in pupils. What is of interest here is that it not only gives the Minister the authority to establish regulations for matters listed in clauses (1) (a)

to (e), but also for any other aspect of head injuries and concussions that come up in the future.

This also means that for (1) (f) and (g), the Minister must be expecting to provide policies and guidelines for which it hopes that school boards will use in making any changes anticipated in (1) (f) and (g). The Minister is also recognizing that it may not have the power to establish regulations that address changes that may be required to any other policies and guidelines that do not relate to head injuries and concussions. This simply recognizes the impact of head injuries and concussions on the entire board operation.

General or particular

(5) A regulation made under subsection (4) may be general or particular.

NOTE: This simply gives the Minister more leeway when it comes to making regulations.

Not regulations

(6) Policies and guidelines established under this section are not regulations within the meaning of Part III (Regulations) of the Legislation Act, 2006.

NOTE: This merely points out that the policies and guidelines are statements of intent that the Minister expects school boards to follow, but is an admission that they do not have the same weight as regulations. The implication seems to be pretty clear that if the school boards do not adhere to the policies and guidelines then regulations will follow.

No liability if person acts reasonably and in good faith

(7) A board employee or volunteer who is involved in intramural or inter-school athletics or any part of the health and physical education curriculum is not personally liable in a civil proceeding for an act or omission if the person acts reasonably in the circumstances, in good faith and in accordance with the Act, regulations and with any policies and guidelines made under this section.

NOTE: This is one of the most important sections of this entire legislation. It makes it very clear that as long as a board employee of volunteer acts “reasonably in the circumstances, in good faith and in accordance…” then that person cannot be held liable in a civil proceeding for any act or omission. This is pretty good immunity for anyone involved in sport-related activities at a school.

What must be noted at this time is that this immunity is not extended to the School Board itself. In other words, only employees or volunteers are free from liability in a civil proceeding. The School Board consists of the individual Trustees who are elected to the Board. Trustees and the School Board itself, as a corporation, are not free from civil liability.

However, it is also a pretty clear warning to school boards that unless the board complies with "all" aspects of this legislation, then their employees and volunteers might be at risk for civil liability. The Bill has now set the "standard" by which all legal cases will be measured. It implies that due to the seriousness of head injuries and the ever increasing public awareness that is being generated, there may be civil cases coming forward for acts and/or omissions when it comes to concussion identification and management.

This is one of the main reasons why we think this legislation is going to come sooner rather than later. It also has implications for private schools which must comply with the directions from the Ministry of Education. Their own policies and guidelines will be judged according to the Act, regulations and any policies and guidelines that fall under the Act and regulations.

Commencement

4. This Act comes into force on a day to be named by proclamation of the Lieutenant Governor.

Short title

5. The short title of this Act is the Education Amendment Act (Concussions), 2012.

EXPLANATORY NOTE

The Bill amends the Education Act. Part XIII.1 of the Act is renamed "Pupil Health" and a new section is added to it. The new section authorizes the Minister to make policies and guidelines respecting head injuries and concussions and sets out a list of matters that this power includes. The section requires boards to establish policies and guidelines respecting head injuries and concussions and requires boards to address the specified matters. The Minister is also given authority to make regulations about the same matters. The section describes when board employees or volunteers will not be liable in a civil proceeding for their acts or omissions.

NOTE: This is merely a summary of what the Bill does.

CHAPTER FIFTEEN

MOVING FORWARD

Some of The Major Challenges We Need To Overcome In Order to Get Control of the Concussion Epidemic In Sports Today

By
Robert Kirwan, President & CEO

You have now come to the final chapter of the CMP Program Development Guide. We have covered a great deal of information and there is so much more we are going to find out in the coming years. That is why this Guide will be continuously updated monthly so that you can always come back to the web site for the most recent version. We will refine it and revise sections as more research results are published and we find out more about the brain and we learn more effective ways of helping everyone deal with this epidemic.

Before I spend some time reviewing what I feel are some of the major challenges we need to be aware of as we all move forward in our very important mission to change the existing culture when it comes to concussion management procedures and protocols, I would like to share a little story that I read quite a while ago. It may help explain why with you about why it is so difficult to get people to change their habits and beliefs. The article helped me realize that a simple creature like the "processionary caterpillar" can teach us all a lot about life if we are only willing to watch and listen.

Processionary caterpillars travel in long, twisting lines, one creature behind the other. A famous social scientist once lead a group of these caterpillars on to the rim of a large flowerpot so that the leader of the procession eventually found itself nose to tail with the last caterpillar in the procession, forming a circle without end or beginning.

Through sheer force of habit and, of course, instinct, the ring of caterpillars circled the flowerpot for seven days and seven nights, until they died from exhaustion and starvation. An ample supply of food was close at hand and plainly visible for all to see, but it was outside the range of the circle, so the caterpillars continued along the beaten path until they all died.

It is hard to get emotional about a small group of caterpillars that were too stupid to see that the key to their survival was simply a matter of breaking out of the line and moving over to the food

that was within sight. However, the really sad thing about this article is that human beings often behave in a similar manner. Habit patterns and ways of thinking become so deeply established that it seems easier and more comforting to follow them than to cope with change and uncertainty, even when that change may give you a good chance for freedom, achievement, and success.

If someone shouts, "Fire!" in a crowded room, it is automatic to blindly follow the crowd, and many thousands have needlessly died because of it. How many stop to ask themselves: Is this really the best way out of here? What if the person at the front of the line is heading in the wrong direction?

So many people "miss the boat in life" because it's easier and more comforting to follow - to follow without questioning the qualifications or wisdom of the people just ahead - than to do some independent thinking and planning. People just assume that if everyone else is doing it, it must be right.

But a little research will reveal that throughout all recorded history the majority of mankind has an unbroken record of being wrong about most things, especially important things. That is worth repeating: “throughout all recorded history the majority of mankind has an unbroken record of being wrong about most things, especially important things.”

For a long time people thought the earth was flat and later we thought the sun, stars, and planets travelled around the Earth. Both ideas are now considered ridiculous, but at the time they were believed and defended by the vast majority of followers. People were exactly like those caterpillars blindly following the person in front of them out of habit rather than stepping out of line to look for the truth.

No matter what you are doing in life, it's always a good idea to step out of the line every once in a while and look around to see if the line is going where you really want to go. If it is not, it might be time for a new leader and a new direction. Or it is time to start your own line.

It's extremely difficult for most people to accept that only a small minority of people ever really develop a true vision about life, about living abundantly and successfully. For some strange reason most people are content to wait passively for success to come to them - like the caterpillars going around in circles, waiting for sustenance, following nose to tail - living as other people are living in the unspoken, implied assumption that other people somehow know more than you about how to live successfully. The older you get the more you realize that most other people, especially people who are deemed to be experts in their field, “don’t have a clue”. They are simply blindly following, nose-to-tail, just like the processionary caterpillar.

As we move forward in our attempt to deal more effectively with sport-related traumatic brain injuries in student-athletes, we are going to have to avoid the fate of the processionary caterpillar. We are going to have to muster up the courage to step out of line and do the right thing to overcome the challenges we face. Keep in mind the old saying, “If we always do what we’ve always done, we’ll always get what we’ve always got.” We have presented you with a lot of new ideas in this Guide. Now is the time to take action

MAJOR CHALLENGES MOVING FORWARD

The risk of traumatic brain injury, otherwise known as concussions, is present in all kinds of daily activities, not just through sports. Injury incident reports in Ontario schools during 2011 showed that approximately 60% of all reported concussions and possible concussions were sport-related, while the rest came from other daily activities, including physical education class, accidents that occur during recess time, while playing at home after school, and from things like slips and falls around the home. In fact, if one is going to be active, there is always going to be a risk of injury, to the head or to any other part of the body for that matter.

The health benefits of participating in sports and being active are simply too great to give up because of the risk of injury. Therefore, we are going to have to accept the fact that this risk is present and do whatever we can to reduce the risk, especially to reduce the risk of head injuries.

The following is a list of some of the major challenges and issues we have addressed in this Program Development Guide which need to be faced head on in the coming years.

UNDER REPORTING OF CONCUSSIONS & POSSIBLE CONCUSSIONS

We must improve our identification skills when it comes to concussions. Far too many concussions are going unnoticed or unreported. It is well known that almost 60% of all student-athletes will receive at least one concussion injury before they are out of high school. We know that 40% of concussions are not sport-related, yet those injuries can still make it much easier to suffer second concussions during sport activities. Collective denial of this problem can no longer be tolerated. The only way we will see an improvement is if everyone – coaches, parents, teachers, administrators – take a more vigilant approach to the identification of signs, symptoms and behaviours consistent with concussion and then "assume" a concussion until proven otherwise.

COMMUNICATION BETWEEN HOME, SCHOOL & SPORT ORGANIZATIONS

It is critical that we establish a much more effective line of communication between school, minor sport organizations and home. A concussion is a concussion. If you get a concussion at school, it affects every other area of your life and accommodations must be made in order to allow your brain to heal properly. But if you don't tell your teacher about a concussion you received on your community hockey team, then how is the teacher going to know what accommodations to make? Every concussion management program must address the need for effective, and automatic communication with all partners and everyone who is involved with the student-athlete.

SHORTAGE OF MEDICAL DOCTORS WITH CONCUSSION EXPERIENCE

This is a problem that we may not be able to solve in the foreseeable future. This is why we are so strongly recommending the partnership approach to concussion management. Even a doctor without concussion management experience can diagnose a fractured skull, internal bleeding, or increased intracranial pressure. If we share the responsibility for rehabilitation among parents,

coaches, teachers and the student-athlete him/herself, then we can all take care of our own rehab procedures and as a group we will know when full recovery has taken place. To place all of the responsibility on the back of a medical doctor who must rely on self-admission and on information taken from the parent is no longer acceptable. The doctor can tell us if there is anything that is life-threatening. Then it is up to the coach to slowly bring the student-athlete through a Return-to-Play process. It is up to the parent/guardian to slowly bring their child through a return-to-normal lifestyle process at home. It is up to the classroom teacher to slowly bring their student through a Return-to-Learn process. All of this is done with the goal of gradually preparing the injured student-athlete to a position whereby he/she is able to get back to normal and withstand the increased stimulation and pressure in his/her brain.

INFORMATION OVERLOAD – TURNING OFF

There is a great deal of interest in concussions, especially during particular times of the year when football, hockey and soccer seasons begin. As parents, coaches and teachers, we must avoid the urge to dismiss the media attention as more of the same. We must also avoid throwing up our hands in a state of confusion, claiming that it is so hard to know what is right that we will do nothing. That is precisely why we recommend sitting down as a steering committee and disseminating all of the available information in order to come up with a specific program for your own jurisdiction. We must do something. We cannot be like the Processionary caterpillar and simply keep walking around in circles until we perish.

ESTABLISHING MANDATORY PROTOCOLS

When you do come up with a solid concussion management program for your school board or minor sport organization, it must be made mandatory for all participants. There should be no opting out of the program. It cannot be voluntary. Once a sign, symptom or behaviour consistent with concussion is spotted, the protocol must be followed to the end.

MINIMUM STANDARD OF CARE REQUIRED BY LEGISLATION

Many school boards are being legislated into taking action with respect to concussion programs. We caution people not to be satisfied by meeting the minimum standards outlined in the legislation since these have likely been watered down in order to get enough support from the politicians to get passed in the legislature. In many ways they are likely to be sub-standard for school boards which are always held to a higher standard of care when it comes to the well-being of their students.

TAKING CONCUSSIONS SERIOUSLY

There is a tendency among many student-athletes and parents to treat concussions with less than the seriousness this injury deserves. This is because many of the symptoms of a concussion are hard to identify and they seem to resolve quickly. What people don't know is what is happening inside as the chemicals interact and the brain is reengineered in order to repair the damage. In many cases the changes that one demonstrates emotionally and cognitively may be passed off as simply being "growing pains" or the young person changing his/her interests. Unfortunately,

some of this change in behaviour and attitude may well be due to the life-altering consequences of the concussion. By making the proper accommodations and by following a planned rehabilitation program, it may be possible to help the student return to normal. But ignoring the injury or not taking it seriously may in fact result in a life that is quite different from that which was intended.

OVERCOMING THE STIGMA OF ADMITTING YOU HAVE A CONCUSSION

A concussion is not considered a very glamorous injury by most student-athletes. It is an injury that no one can see, so it is difficult for others to understand your symptoms if they cannot really spot the signs of concussion. This injury "in your head" can be somewhat of a stigma for students as well in that they do not want to admit or let others know that there is something wrong with their cognitive abilities. It is not cool to have "mental" problems. Therefore, it is up to the classroom teacher to make sure that the rest of the class understands the nature of concussions and actually assists in the rehabilitation process. This is a great learning experience for all students since pretty well everyone on this planet will have some kind of dealing with a traumatic brain injury during their lifetime.

FAMILY DOCTORS REFUSING TO DIAGNOSE – REFERING TO SPECIALISTS

The most popular concussion management protocol includes placing all of the responsibility for diagnosing a concussion and then eventually clearing a person for a return to play squarely upon the shoulders of a medical doctor. Many doctors are now beginning to refuse to sign these clearance forms, preferring to refer their patients to a sport medicine specialist familiar with concussions. This is going to create a huge shortage in available doctors who are willing to work with concussed student-athletes, which in turn will increase the time it takes to see a doctor, which in turn will likely result in many more unidentified concussions because parents are unable to see a doctor in a timely manner.

FUNDING FOR NEUROCOGNITIVE TESTING

While all indications are that a concussion management program is enhanced if it includes baseline and post-injury neurocognitive testing, the cost of providing this testing is going to prove prohibitive for many school boards. Minor Sport organizations may also be reluctant to incorporate such a test since it would mean that their registration fees might have to increase. We have found that the cost of the actual testing is not really a problem, but it is the cost of having the assessment done by a qualified neuropsychologist which is the greatest expense. And yet, the test without a neuropsychologist doing the assessment wouldn't be much use either. This may simply have to become a cost that is part of the sports program. It is just that important and one would have to question why it would be such a huge financial burden to come up with about $25 per year per student-athlete to include this important tool in the program.

STUDENT-ATHLETES DO NOT HAVE AN OFF-SEASON

Many student-athletes take part in multiple sports during the course of the year, so there really is no off-season for a lot of students. This means that the brain is always under stress and stimulation with no time to really heal. On top of this, sports such as football, hockey and soccer consist of so many more games than in past decades, including many tournaments where you may play as many as three or four games in a day. This leaves little time for an injured brain to heal, and with so many concussions going unidentified, it means that many players are participating when their brain is still recovering from a first concussion.

RECKLESS PLAY WITH NO REGARD FOR PERSONAL SAFETY

We will have to pay more attention to training student-athletes in the area of safe play. Too many young athletes today play with reckless abandon, with absolutely no regard for the safety of their opponents or themselves. There are ways of playing each sport so that you reduce the risk of being involved in a dangerous situation on the ice or on the field. By taking just a bit more care and avoiding those actions that could result in an injury, we may be able to reduce the incidence of concussions

POOR ROLE MODELS AT THE PROFESSIONAL LEVEL

It is hard for young people to take concussions seriously when they hear professional athletes stating how they play hurt with concussions; how they cheat on their neurocognitive testing so that they have a lower baseline in case they are injured; by deliberately attempting to injury opponents; etc., Professionals must take their role model responsibilities much more seriously if we are going to make a positive impact on concussions at the high school level.

THE ILLUSION OF PROTECTIVE EQUIPMENT

We still seem to be under the illusion that you can prevent concussions with better equipment. It is well documented that a helmet will protect your skull, but it won't protect your brain which is inside your skull. The problem is that with better equipment, players are playing much more recklessly and are therefore in more danger of receiving concussions because of this style of play.

IDENTIFYING NON-SPORT RELATED CONCUSSIONS

While most of our attention in this Program Development Guide is focussed on sport-related concussions, there is a huge problem with respect to non-sport-related injuries that may occur in the playground, through simple slips and falls, or while playing pick-up games with friends. In most of those instances a person will get injured and after shaking it off will simply get back into the game. The lack of adult supervision with watchful eyes for signs of concussion will normally mean that these concussions go unnoticed. Then the young person will go out to his/her hockey game with their brain in a vulnerable condition and risk a much more serious injury. This is going to be a difficult challenge to overcome.

GETTING THROUGH TO CLASSROOM TEACHERS

We are always going to have trouble getting through to classroom teachers who are being inundated with demands from the school board to begin with. To watch for signs, symptoms and behaviours consistent with concussions is something that may prove difficult to add to the daily routine. I don't think there will be much difficulty with respect to making necessary accommodations to assist in the rehabilitation, but the problem now will be finding a way of educating the entire staff on this whole issue of concussions.

FINAL THOUGHTS

As we come to the end of the CMP Program Development Guide, I just have a few final thoughts to leave with you.

First of all, I would like you to answer the following riddle.

"There are five birds sitting on a telephone wire. One decides to fly away. How many are left?"

Before I give you the answer to the riddle, I want to say that over the years I have discovered that the root of most of the problems in society today is that many people are unwilling to engage in the hard, honest work that is necessary in order to achieve success. Many of us want the easy way out!

I once read a little story about a young man in high school who obviously has a very bright future thanks to his focus on three letters, M.I.H. This kid has a passion for excellence in everything he does, particularly in his favourite sport, wrestling. One year he had what most considered an amazing wrestling season and ended up coming in second place in the provincial championships.

The day after the finals, he was back in the same old gym working out in the same old sweats with one small change. He had placed white tape on each of his three middle fingers, and on each piece of tape was a letter. M.I.H. His friends, family, and team mates all repeatedly asked about the letters, but he refused to divulge their meaning.

He kept the letters on his fingers all year, and he trained harder than ever, until he again found himself at the provincial championship tournament one year later. This time the outcome was slightly different and not a surprise to anyone who had witnessed his daily determination in the gym; he was crowned provincial champion.

Finally, he was able to share with everyone that while they cheered his second place finish the year before, he vowed to himself to get better – to be the best. Displaying vision beyond his years, he developed his clear goal, designed a plan to achieve it, and created a tool to provide

focus. He knew that if he really wanted to be the best, it was up to him. He was determined to **Make It Happen**. The letters M.I.H. became his inspiration. **Make It Happen!**

Now, let's go back to the riddle I asked you earlier. *"There are five birds sitting on a telephone wire. One decides to fly away. How many are left?"*

The correct answer is five (5). Read the question again and you will see that it did not say that one bird actually "flew away". The information you are provided with is that one bird merely "decided to fly away". In fact, deciding to fly away and actually flying away are two completely different things.

There is a life lesson for us all within this riddle. It is that you'll never get where you want to go in your life until you point yourself in the right direction, jump off the wire, and flap your wings. Just deciding what you want to do is not enough. You must take action that is consistent with your desired goals. We all have to face a basic fact of life and the sooner we realize it the better. Success is not going to fall in your lap.

It is going to take a lot of work by a lot of people in order to develop an effective student-athlete concussion management program that will meet the needs of school boards and minor sport organizations. We know that a lot of people have "decided" to do something about this problem. And we know that a lot of people are doing a lot of great work motivating people and inspiring people to find out more about concussions.

But good intentions are not enough. We need people willing to "make it happen". We need people willing to sit down and come up with a practical approach to the problem, to develop a realistic plan and then have the will to see that plan through to the end.

Our mission at CMP Concussion Management Partners Inc. is to assist school boards and minor sport organizations in Canada and the United States in the development of a Student-Athlete Concussion Management Program that addresses their local needs and concerns while at the same time embracing universally accepted principles such as the establishment of consistent standards in the areas of training of coaches and student-athletes, the education of parents/guardians, teachers and professors, and the implementation of effective protocols for sport-related concussion identification and rehabilitation.

As we wish you the best of luck in achieving your goals and vision, we leave you with the words of Albert Einstein, "Learn from Yesterday. Live for Today. Hope for Tomorrow. The important thing is to not stop questioning."

CMP
Concussion Management Partners Inc.