

A CULTURE PROBLEM:

NEW STUDY SHOWS THAT CONCUSSIONS ARE BEING UNDERREPORTED IN ICE HOCKEY

TEAM Business spoke with Dr. Paul Echlin, lead investigator of a new study of hockey concussions, to better understand the ramifications behind the underreporting of concussions in the game of ice hockey and what can be done to change an unhealthy culture and reduce head injuries.

By **Fernando J. Delgado**

A year-long study that followed men's and women's college hockey teams in Canada and the United States concluded that coaches underreported concussions, while also revealing a culture among players and coaches that resists proper treatment and diagnosis of potential head injuries. The study's findings showed something alarming: a tendency by coaches to keep players with possible head injuries playing rather than remove them from the game for medical checks and concussion tests. Speaking with the study's lead investigator helps shed light on an issue affecting all levels of professional and youth sports.

Dr. Paul Echlin is a primary care sports medicine specialist based in Burlington, Ontario, Canada, and a leading concussion researcher and expert. Board certified in both the U.S. and Canada, Echlin is the primary investigator of the Hockey Concussion Education Project (HCEP), the group responsible for the most recent hockey concussion study. In addition to serving as chair of the Sport Neurotrauma and Concussion Initiative Research Committee, Echlin has also established the Sport Concussion Library website, sportconcussionlibrary.com, a legacy project of HCEP that hosts a wealth of information and educational resources regarding the topic of concussion in sport. Clearly, Echlin has a passion for studying and treating concussions, and the results of his most recent study stand out in the ongoing hot-button topic of player safety in team sports.

The study was published in late November 2012 as part of a series of articles in the journal *Neurosurgical Focus*. It was conducted during the 2011-12 hockey season by researchers from the University of Western Ontario, the University of Montreal, Harvard University and other institutions.

The full study, entitled "A prospective study of physician-observed concussion during a varsity university ice hockey season," can be found online in four parts at The Journal of Neurosurgery's (JNS) official website, thejns.org.

Researchers followed two Canadian university teams - a men's team and a women's team. The two teams tracked in the study were unidentified. Every player's brain was scanned both before and after the season, while players who sustained head injuries also underwent scans at three intervals after their injuries. An independent specialist physician was present at each game played by the study's teams and was given authority to pull any player off the ice for examination in the event of a possible concussion.

The study is considered to be one of the most comprehensive analyses of concussions in hockey. The sport's rate of head trauma approaches that of football, which has come under fire in recent years due to concussions at both professional and amateur levels, as well as suicides by well-known NFL players. Analyzing the results of the investigation are important not only for researchers and physicians, but for players, parents, coaches and members of the sporting goods industry as well.

Echlin shared his motivations for this investigation with *TEAM Business*. "There's a two-point reason we did this study," he said. "The first one was to reproduce the previous study in 2009-10, to show that the direct physician-observed instance of concussion is significantly higher than what had previously been reported through secondary and tertiary reports. An independent physician with each team was looking at probable mechanisms of concussion and post-impact symptoms



exhibited by the player that got hit, and then examined at rink-side in an examining room to make a diagnosis. That hadn't been happening before. So a lot of true concussions had not been reported, and therefore the incidence rate is very low."

Results of the study revealed some interesting trends not only in terms of the rate of concussion compared to previous studies, but also with regards to gender. "We found that the rate was three times higher than previous literature in the men, and five times higher in the women," explained Echlin. "Women were twice the instance of men over the same period of time, which was surprising, but it aligns with a lot of the literature saying that women have a higher rate of instance of concussion. And the women's sport, in hockey at least, is non-checking. Why is that? We're not sure, but we're looking at the possibilities that have been pointed to in the past."

"The second reason we did this study was to look at the effects of concussion," continued Echlin. "We did advanced MRI imaging...[and] susceptibility-weighted imaging, to look at metabolic and neurological structural components of the brain. We did scanning of all the participants before the study, and scanning of them after. For those that were clinically diagnosed with concussions during the study, we did scans sequentially at 72 hours and two

months to look at the structure and metabolic function of the brain after these hits, and then after the season."

The comprehensive methodology used in the study showed a significant finding about the health of hockey players that, unfortunately, is very discouraging. "The surprising and shocking finding – and these are words from the scientists at Harvard University and the University of Montreal – was that the whole cohort had changed, not just the ones we had identified," shared Echlin. "There were statistically significant changes in the DTI [Diffusion tensor imaging scan] and substantive change, which is just under significance, in the metabolic, pre and post. Those are big findings to build upon, and what we think may be happening is that these sub-clinical injuries aren't getting identified. Not only did we demonstrate that the instance of observed concussions is much higher than had previously been published, but we found that there may be many, many more of these sub-clinical injuries that are going on, and we know that some of them add up on top of each other to eventually produce a state that the brain cannot recover from, and either goes into post-concussion syndrome, or worse."

Not surprisingly, reactions to the HCEP study have caused a stir in the medical community, sports world and in the media. "What people have been finding to be most fascinating with the study is: why does it happen? Why does it continue to happen?," observed Echlin. "You have all these pro football players and hockey players having big neurological injuries, and then the injuries that are being demonstrated later on in life in the brain that they're finding pathologically. Why are we still going down the path of saying that it doesn't really exist, and continue playing with it and modifying the games that we play. That's the important part - that science is not only just numbers, but it's why it's happening. Can we change, can we modify, can we adapt to what we're finding in the public health realm?"

Researchers observed multiple instances of coaches, trainers and players avoiding examinations, ignoring medical advice or interfering the study, despite the fact players had signed consent forms to participate and university ethics officials had granted institutional consent. This affirmed a problem Echlin and his colleagues have observed for several years: there's a culture in hockey which encourages players to keep playing in spite of suffering concussions and other injuries.

"It wasn't anything new during this study," said Echlin in regards to the culture of hockey today. "This is the third study we've done;



The idea that coaches may not have the safety of players in mind, even in the midst of a study geared towards identifying and treating concussions, is concerning to say the least. Such an attitude in coaches reveals part of a serious problem that has existed in the culture of hockey for generations. “All the way along, the resistance from coaches was heavy at all levels, and we found that in the first study, the second study, and this one,” shared Echlin. “So that’s not new. It’s a cultural entrenchment of allowed violence that occurs. The violence is intentional hits to the head, and the culture doesn’t want anyone to change it. But what we have to do is show the injuries that do occur, and say that this is what’s currently going on. It’s not about what they think, it’s about the objective findings. And that’s what this literature is about. It’s about setting up a study, letting it happen, and then reporting it. The results are what they are. You can’t change it.”

What, then, can be done about concussions in hockey, and sports in general?

In order to combat the inherent detrimental behavior in the culture of hockey, and the resulting underreporting and mismanagement

the second study was an unpublished one, but we got ethics approval and financing, and we took the neutral observer out of it. These were all physician-observed games, but not neutral physicians.” Surprisingly, at least to anyone not familiar with hockey culture’s resistance to recognizing concussions, the physicians in the second study only reported one concussion for the regular season for the same group of university-level hockey players. “That was important to show,” shared Echlin. “We thought it was a failed study, but actually it demonstrated the significance of independent observation away from any of the bias of the team or anything else. Just saying if a concussion occurred or not according to observation and diagnosis. That was important.”

Observations of the study’s participants and their reactions to the study are fascinating. Echlin contacted each physician after each game, and talked to some of the trainers, and they reported what they saw and heard after each game. “I started off, when I was funding the study, with one of the biggest funding groups in the U.S. and maybe even the world,” he recalled. “And one of the reviewers for the study said, ‘This study is absurd. You’d never get funding for this because teams will never allow it.’ And you go, ‘What? They wouldn’t allow a physician at each game?’”

Echlin also encountered skepticism to the research from key participants in the study itself. “One of the coaches at the study, after a year of being in contact with myself and other people involved in the study, and knowing the methodology backwards, said, ‘You know, I think this is a really good study, and I’m really glad to be part of it, but I don’t think the physician should be a part of the game.’” said Echlin. “[The coach] is a part of this, he knows exactly what is going on, and he doesn’t want a physician at the game watching the players. Their bias is that their player will be taken off the ice. And that’s not what an ethical, well-trained physician with an education in sports medicine does. They don’t want to take players off unnecessarily, but they also don’t want to stand by while injuries occur that will affect the outcome of a player’s health.”



of concussions, increasing awareness of the problem is essential in finding a solution for reducing head injuries. According to Echlin, that must start with the education system in the U.S. and Canada. Players should be exposed to safety campaigns in school, and at a young age in order to positively influence their attitudes and development. “In terms of the education component, because it’s so entrenched in the culture - wanting the allowed violence and the hits to the head to be ok just because the person looks ok, or because they feel that it will not cause them any injury – what we need to do is start early in the education system to make it similar to seatbelts and drinking and driving and say, ‘No hits to the head,’” said Echlin. “Because hockey is a fast collision sport, you’re always going to have a certain number of concussions. But we can prevent the obvious ones and the intentional ones. When they do occur, get that player off the ice or the field of play. Get them to a specialist and let them get treated. The worst thing is to allow them to have repetitive head injuries or brain injuries so that they compile and add up, and the person has life-long injuries because of the sport he plays. What we want to do is to work with the public education system and approach the next generation so that they are

a generation of coaches and parents to say, 'No, we're not going to allow this,' and ask that these sports be modified so that these head injuries don't occur at such a high rate."

Echlin also strongly believes that better testing is essential in diagnosing and treating concussions, as well as preventing long-term injuries. "We do need to have better objective testing, because we found that the SCAT 2 and the ImPact were not very good tests," he stated. "The ImPact actually showed an increase in scores after the person got injured, which is the reverse of what it should show. What does that mean? A possibility is that they just weren't paying enough attention when they were doing the testing. You cannot depend on these tests that have no reliability, no validity. People should be made aware of how these tests stack up when you look at them in the real setting. I'm not dismissing these tests, but they could be better. I think we could have better tests for our athletes, and they should be based on objective findings such as the imaging." Real-time evaluation, according to Echlin, must be more widely implemented for athletes with potential concussions. "Real time evaluation hasn't been done before," he said. "It's all been cross sectional."



Dr. Paul Echlin is the founder of the Sport Concussion Library, an online resource on concussion in sport, and served as primary investigator in one of the most comprehensive studies of concussions in hockey ever conducted. Echlin stresses the importance of raising awareness of head injuries and changing the culture of hockey and other contact sports.

For the sporting goods industry, concussions are always a consideration when manufacturing protective equipment. However, no equipment available can prevent concussions, and it is unlikely that concussion-preventing equipment will be produced any time soon given the fragility of the human brain. "There's no mouth guards, there's no helmets that will alter the forces of a hit significantly enough to prevent concussion," said Echlin. "People have to know that just buying a \$300 helmet is not going to change the possibility of sustaining a concussion. It is about fundamentals - stop hitting the head, and when it does happen, identify it. There's going to be a lot of money spent trying to get a quick fix, when the real fix is social change in the sport. You can't prevent all hits to the head, but you can prevent a lot of them."

In the end, solving the problem of concussions in sports is rooted in transforming the current culture at the youth levels. "From my point of view, we're not looking at the pros, we're talking about grassroots change in contact collision sports. You're not going to get that from the pro level," said Echlin. "The pro level is based on selling a high level of violence, and that just has to be stated directly. They're not going to change until they are forced to change. You don't try to continue to fight a system that doesn't want to cooperate. You go for fundamentals of identification of incidents, and addressing it through the educational component in the curriculum of the schools... so that when kids are growing up, they understand it."

For Echlin, culture change is necessary in order for today's group of athletes to avoid the same fate as older generations who have suffered the serious effects of brain injuries. "The groups of parents and coaches right now have a certain way of thinking about these games that's very hard for them to change," he stated. "That's why there needs to be a generational and cultural shift in understanding how important these brain injuries are compared to two generations ago when it was a badge of honor to get a concussion. A lot of those guys are suffering right now from memory loss and inability to conduct their lives in any way." ■

Note: To read more, the first part of the study can be accessed at <http://thejns.org/doi/full/10.3171/2012.9.FOCUS12287>