



Special Feature

Ice Hockey Summit II: Zero Tolerance for Head Hits and Fighting

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Abstract

Objective: To present currently known basic science and on-ice influences of sport related concussion (SRC) in hockey, building upon the Ice Hockey Summit I action plan (2011) to reduce SRC.

Methods: The prior summit proceedings included an action plan intended to reduce SRC. As such, the proceedings from Summit I served as a point of departure, for the science and discussion held during Summit II (Mayo Clinic, Rochester MN, October, 2013). Summit II focused on Basic Science of Concussions in Ice Hockey: Taking Science Forward; (2) Acute and Chronic Concussion Care: Making a Difference; (3) Preventing Concussions via Behavior, Rules, Education and Measuring Effectiveness; (4) Updates in Equipment: their Relationship to Industry Standards and (5) Policies and Plans at State, National and Federal Levels to reduce SRC. Action strategies derived from the presentations and discussion described in these sectors were subsequently voted on for purposes of prioritization. The following proceedings include the knowledge and research shared by invited faculty, many of whom are health care providers and clinical investigators.

Results: The Summit II evidence based action plan emphasizes the rapidly evolving scientific content of hockey SRC. It includes the most highly prioritized strategies voted on for implementation to decrease concussion.

Conclusions: The highest priority action items identified from the Summit include: 1) eliminate head hits from all levels of ice hockey, 2) change body checking policies, and 3) eliminate fighting in all amateur and professional hockey.

Introduction

Ice hockey, a game with inherent risks of injury, is played in North America and Europe at high speeds, on hard ice, with boards, sticks and pucks [1]. Ice hockey, played primarily in regions frozen for over six months of the year, can also bring joy when played in a fun, respectful, yet competitive manner. Collisions, body checking and illegal on-ice activity results in potentially

serious consequences including sport related concussions (SRC) / mild traumatic brain injury (mTBI) [2-5]. These proceedings disseminate information presented at Ice Hockey Summit II: Action on Concussion in context with accomplishments made since Summit I, 2010. Action items from the five sectors identified for Summit II, 2013 were voted on and prioritized in five areas: (i) Basic Science of Concussions in Ice Hockey: Taking Science Forward; (ii) Acute and Chronic Concussion

Care-Lets Make a Difference; (iii) Preventing Concussions (Behaviors, Rules, Education and Epidemiology): Measuring Effectiveness; (iv) Updates in Novel Equipment (Helmets, Chin Straps, Mouthguards): Their Relationship to ASTM, ISO, and BNQ Standards; and (v) Policies and Plans for Organizations: State, National and Federal Levels. The evidence-informed support for each of the sectors is discussed from the perspective of published literature, action accomplished since 2010 and compelling new science [6,7]. To update Summit II attendees, the status of action items prioritized during Summit I were briefly summarized and reported in the following paragraphs.

- (i) **Databases and Metrics** Little progress occurred since Summit I in: certifying health care professionals who have SRC expertise, or in establishing stringent concussion metrics, data bases, or a national concussion registry [7-10]. All states have accepted a version of the Lystedt Law, which dictates that RTP is the job of a licensed health care provider; however, there is no centralized registry to document concussion information. Injury reporting surveillance programs through the NCAA, the National Athletic Treatment, Injury and Outcomes Network (NATION), and the Reporting Information Online system (RIO) collect epidemiological injury and concussion data across multiple sports, at collegiate and high school levels. However, these databases are not hockey specific, they lack a consistent concussion definition, and data collected are not concussion specific. In the absence of a national injury registry, these resources allow us to better measure SRC across sports and age groups using more standard methods so that trends over time can be detected [11].
- (ii) **Recognizing, Diagnosis, Management and Return to Play (RTP)** Criteria for recognition, diagnosis and RTP of athletes with SRC are evolving. SRC is accepted as a brain injury that in 80-85% of athletes resolves within ten days [6,7]. Traditional neuroimaging (CT, MRI) is usually normal. Advanced imaging such as fMRI or DTI may identify SRC in research studies but these techniques are not generally suitable for direct clinical use [12]. "No same day RTP" and RTP, only after symptom resolution, are clearly now responsibilities of licensed health care professionals [13].
- (iii) **Player Equipment and Facilities** Hockey helmet standards and designs have not changed since Summit I. Helmets effectively mitigate impact energy, but do not prevent SRC and no scientific evidence confirms the preventative effect of mouth guards in reducing SRC. Helmet testing standards are based on biomechanical thresholds for skull fracture and severe TBI - not concussion (mTBI). Tolerance limits for SRC have been

proposed, and sensors detecting head acceleration are studied in relation to symptom onset and concussion diagnosis [14,15]. Debate continues within standards organizations about how acceleration tolerances can be implemented in helmet testing, and if SRC risk can be reduced by helmet design. Hockey helmets and mouth guards are worn in a manner non-compliant with manufacturers' instructions, thereby impeding the *in vivo* assessment of helmet effectiveness [16,17].

- (iv) **Education and Prevention** Hockey requires behavior modification to reduce SRC. Fair Play, a component of the Minnesota Hockey Education Program, was implemented 10 years ago, a result of collaboration with Mayo Clinic. Game score sheets, analyzed annually by Mayo Clinic Sports Medicine, track major infractions such as head hits and checking from behind. Tougher sanctions are imposed as needed to influence these behaviors. "Heads Up, Don't Duck," Play it Cool (Coaching Education), ThinkFirst Smart Hockey, and *Concussions and Female Athletes: The Untold Story*, viewed over 2,500 times, increase SRC awareness [18-21]. Education of coaches, parents and players in conjunction with a behavioral modification program have the potential to help decrease SRC in hockey [22].
- (v) **Rule Changes, Policies, and Enforcement** Pee Wee hockey leagues (ages 11-12 years) that allow body checking increase the risk of SRC threefold compared to leagues without body checking [23]. USA Hockey championed a rule change in 2011 that prohibited body checking in Pee Wee games, but allowed checking skills to be taught during practices. The rationale to delay checking in games until Bantam (age 13-14) hockey was based on studies that document a decreased risk of concussion [23,24] and the premise that skill development may progress faster without checking. Further, evidence supports more positive game outcomes based on win loss tie record in teams with fewer injuries through the season [25] and a significant reduction in health care utilization costs in leagues where body checking is not allowed [26]. A body checking discussion meeting in 2014 [27] included a task force of researchers and community partners from Canada and the USA. The deliberations led to an evidence-informed decision to delay body checking until age 13 (Bantam) [24,25,27,28]. MN data showed fewer checks from behind and head hits in the United States, after the rule change. Data based on the rule change regarding SRC incidence, economics, player attrition and skill development in hockey will be available in the future.
- (vi) **Communications** Seven journal editors simultaneously published the post-Summit I Proceedings

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