

SAFETY IN ICE *Third Volume* HOCKEY



ASTM STP 1341

ALAN B. ASHARE
Editor

STP 1341

Safety in Ice Hockey: Third Volume

Alan B. Ashare, editor

ASTM Stock Number: STP1341



ASTM
100 Barr Harbor Drive
P.O. Box C700
West Conshohocken, PA 19428-2959

Printed in the U.S.A.

Library of Congress Cataloging-in-Publication Data

(Revised for vol. 3)

Safety in ice hockey.

(STP ; 1050,)

Papers presented at a symposium held on 27 Oct., 1987, in Montreal, Quebec, sponsored by the ASTM Committee F-8 on Sports Equipment, the Subcommittee F08.15 on Hockey, and cosponsored by the Hockey Equipment Certification Council.

Vol. 2 edited also by P.J. Bishop.

"The Second International Symposium on Safety in Ice Hockey was presented at Pittsburgh, Pennsylvania, on 20-21 May 1992."—Foreword.

Includes bibliographies and indexes.

1. Hockey—Safety measures—Congresses. 2. Hockey—Accidents and Injuries—Congresses. I. Castaldi, C.R. (Cosmo R.) II. Hoerner, Earl F. III. ASTM Committee F-8 on Sports Equipment and Facilities. Subcommittee F08.15 on Hockey. IV. Hockey Equipment Certification Council. V. Series: ASTM special technical publication ; 1050.

GV848.35.S34 1989

796.96'2028'9

89-35946

ISBN 0-8031-1274-2 (v. 1)

ISBN 0-8031-1873-2 (v. 2)

ISBN 0-8031-2488-0

Copyright © 2000 AMERICAN SOCIETY FOR TESTING AND MATERIALS, West Conshohocken, PA. All rights reserved. This material may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media, without the written consent of the publisher.

Photocopy Rights

Authorization to photocopy items for internal, personal, or educational classroom use, or the internal, personal, or educational classroom use of specific clients, is granted by the American Society for Testing and Materials (ASTM) provided that the appropriate fee is paid to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923; Tel: 978-750-8400; online: <http://www.copyright.com/>.

Peer Review Policy

Each paper published in this volume was evaluated by two peer reviewers and at least one editor. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM Committee on Publications.

To make technical information available as quickly as possible, the peer-reviewed papers in this publication were prepared "camera-ready" as submitted by the authors.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of the peer reviewers. In keeping with long-standing publication practices, ASTM maintains the anonymity of the peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution of time and effort on behalf of ASTM.

Foreword

This publication, *Safety in Ice Hockey: Third Volume*, contains papers presented at the Third Symposium on Ice Hockey held 5–6 May 1997 in St. Louis, Missouri. The symposium was sponsored by ASTM Committee F08 on Sports Facilities and by its Subcommittees F08.15 on Hockey Equipment and F08.51 on Medical Aspects and Biomechanics. The event was also sponsored by the Hockey Equipment Certification Council and the USA Hockey Foundation. The symposium was organized and chaired by Alan B. Ashare, who also served as editor of this publication. Dr. Ashare also serves as Chairman of F08.51, Chairman of the HECC Certification Committee, and Chairman of the USA Hockey Safety and Protective Equipment Committee.

Acknowledgments

The task of putting together a symposium like this is just one piece of the puzzle. Reviewing and editing the submitted manuscripts is another, a piece that the editor did not contemplate or handle very well. The cause of the delay in publication (three years after the meeting) rests with the editor. I certainly did not appreciate at the time the efforts of my predecessors, Earl Hoerner, Comos Castaldi, and Patrick Bishop in the two previous symposia held in 1987 and 1992.

Certain staff and volunteers at ASTM must be mentioned. Without their counsel, time, and efforts, this publication would not have seen the light of day. Mark Marcus was the technical advisor; at times, when he wanted to proceed in one way with a manuscript and I wanted to proceed in another, his objective reasoning won out. He was a major driving force behind this publication. Monica Siperko was the driving force at ASTM. Her efforts are greatly appreciated. Kathy Dernoga, who has had experience with many ASTM publications, was also extremely helpful. John Sabelli, Chairman of F08.51, was drafted and did a great job helping to review manuscripts. Jim Goode, Chairman of the ASTM Publication Committee, was daring in extending the time boundaries for this publication, and I thank him for that. George Luciw, technical advisor for F08, also showed tenacity in allowing me to proceed with this publication.

Contents

Overview	ix
-----------------	-----------

INJURY SURVEILLANCE

Development of an Injury Surveillance System: Results from a Longitudinal Study of High School Athletes—STEPHEN G. RICE	3
Principles of Ice Hockey Injury Research—MICHAEL J. STUART AND AYN SLEY M. SMITH	19
Sports Injury Surveillance: Foundations of Data Collection—JOHN W. POWELL	32
Injury Report System—NICOLA BIASCA, RONNY LORENTZON, AND DIETER MONTAG	44

PROTECTIVE EQUIPMENT

Is the Face Mask Good for Ice Hockey?—PAUL F. VINGER	63
The Certification of Protective Equipment for Ice Hockey in the United States—CHAUNCY A. “DEWEY” MOREHOUSE	72
Comparison of International Safety Standards for Ice Hockey Helmets—DAVID J. PEARSALL, R. EDWARD WALL, AND BLAINE T. HOSHIZAKI	78
Hockey Headgear and the Adequacy of Current Designs and Standards—P. DAVID HALSTEAD, CHERIE F. ALEXANDER, EDWARD M. COOK, AND ROBERT C. DREW	93
Comparison of Ice Hockey Helmet Impact Attenuation Tests on Steel and Elastomeric Impact Surfaces—JOHN SABELLI AND CHAUNCY A. “DEWEY” MOREHOUSE	101
Impact Performance Characteristics of Hockey Helmets with Liners of Differing Thicknesses —PATRICK J. BISHOP	112

A Comparison of the Epoxy Alloy and Magnesium Alloy Headforms— PATRICK J. BISHOP	118
--	-----

The Single Strap Helmet Fixation System in Intercollegiate Ice Hockey: A Source of Variable Face Protection— ROBERT F. LAPRADE AND ROBERT J. BROXTERMAN	124
---	-----

SPINAL INJURIES AND CONCUSSIONS

Concussions in Youth Ice Hockey Players— RALPH L. BEDNARZ	133
--	-----

Spinal and Head Injuries in Ice Hockey—A Three Decade Perspective— CHARLES H. TATOR, JAMES D. CARSON, AND VIRGINIA E. EDMONDS	150
---	-----

Serious Spinal Injuries in Swedish Ice Hockey— YELVERTON TEGNER	165
--	-----

Care and Transport of Injured Participants with Potential Spine Injuries from Ice Rinks— ROBERT F. LAPRADE, ROBERT J. BROXTERMAN, MARK BAHR, FRED A. WENTORF, RICHARD J. FEIST, KEVIN J. CARDINAL, AND JUDSON FREED	173
---	-----

Position of the Cervical Vertebrae During Helmet Removal and Cervical Collar Application in Ice Hockey— ROSANNE K. E. PRINSEN, DANIEL G. SYROTUIK, AND DAVID C. REID	185
--	-----

PENALTIES, INJURIES, AND PRESSURES

A Psychosocial Perspective of Aggression in Ice Hockey— AYNSLEY M. SMITH, MICHAEL J. STUART, CHERYL M. L. COLBENSON, AND SCOTT P. KRONEBUSCH	199
--	-----

Psychological, Physiological, and Performance Variables in Goalies During Hockey Games— AYNSLEY M. SMITH, MICHAEL J. STUART, AND KATHERINE N. FISH	220
--	-----

Effects of an Intervention Strategy on Body Checking, Penalties, and Injuries in Ice Hockey— PIERRE TRUDEL, DANY BERNARD, ROGER BOILEAU, AND GASTON MARCOTTE	237
--	-----

Tracking the Relative Age Effect Across Minor Amateur and Professional Ice Hockey Leagues— WILLIAM J. MONTELPARE, DAVID SCOTT, AND MICHAEL PELINO	250
---	-----

Amateur Youth Ice Hockey Coaches' Views on Rule Infractions, Aggressive Play, and Injuries during Games— STEPHANE GAUMOND, PIERRE TRUDEL, AND WADE GILBERT	261
--	-----

Differences Between Assessments of Penalties in Ice Hockey by Referees, Coaches, Players, and Parents— PIERRE TRUDEL, JEAN-PAUL DIONEE, AND DANY BERNARD	274
A Profile of Rule Infractions in Bantam Level Ice Hockey— WADE D. GILBERT AND PIERRE TRUDEL	291
Crashing Into Court: Liability Facing the In-Line Skating Industry— RICHARD A. SAWIN, JR. AND BRIAN D. GROSS	302
Indexes	309

Overview

Can there be safety in the game of ice hockey? We certainly hope so! We have made great strides for safer ice hockey in the last two decades. Much has been done to promote the prospect of a game with less injuries and more fun and finesse for the players. More people are playing ice hockey today than at any time in history. There are more professional teams, but the biggest growth is at the recreational level. Women's ice hockey was an Olympic sport for the first time in 1998, and the growth of women's ice hockey at the youth, high school, and college level is phenomenal.

This Symposium is divided into four areas:

1. Injury surveillance. When does an injury become a problem? It is only with proper epidemiological studies that we can find out what the problems are before we start searching for a solution.
2. Discussion of injuries and the handling of injuries.
3. Playing techniques and playing rules.
4. Protective equipment.

Injuries are not part of the game. The purpose of ice hockey is not to injure another player, but to control the puck and to score goals. The purpose of body checking is to separate the player from the puck, NOT to separate the player from consciousness!

The game is different than it was twenty, ten, or even five years ago. The protective equipment is better. The playing rules tend to pay more attention to safety aspects. The coaches are smarter, and the players are smarter. Players at the elite levels may tend to be bigger, stronger, and faster, but the recreational twelve or fourteen year old player hasn't changed that much in stature or skill level. Injuries are still present at all age levels and all skill levels. Our concern must be directed at decreasing the risk for injuries at all age levels and at all skill levels.

There is a four-step approach to decreasing the risk of injuries:

1. Use of protective equipment.
2. Changes in playing rules.
3. Changes in coaching techniques.
4. Awareness programs.

This roughly follows the ideas of Paul Vinger, who along with Thomas Pashby, advocated the use of facial protection with the terrific result of a decrease in the number of blinded eyes in ice hockey.

Catastrophic injuries, such as paralysis due to cervical spine injuries, are still with us. I believe that we have made some inroads into decreasing the risk of paralyzing cervical spine injuries with playing rule changes (severe penalties for checking from behind, which is responsible for 25% to 33% of these injuries), with coaches teaching the proper methods for body checking and for taking a body check, and with an awareness program that these injuries can occur and that techniques do exist to decrease the risk for this injury. At present there is no equipment that can be used easily to prevent this injury.

Everyone agrees that (brain) concussions are a major problem, and head trauma is a major problem in ice hockey at all age levels and at all skill levels. There is no agreement on the

best approach to decreasing the risk for concussions. Helmets and mouth guards may help to decrease the risk for a concussion, but players at the elite level are still sustaining concussions. We have recently come to a general agreement on the definition of different levels of concussions and have roughly associated these levels with return-to-play guidelines. I believe that the important concepts are:

1. A player does not have to lose consciousness in order to have sustained a concussion.
2. Once a player has a concussion, he/she is several times more likely to sustain another concussion during that season.
3. As concussion severity increases, the likelihood of sequelae (long range symptoms) increases.
4. A helmet that fits well, is stable on the head, and stays on the head during play will give the player some protection from serious head trauma.
5. Mouth guards (Type III and Type IV) may provide some protection from serious head trauma.

Alan B. Ashare

St. Elizabeth's Medical Center

736 Cambridge St.

Boston, MA 02135;

symposium chairman and STP editor

Injury Surveillance

ISBN 0-8031-2488-0