LACROSSE SPORTS MEDICINE

Taking Care of America's Fastest Growing Game

MedChi
The Maryland State Medical Society

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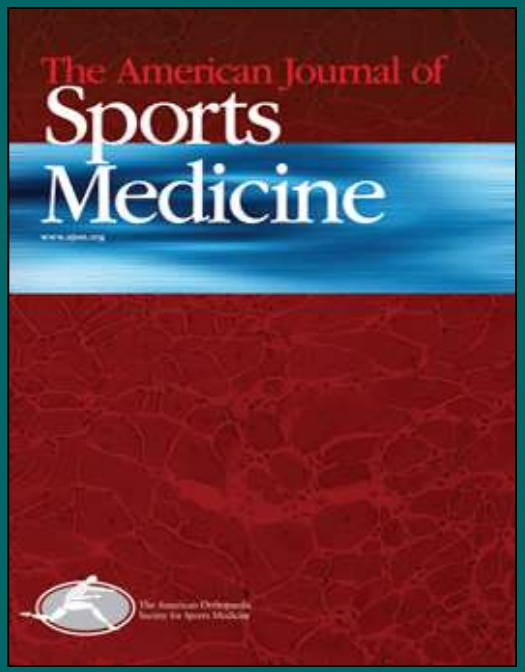
GOALS AND OBJECTIVES

- *Appreciate priority health and safety issues facing the game of lacrosse*
- *Understand the role of US Lacrosse, the national governing body for men's women's, and youth lacrosse promoting in health and safety.*
- *Understand the public health approach to research which has been utilized by the US Lacrosse and MedStar Sports Medicine to investigate and prioritize lacrosse medical conditions*
- *Appreciate the significant differences in men's and women's lacrosse with regard to health and safety.*
- *Appreciate the position of lacrosse as America's fastest growing team sports and some consequences and opportunities associated with this rapid growth.*

LACROSSE SPORTS MEDICINE

- Growing body of sport specific knowledge
- Multidisciplinary
- Real world impact

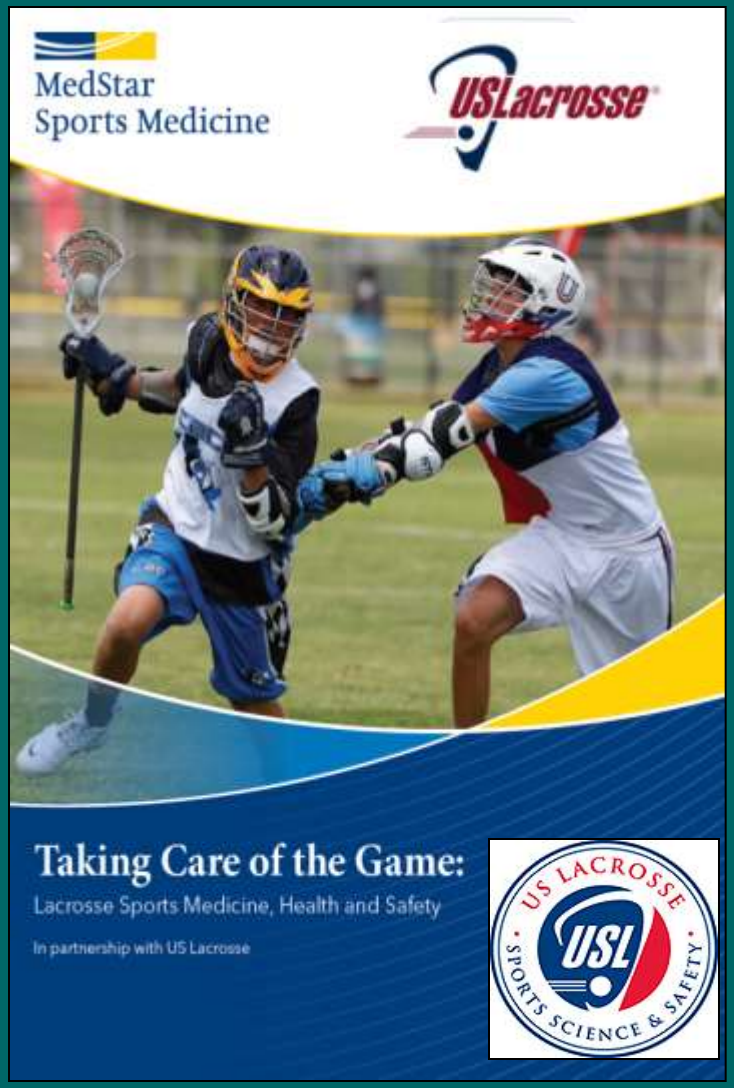


MEDSTAR HEALTH / SPORTS MEDICINE

- Largest, Comprehensive Sports Medicine Program in Mid Atlantic
- Graduate Medical Education Research in Sports Medicine
- Teams and Organizational Partnerships

MEDSTAR: LACROSSE SPORTS MEDICINE

LACROSSE SPORTS MEDICINE: A PARTNERSHIP



- US LACROSSE: *The national governing body for men's. women's, and youth lacrosse*
- Full Circle of Activity
- Public Health Approach to Health and Safety

US LACROSSE

- Unified administrative body established in 1998
- Baltimore based, but national scope
  - 65 national chapters
  - 450,000 members
  - Exponential growth
- Current 18 million campaign for new national headquarters
  - 1million toward health and safety programs
  - 1 million toward expanding play opportunities
- Proactive in health and safety
- Mission: Positive games experience

SPORTING SUCCESS IN AMERICA

- Focus on the Top of the Participation Pyramid
- Multiple Secondary Gain Issues
- Victory at Others Expense
- Professional Play the Picture of Success

US LACROSSE: SPORTING SUCCESS

- Positive Games Experience for the Base of the Pyramid
- Honoring the Game
- Playing the Sport to Learn Life's Lessons
- Health and Safety a Priority
- Can this Model Succeed ?

COMPETE WITH CLASS · USL · HONOR THE GAME

HONOR THE GAME OF LACROSSE!

Respect the ROOTS of Positive Play

Rules: We refuse to bend the rules to win

Opponents: A worthy opponent is a gift that brings out our best

Officials: Show respect even when we disagree

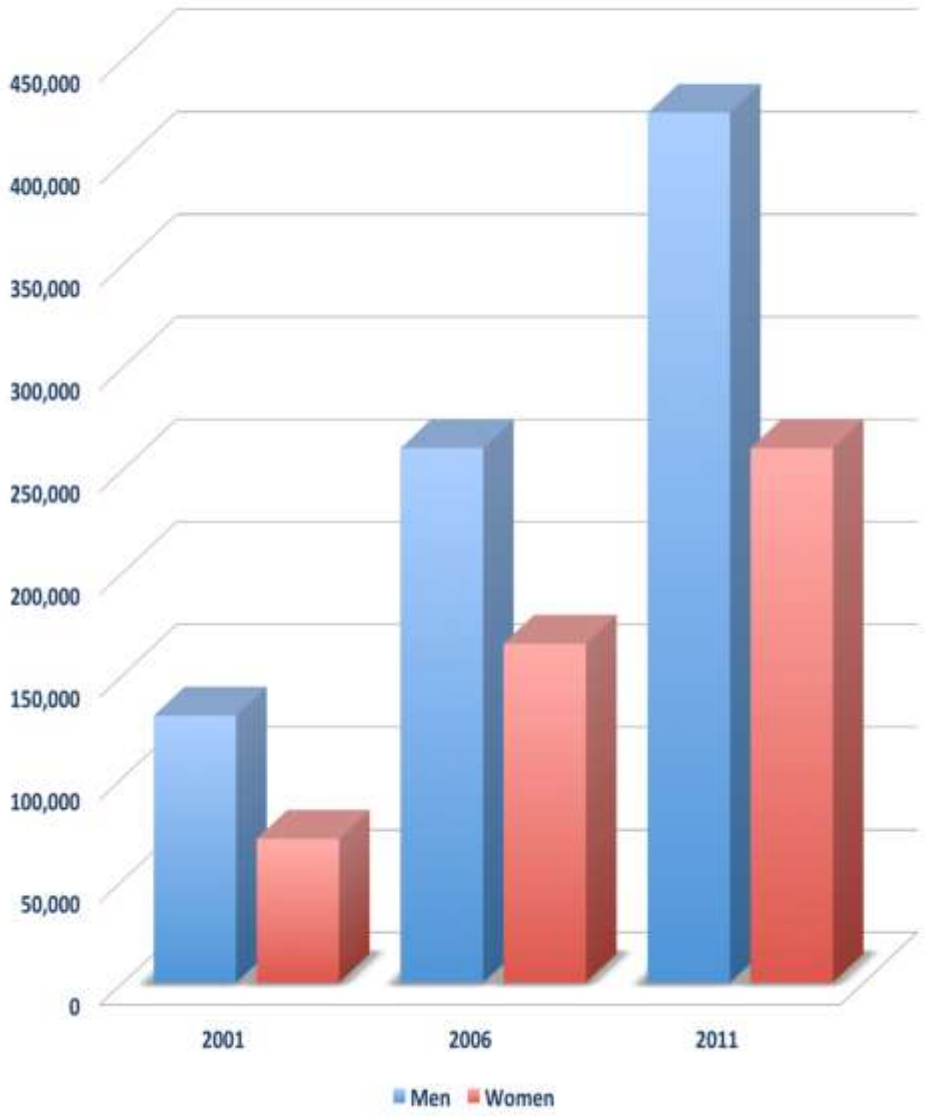
Teammates: Never do anything to embarrass our team

Self: We live up to our own standards even when others don't

BACKGROUND

- Oldest and fastest growing team sport in America
- Unique men's, women's and youth games
- Played by all age groups
- Combination of speed, stick, ball, and contact make for a unique set of injury mechanisms, types, and preventive efforts

LACROSSE PARTICIPATION GROWTH (2001-2011)



MEN'S LACROSSE

Youth: The number of youth boys playing lacrosse has risen 65.5 percent since 2006

High School: Over the last five years, 497 high schools have added varsity boys' lacrosse teams.

College: More than 20,000 men played college lacrosse in 2011, the first time total participation in the category topped that number.

WOMEN'S LACROSSE

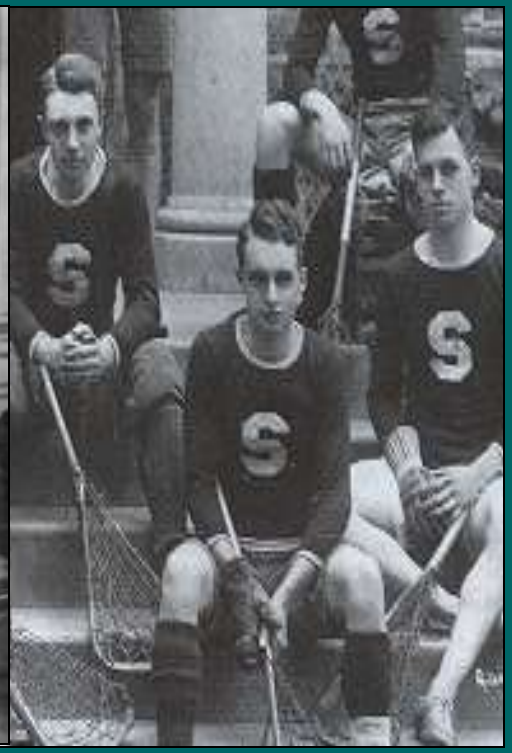
Youth: The number of youth boys playing lacrosse has risen 60.0 percent since 2006

High School: The 2011 National Federation of State High School Associations (NFHS) participation report had lacrosse ranked 10th in total participants in girls' sports, the first time lacrosse was in the Top 10.

College: Eight new Division I women's programs will begin in 2013, pushing the total number of Division I programs to 100.


MONROE LACROSSE

EARLY MODERN GAME



- 1800's: French Pioneers
- 1856: Montreal Lacrosse Club
- 1867: George Beers: Rules Standardization
- 1877: New York University First U.S, College Team
- 1930s: 12 > 10 Players, Reduced Field Size, Protective Equipment, 60 minute games 4 quarters

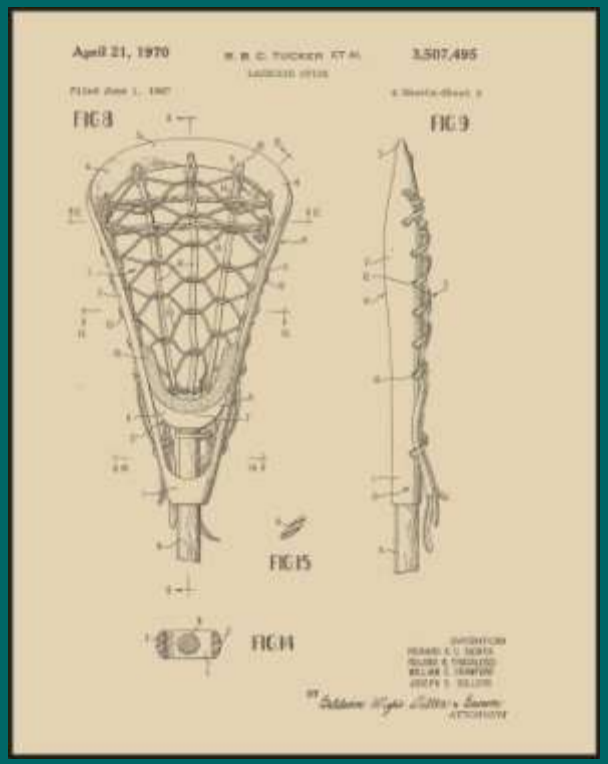
EARLY MODERN GAME

- 1904 – First Olympic play in St. Louis Games (‘08, ‘28, ’32 & ‘48)

MODERN GAME

- Protective head gear first required in men's lacrosse in 1948
- NOCSAE manufacturing standard for men's lacrosse helmets 1986

MODERN GAME



EARLY MODERN GAME

- 1890s: St. Leonard's School in Scotland
- 1926: Bryn Mawr School in Baltimore
- 1931: U.S, Women's Lacrosse Association
- Rules: Maintained Lower Contact, Less Structure than Men's Game

MODERN GAME

US LACROSSE

Sports Science and Safety Committee

- 16 Member Multidisciplinary Committee
- Formed 1999: A priority for US Lacrosse
  - Primary Care
  - Surgical Subspecialties
  - Epidemiologists
  - Health Policy
  - Allied Health
- Committee Liaisons
  - NCAA
  - NFHS
  - NATA
  - Rules Committees
  - Insurance and Risk Management
- Other Affiliations
  - MedStar Research
  - AOSSM / STOP

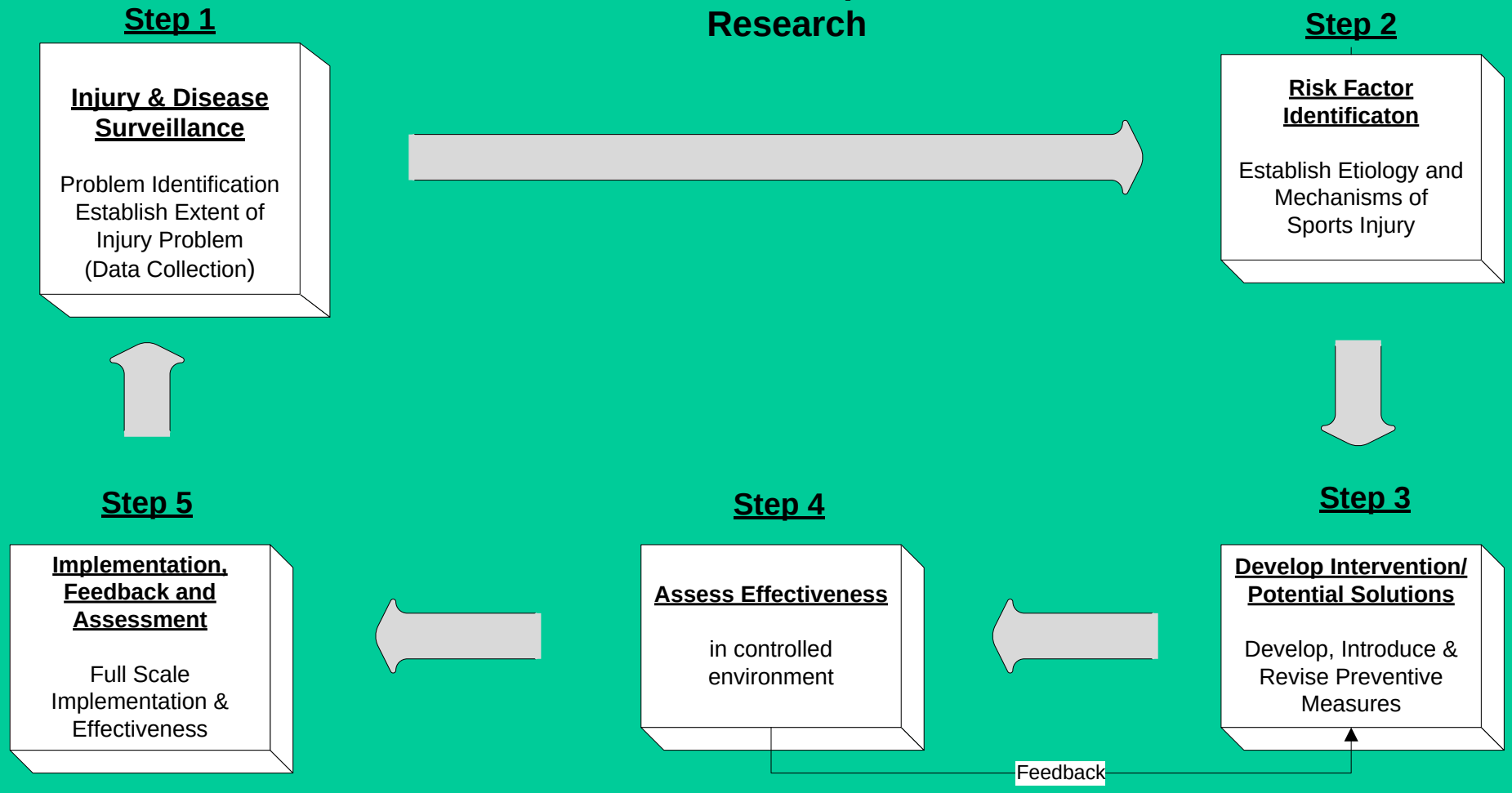
US LACROSSE

Sports Science and Safety Committee

- *"To utilize and grow the body of lacrosse health and safety knowledge to objectively advise US Lacrosse and the lacrosse community on factors to enhance the safety and quality of experience in the sport at all levels of play"*

- Review available Lacrosse specific literature
- Survey of stakeholders
- Initial assessment of priority health and safety issues
- Build research foundation and develop appropriate partnerships
- Conduct and facilitate research
- Comprehensive, Public Health Approach with Real World Applications

The MedStar Advanced Model for Sports Medicine Research



PUBLIC HEALTH APPROACH: STEP 1 /2

Injury & Disease Surveillance

Problem Identification
Establish Extent of Injury Problem
(Data Collection)

- Critical Pre-Cursor to all other steps
- Challenges:
  - Standardized Sports Injury and Exposure definition
  - Statistical Methods to assess spatial and temporal trends in injury incidence

Basic, Descriptive Epidemiology,
the *" Who, What, Where, When and How "*

Sports Injury Surveillance Systems

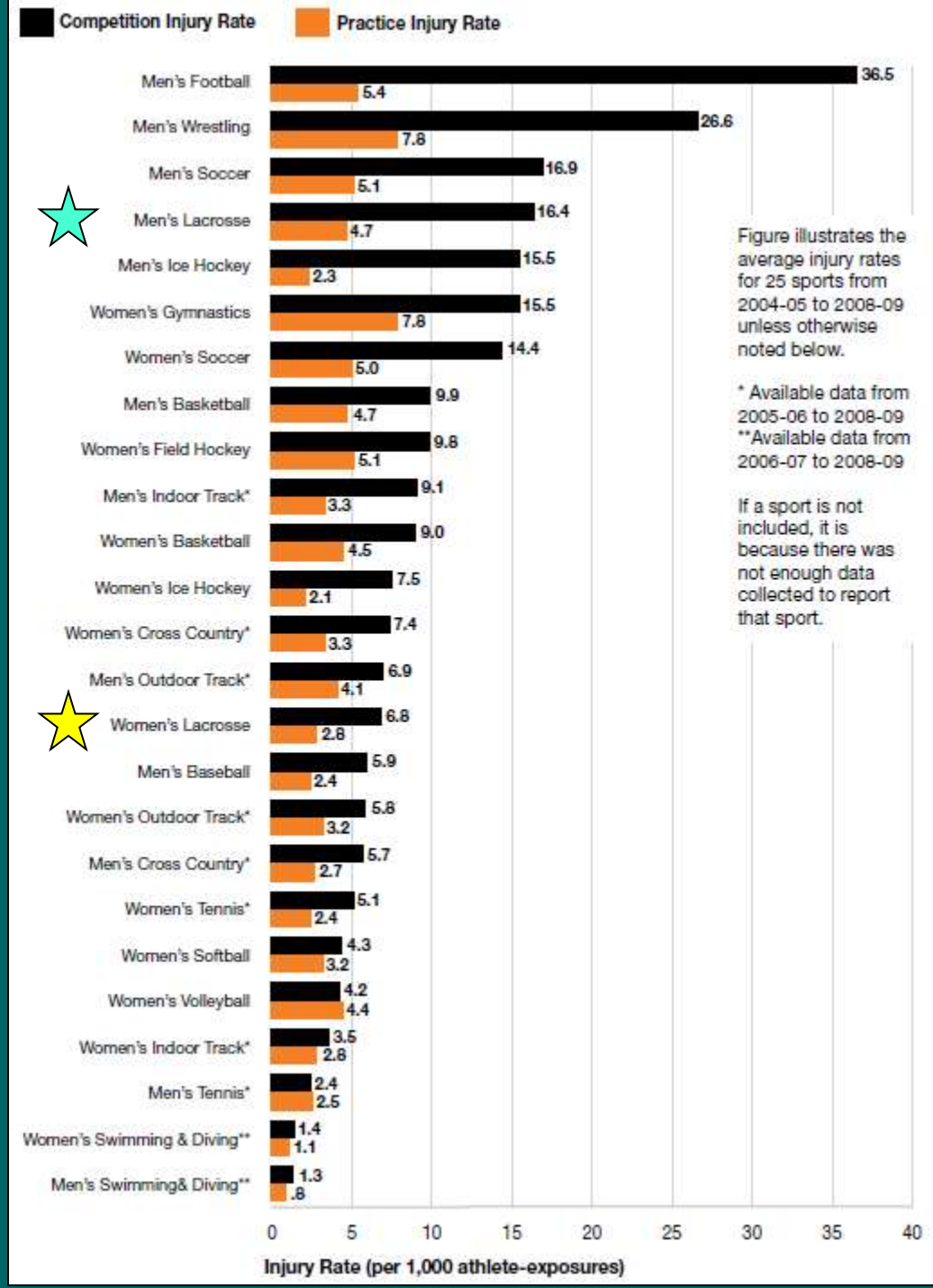
System	Administrator	Pros	Cons	Example study
NCAA Injury Surveillance System (ISS)	Datalys Center	•Web-based •High capture rate •National sample	•Variability in data coding(?) •Limited # of participating colleges	Validity of Soccer Injury Data in NCAA (2011)
Injury Treatment & Tracking System (ITTS)	Fairfax County (VA) Public Schools	•Daily electronic capture of 25 high schools & 27 sports •Includes time-loss and no time loss injuries	•Representative of a single geographic area/school district	Trends in concussion incidence in high school sports (2011)
Reporting Information Online (RIO)	Nationwide Children's Hospital	•Web-based •100 participating high schools with AT •National sample of 12 sports	•Variability in data coding(?)	Sex Differences in Concussion Symptoms of High School Athletes (2011)
National Center for Catastrophic Sport Injury Research	University of North Carolina at Chapel Hill	•Death and permanent disability sports injury data that involve brain and/ or spinal cord injuries	•Based on reports of catastrophic/ fatal injuries	Catastrophic Football Injuries Annual Report (2011)

Injury Surveillance Systems: Hinton, RY Sports Medicine Update, AOSSM Jan / Feb 2012

INJURY RATES: NCAA MENS AND WOMENS LACROSSE

- Men's: Upper 1/3
  - < ½ Football
  - 2 x > Women
  - Game 3.5 x Greater than Practice
- Women's: Lower 1/2
  - < ½ Soccer
  - Game 2.5 x Greater than Practice

2012-13 NCAA® Sports Medicine Handbook



Epidemiology of Lacrosse Injuries in High School–Aged Girls and Boys

A 3-Year Prospective Study

Richard Y. Hinton,*† MD, MPH, Andrew E. Lincoln,‡ ScD, MS, Jon L. Almquist,§ ATC, Wiemi A. Douoguih,† MD, and Krishn M. Sharma,† MD
From the †Department of Orthopaedic Surgery, The Union Memorial Hospital, Baltimore, Maryland, ‡Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, and §Fairfax County Public Schools, Athletic Training Program, Fairfax, Virginia

- Fairfax Co. Virginia: 2 ATCs in Each Public High School
- Data Entry Part of Job Description: High Quality, Real Time
- SIMS Injury System: Prospective, Computerized Injury Tracking System, 1997 – 99 (On Going)
- 25 High School: Boys and Girls Lacrosse
- Boys (combined seasons)
  - 2476 Athletes
  - 136,180 Athletic Exposures
- Girls (combined seasons)
  - 1711 Athletes
  - 85,555 Athletic Exposures

SCHOLASTIC LACROSSE INJURIES: BOYS

Rank Order	Body Part	Nature of Injury	Number of Cases	Incidence Rate[a]	Median Days Lost	Total Days Lost
1	Ankle	Ligament sprain	82	0.39	4.0	557
2	Head/face	Concussion	61	0.29	6.0	520
3	Knee	Ligament sprain	34	0.16	29.0	1880
4	Upper leg	Muscle-tendon strain	26	0.12	7.0	357
5	Head/face	Contusion	21	0.10	1.0	52
5	Wrist/hand	Fracture	21	0.10	19.5	379
7	Wrist/hand	Ligament sprain	20	0.09	3.0	127
8	Upper leg	Contusion	18	0.08	3.0	75
8	Back	Muscle-tendon strain	18	0.08	5.0	120
8	Knee	Inflammation	18	0.08	6.5	316

SCHOLASTIC LACROSSE INJURIES: GIRLS

1	Ankle	Ligament sprain	79	0.54	7.0	972
2	Knee	Inflammation	30	0.21	2.5	619[b]
3	Head/face	Contusion	23	0.16	1.0	55
4	Knee	Ligament sprain	21	0.14	16.0	581
5	Head/face	Concussion	14	0.10	4.0	83
6	Wrist/hand	Contusion	13	0.09	2.0	38
6	Hips	Muscle-tendon strain	13	0.09	7.0	107
8	Upper leg	Muscle-tendon strain	12	0.08	2.5	72
9	Wrist/hand	Fracture	11	0.08	31.0	439
10	Back	Muscle-tendon strain	9	0.06	2.0	39

Head, Face, and Eye Injuries in Scholastic and Collegiate Lacrosse: A 4 Year Prospective Study:

Lincoln, A, Hinton, RY et al AJSM 2007,35,207 - 15

- AOSSM Keystone, CO July 16, 2005: NCAA Research Award
- Most Comprehensive View of Head, Face, and Eye Injuries in Lacrosse Injuries
- Prospective, Multiyear, Well Defined, Quality Data Entry
- Information on Injury Type, Location, Severity, Mechanism and Risk Factors based on Gender, Player Activity, Game Activity, Position Specific to Head, Face, and Eye Injuries
- Scholastic and Collegiate Players: Fairfax Co., Va and NCAA Data

GENDER SPECIFIC INJURY RATES

- Overall Head/Face/Eye Injury Rates Significantly Higher for Women vs. Men
  - Scholastic
    - RR 1.42, 95 % CI 1.09 – 1.86
  - Collegiate
    - RR 1.61, 95 % CI 1.32 – 1.97

GENDER SPECIFIC INJURY

Injury Type and Percentage

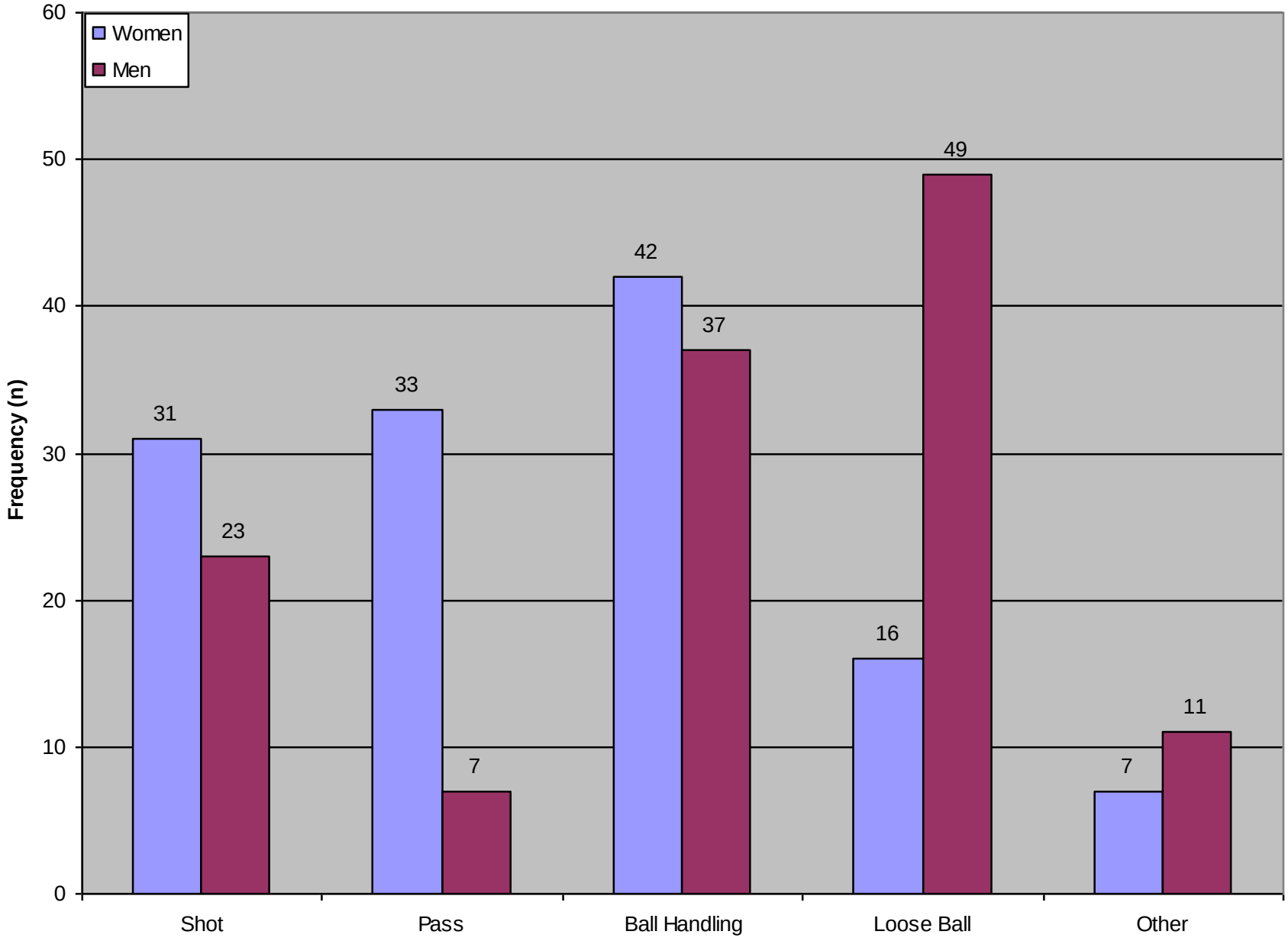
- Men: Scholastic
  - Concussion 73 %
  - Contusion 12 %
  - Fracture 4 %
- Men: Collegiate
  - Concussion 83 %
  - Contusion 12 %
  - Fracture %
- Women: Scholastic
  - Concussion 40 %
  - Contusion 33 %
  - Fracture 14 %
- Women: Collegiate
  - Concussion 43 %
  - Contusion 23 %
  - Fracture 17 %

CONCUSSION

Mechanism, Number, Incidence Rate

- Men, Scholastic
  - Body to Body: 33, 0.11
  - Stick to Body: 14, 0.05
  - Body to Ground: 6, 0.02
- Men, Collegiate
  - Body to Body: 101, 0.27
  - Ball to Body: 11, 0.03
  - Stick to Body: 8, 0.02
- Women, Scholastic
  - Stick to Body: 22, 0.11
  - Body to Body: 6, 0.03
  - Body to Ground: 5, 0.02
- Women, Collegiate
  - Stick to Body: 55, 0.12
  - Ball to Body: 45, 0.10
  - Body to Body: 20, 0.04

Figure 2. Concussions and player activity in collegiate lacrosse, NCAA, 2000-2003



Video Incident Analysis of Head Injuries in High School Girls' Lacrosse

Shane V. Caswell,*† PhD, VATL, ATC, Andrew E. Lincoln,‡ ScD, Jon L. Almquist,§ VATL, ATC, Reginald E. Dunn,‡ BA, and Richard Y. Hinton,‖ MD, MPH, PT
Investigation performed at Sports Medicine Assessment, Research and Testing Laboratory, George Mason University, Manassas, Virginia

MedStar Health Research Institute

American Journal of Sports Medicine, 2012 40: 756 - 62

Video Incident Analysis of Concussions in Boys' High School Lacrosse

American Journal of Sports Medicine, 2013, 41: 756 - 61

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Investigation performed at MedStar Sports Medicine Research Center, Baltimore, Maryland

MedStar Health Research Institute

MECHANISM OF CONCUSSION IN SCHOLASTIC LACROSSE

Injury Characteristics	Boys	Girls
Level of play		
Varsity	22 (65%)	14 (100%)
Junior varsity	12 (35%)	0
Concussion mechanism		
Body check	32 (94%)	1 (7%)
Stick (unintentional)	0	5 (36%)
Stick (intentional)	0	3 (21%)
Collision (unintentional)	2 (6%)	3 (21%)
Ball	0	1 (7%)
Undetermined	0	1 (7%)
Penalty called		
Yes	8 (24%)	2 (14%)
No	25 (73%)	10 (71%)
Unknown	1 (3%)	2 (14%)

MedStar Health Research Institute

PUBLIC HEALTH APPROACH: STEP 3 /4

Develop Intervention/ Potential Solutions

Develop, Introduce & Revise Preventive Measures

Treatment Protocols
Policy Changes
Rule Changes
Coaching Techniques
Training Techniques
Safety Equipment

Assess Effectiveness

in controlled environment

Did the intervention achieve the intended objective?
Were there unintended consequences?
What is the overall effect on health & safety?

Effectiveness of the Women's Lacrosse Protective Eyewear Mandate in the Reduction of Eye Injuries

AJSM 2012, 40: 611 - 14

Andrew E. Lincoln,*† ScD, Shane V. Caswell,‡ PhD, ATC, Jon L. Almquist,§ VATL, ATC, Reginald E. Dunn,† BA, Mark V. Clough,‖ MD, Randall W. Dick,¶ and Richard Y. Hinton,‖ MD, MPH, PT
Investigation performed at MedStar Sports Medicine Research Center, Baltimore, Maryland

TABLE 1
Rates of Injury Before (2000-2003) and After (2004-2009) Introduction of Protective Eyewear in Women's Lacrosse[a]

	2000-2003		2004-2009		
Body Part	Frequency	Rate (per 1000 AEs)	Frequency	Rate (per 1000 AEs)	Rate Ratio (95% CI)
Eye	22	0.10	5	0.016	0.16 (0.06-0.42)
Head/face	33	0.15	21	0.07	0.44 (0.26-0.76)
Concussion	38	0.18	86	0.28	1.6 1.1-2.3
All injuries	406	1.9	543	1.8	0.93 0.82-1.1

[a]Total athlete-exposures (AEs): 212 520 in 2000-2003 and 306 130 in 2004-2009. CI, confidence interval.

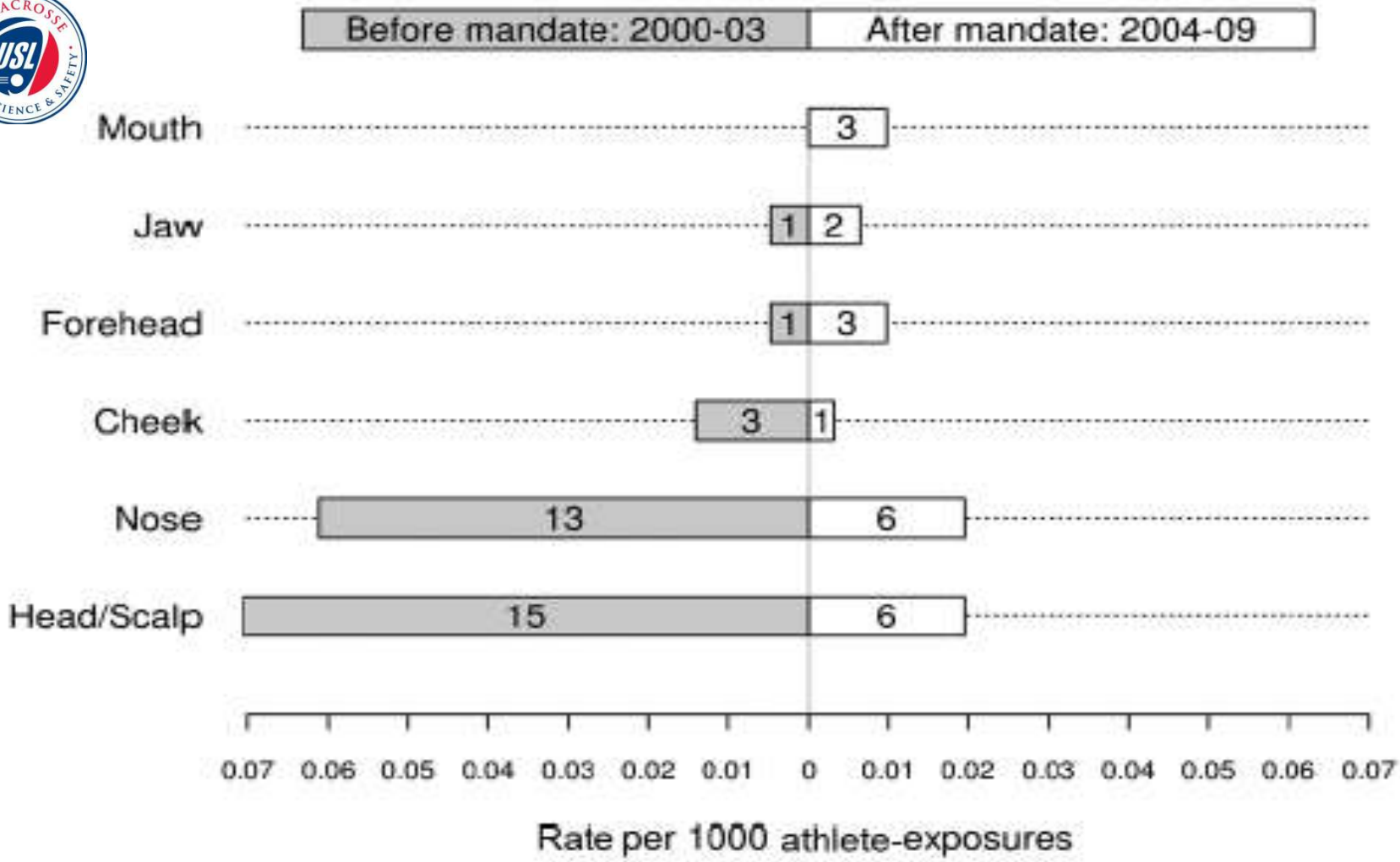


Figure 3. Head/face injuries by area of head and face, before and after introduction of mandated eyewear. Values inside the graph bars indicate number of injuries.

PUBLIC HEALTH APPROACH: Step 5

Implementation, Feedback and Assessment

Full Scale Implementation & Effectiveness

- Implementation Strategy
  - Governing Body Policy
  - Player, Coach and Governing Body Education
- Feedback and Assessment
  - Measure Rates of Adoption
  - Measure Rates of Injury – Step 1 methodology

REAL WORLD IMPACT

- Recent safety related rules changes
- Equipment changes and research
- AED access
- Youth specific rules changes
- Condition specific white papers
- National and regional educational events
- Inclusion of health and safety education as part of national standardized coaching and officials certification
- Health and safety requirements for US Lacrosse sanctioned events

LACROSSE:

HEALTH AND SAFETY PRIORITIES FOR THE GAME

Priority Health and Safety Issues

- Education and Games Integrity
  - Lacrosse specific certification
    - Coaches
    - Officials
  - Public Education
    - Individuals
    - Organizations
    - Mass Media
  - Effectively growing the game
    - Participation Priorities
    - Honoring the game
    - Regulating growth
    - Secondary gain issues

Parents' Guide

To the Sport of Lacrosse - 13th Edition

US LACROSSE COACHING EDUCATION PROGRAM

USLacrosse

Priority Health and Safety Issues

- Appreciation of Differences in Men's and Women's Lacrosse
  - One Sport: Two Games
  - History and Culture
  - Rapid Expansion: Filling the Needs for Appropriate Coaching and Officiating

Priority Health and Safety Issues

Differences in Men's and Women's Lacrosse

- Games share
  - Full field, free flowing play
  - Speed, quick change of direction
  - Passing, shooting, stick work
- Men's game
  - Purposeful collision sport
- Women's game
  - Incidental contact
- Changes
  - Men's game currently more specialized and questionably "over coached"
  - Women's game more athletic and subtly becoming more aggressiveness

EQUIPMENT	Shallow pocket rule allows for easier ball dislodgement	Deeper pocket rule requires more aggressive checking
	Protective eyewear and mouth guards	Mouth guards required
	Soft head gear and nose guards optional	Helmets meeting NOCSAE standard required
	Lightly-padded, close-fitting gloves optional	Arm pads, shoulder pads and protective gloves required
	Goalie: helmets meeting NOCSAE standard, chest protectors, throat protectors, mouth guards, gloves required; shin guards optional	Goalie: helmets meeting NOCSAE standard, chest protectors, throat protectors, mouth guards, gloves required; cups recommended; shin guards optional

Priority Health and Safety Issues

Differences in Men's and Women's Lacrosse

- Game specific protective equipment
- Game specific injury prevention strategies
- Game specific injury patterns
- Perception of easy fix. *"Pad the women up and let um play"*

- *Women equipped like men playing a game more similar to men's lacrosse would significantly increase the game's overall injury burden*
- Examples
  - Overall injury
  - Concussions
  - Hand fractures

Priority Health and Safety Issues

- Head / Face / Eye Protection and Concussions
  - Overall low to moderate injury rates, but head injury make up ~ 1/3 of all injuries
  - Priority for men's and women's games
  - Current focus on sport related concussion
  - Multiple interventions possible
  - Multifactorial problem

A Case Against Helmets in Lacrosse

Larry French

Helmets, except for goalkeepers, are banned in women's lacrosse. "This to me is like, come on, you're not serious," Dr. Jack Ryan said. "This is 2011."

By ALAN SCHWARZ

Published: February 16, 2011

HEAD AND FACE PROTECTION:

Why are hard helmets & traditional facemasks not required for women's lacrosse?

While contact to the head is illegal in both men's and women's lacrosse, many of the other rules of the games are very different. Hard helmets / facemasks have not been required or deemed necessary in women's lacrosse because:

- *The nature of women's lacrosse: an incidental contact sport*
- *The risk of head/face injury is on par with other sports*
- *Administrative controls (rules) and educational programs have been created for players, coaches, and officials to teach the nature of the game and reduce exposures*

HEAD AND FACE PROTECTION:

Unique Women's Lax Safety Rules to Minimize Injury Risk

- The "bubble" rule
- No pocket in the stick, making it easier to dislodge ball without player contact,
- Mandatory cards (penalties) for slashing, dangerous play and dangerous follow through
- Penalties for offensive shot taken in an uncontrolled way or without regard of an opposing field player,
- Penalties for defensive field player guarding goal with any part of the body which denies the attacker opportunity to shoot safely in free space

HEAD AND FACE PROTECTION:

The Case Against Helmets

- Hematoma and skull / scalp injuries, of which hard helmets have been designed to prevent, are basically non-existent in this sport.
- Oral, nasal and facial injuries do not occur frequently based on injury surveillance data and are addressed to some extent by the eye guards.
- The existing rules, when enforced, minimize the risk of head and face injuries
- Unintended consequences / change the game
- Honor the tradition, uniqueness of the game

HEAD AND FACE PROTECTIONS:

The Case for Helmets

- Helmets (hard or soft) that support a face mask almost eliminate the risk of oral, nasal, facial injuries, and possible concussion severity, particularly from inadvertent stick and ball

- With rapid growth in sport, there are not enough qualified officials or coaches that understand the foundation of the way the game is played to enforce existing rules.

Priority Health and Safety Issues

- Youth Specific Rules and Safety Information
  - National, standardized rules for boys and girls
  - Games administration incorporating developmental stages
  - Avoiding the professional model trickledown
  - Avoiding burnout and enhancing lacrosse experience
  - Respect for game and others

Priority Health and Safety Issues:

Youth Specific Rules

- Boys Rules Changes
  - Graduated checking in the boys game
  - No long sticks in boys U -11 and under
  - Decrease from 5 to 3 yards distance allowed to advance before contact

- Girls Rules Changes
  - Any check to the head mandatory card
  - Team plays short handed from first card received
  - Field player no longer can step into goal if goalie out of goal area

Priority Health and Safety Issues

- ACL Injuries and other Lower Extremity Injuries
  - ACL injury most common cause of lost game and practice time
  - Greatest insurance payouts through US Lacrosse membership insurance plan
  - Lacrosse specific return to play
  - Nature of lacrosse play
  - Ankle injuries highest frequency

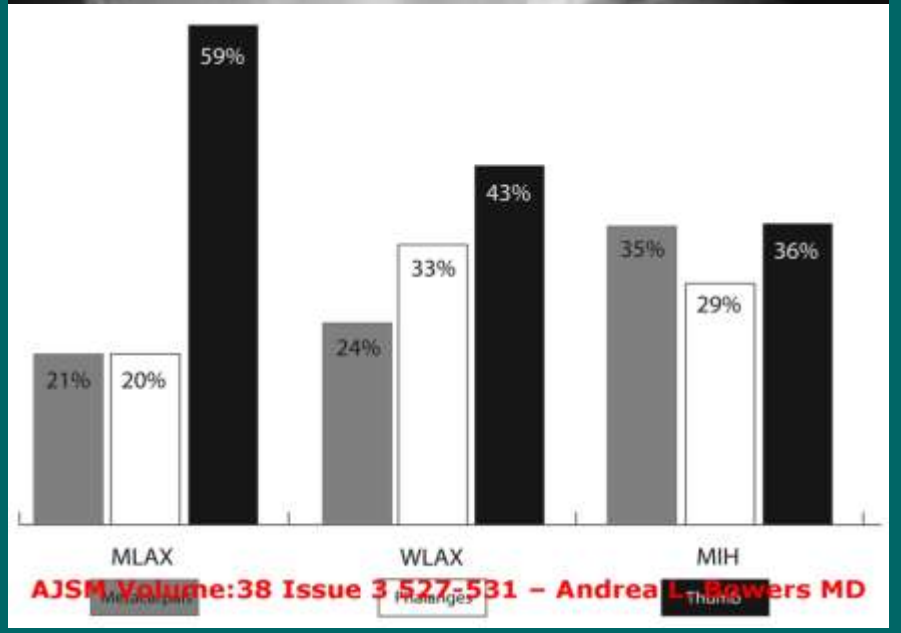
Priority Health and Safety Issues

- Commotio Cordis
  - Mechanism
    - Blunt trauma upstroke T wave
  - Lacrosse specific cases
    - Adolescent males
    - ~ half goalies wearing chest protectors
  - Preventive efforts
    - Education
    - AED access and utilization
    - Equipment changes
      - Chest protection
      - RIF type balls
    - Rules changes
      - Body blocking ball
      - Crowding in front of goal

LA12.ORG

Priority Health and Safety Issues

- Lacrosse specific issues
  - Men's shoulder injuries
    - Shoulder pads
    - Body to body and stick to body contact
    - Contusions, Clavicle fractures, A/C
  - Hand and Wrist Fractures
    - Different patterns based on allowed checking and ball speed
    - Thumb IP Joint Fractures
    - Glove tip protection



Priority Health and Safety Issues

- Dental protection
  - Mandatory
  - Types
- Conditioning
  - Sport specific
- Men's Collegiate Game
  - NCAA drug use survey data


USLacrosse
THANK YOU
Richard Hinton, MD, MPH
MedStar Sports Medicine
US Lacrosse
Sports Science and Safety
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