An Epidemiological Comparison of Elbow Injuries Among United States High School Baseball and Softball Players

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BACKGROUND
• Approximately 1 in 4 high school baseball players pitch.
• The majority of healthy (actively competing) youth baseball players report at least some baseline arm pain, with only 26% of players reporting that their arm never hurt when throwing (Makhni et al. AJSM 2015).
• ~1 injury per 1000 practices or competitions for boys’ baseball and girls’ softball.
• The number of softball athletes has doubled in the past 2 decades.
• The Amateur Softball Association of America annually registers more than 83,000 youth girls’ fast-pitch softball teams with over 1.2 million girls participating.

METHODS
• Baseball- and softball-related injury data from the 2005-2006 through 2014-2015 academic years were collected from the High School Reporting Information Online (RIO) Internet-based data collection tool.
• Included a total of 100 high schools.
• Athlete-exposure (AE) and injury data were collected by certified athletic trainers.
• Rate ratios (RRs) were calculated comparing injury rates in the 2 populations.
• Injury proportion ratios (IPRs) comparing elbow injuries in pitchers and nonpitchers were calculated as the proportion of all elbow injuries in pitchers divided by the proportion of all elbow injuries in nonpitchers.

RESULTS
• A total of 214 elbow injuries in male baseball players occurred over 2,327,774 AEs, for an overall elbow injury rate of 0.92 per 10,000 AEs.
• A total of 75 elbow injuries were reported in female softball players over 1,731,644 AEs, for an overall rate of 0.43 per 10,000 AEs.
• The rate of elbow injury was significantly higher for baseball than softball (RR, 2.12; 95% CI, 1.64-2.77).
• A significantly greater proportion of elbow injuries in baseball were pitching-related compared with those from softball, with 50.2% occurring while pitching in baseball versus 11.0% in softball (IPR, 4.58; 95% CI, 2.35-8.93).
• In baseball there is a significantly higher rate of elbow injury during competition versus practice (RR 2.24; 95% CI, 1.71-2.93).
• If all injuries occurring during pitching were removed from both sports, the difference in elbow injury rate for baseball and softball would no longer be significant (RR, 1.19; 95% CI, 0.88-1.62).

DISCUSSION/CONCLUSIONS
• Injuries to the elbow have a higher incidence rate in baseball than softball.
• These differences are likely attributable to the differences in pitching mechanics.
• If all injuries occurring during the activity of pitching are removed from both baseball and softball, the difference between elbow injury rate in baseball and softball would no longer be significant.

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Table 1. Nature and circumstances of boys’ baseball and girls’ softball elbow injuries, 2005-2006 through 2014-2015

<table>
<thead>
<tr>
<th>Sport</th>
<th>Injury Type</th>
<th>Rate per 10,000 AEs</th>
<th>Injury Proportion Ratio (IPR) *</th>
</tr>
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<tbody>
<tr>
<td>Baseball</td>
<td>Competition</td>
<td>4.4 (95% CI: 1.7-11.2)</td>
<td>1.0 (95% CI: 0.6-1.7)</td>
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<tr>
<td></td>
<td>Practice</td>
<td>3.2 (95% CI: 0.8-12.4)</td>
<td>1.0 (95% CI: 0.7-1.4)</td>
</tr>
<tr>
<td>Softball</td>
<td>Competition</td>
<td>7.8 (95% CI: 3.9-16.1)</td>
<td>1.0 (95% CI: 0.7-1.3)</td>
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<tr>
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<td>Practice</td>
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*Rate ratios compare competition vs. practice with 95% CI shown. Significant differences are highlighted in bold. (IPR, 4.58; 95% CI, 2.35-8.93).

Table 2. Rate ratios for elbow injuries during competition versus practice in baseball and softball

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