Introduction

- The athletic training room, a communal space where athletes receive treatment and recover from athletic competition, has been associated with the spread of infection.
- Training tables, towels, water bottles, and training equipment serve as vectors for bacteria and viruses such as methacillin-resistant staphylococcus aureus (MRSA), vancomycin-resistant enterococcus (VRE), and influenza virus.
- The Centers for Disease Control (CDC) and Duke Infection Control Outreach Network (DICON) have served as templates for infection control protocol in the National Football League and professional sports.
- **Problem:** There is a lack of standardized protocols for infection prevention for high school and collegiate athletics.
- **Purpose:** The purpose of this investigation was to examine the outcomes of a year-long quality improvement study aimed at reducing bacterial and viral burden in athletic training rooms at the collegiate and high school levels by creating an infection control protocol consisting of hand hygiene solutions, surface disinfectants, athletic trainer education, and student athlete teaching.

Methods

- Two suburban high schools and two suburban colleges (Division II and Division III) were selected for the investigation performed during the 2017-2018 academic year.
- High touch surfaces in the athletic training rooms were swabbed for bacteria and viruses. Surfaces included training room benches, door/cabinet handles, water bottle lids, and water cooler nozzles.
- A standardized infection control protocol based upon DICON and CDC principles was implemented in three phases throughout the academic year with surface sampling following each phase (Figure 1).

Phase 1: Athletic training rooms were equipped with alcohol-based hand sanitizer (PURELL® Foam Handwash, GOJO Industries Inc., Akron, OH) and antimicrobial spray for hard surfaces (PURELL® Surface Spray, GOJO Industries Inc., Akron, OH) (Figure 2).

Phase 2: Educational posters were placed in the training rooms and common areas and daily cleaning checklists were placed in training rooms (Figure 3).

Phase 3: Informational slides and handouts were delivered to athletic trainers and distributed to parents, coaches, and student athletes.

- **Primary Outcomes:** Samples were run for aerobic plate count (APC) to quantity bacterial load. Samples were also tested for presence of MRSA, VRE, enterococcus, and staphylococcus species.
- **Secondary Outcomes:** Two adenosine triphosphate (ATP) assays (CHARM® and Hygiena®) were run on samples as surrogates for bacterial load.
- Influenza viral load was obtained on all samples during flu season in November and February.

Results

- A steady, progressive decrease in overall bacterial load, as measured by APC, was noted following implementation of each phase (Figure 4).

<table>
<thead>
<tr>
<th>School</th>
<th>Measure</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>College A</td>
<td>Micro (CFU APC) log mean counts</td>
<td>16.7</td>
<td>16.7</td>
</tr>
<tr>
<td># of MRSA + VRE hits</td>
<td>2/12</td>
<td>2/12</td>
<td></td>
</tr>
<tr>
<td>College B</td>
<td>Micro (CFU APC) log mean counts</td>
<td>16.7</td>
<td>16.7</td>
</tr>
<tr>
<td># of MRSA + VRE hits</td>
<td>2/12</td>
<td>2/12</td>
<td></td>
</tr>
</tbody>
</table>

- **College**
- **School**

- **Mean Results (all surfaces)**

<table>
<thead>
<tr>
<th>School</th>
<th>Measure</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>College A</td>
<td>Micro (CFU APC) log mean</td>
<td>4.467</td>
<td>3.058</td>
</tr>
<tr>
<td># of MRSA + VRE hits</td>
<td>2/12</td>
<td>2/12</td>
<td></td>
</tr>
<tr>
<td>College B</td>
<td>Micro (CFU APC) log mean</td>
<td>4.467</td>
<td>3.058</td>
</tr>
<tr>
<td># of MRSA + VRE hits</td>
<td>2/12</td>
<td>2/12</td>
<td></td>
</tr>
</tbody>
</table>

- **College**
- **School**

Figure 5: Bacterial reduction with breakdown by colleges and high schools.

- **MRSA and VRE**, which were found on 24% of surfaces at Time 0, were eliminated by the end of the academic year (Figure 6).

- **Results**

- **Conclusion**

- The implementation of a standardized infection control protocol focused on student-athlete education and antimicrobial cleaning solutions effectively eliminated multi-drug resistant bacteria and influenza virus while significantly lowering overall bacterial burden in high school and college athletic training rooms.

- Future investigations tracking pathogen incidence and transmission in more schools are warranted to further evaluate the efficacy of this protocol and its effects on infection incidence and outcomes at different institutions in various geographic areas.