The Impact of Orthopaedic Injuries Sustained at an Urban Public Ice Skating Rink
Is It Really Free?

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Abstract

Introduction: Previous reports in the literature from Europe and Asia cite an increased burden on the local emergency departments and orthopaedic services during the operational period of the ice skating rinks. This retrospective observational study was undertaken in order to report the incidence, characteristic, and severity of injuries during a full season at a large urban ice skating rink, as well as to quantify the added burden the ice skating rink places on the local emergency department and the orthopaedic service.

Methods: All patients seen at our emergency room who sustained an injury at the neighboring “free” ice rink were identified over the 4-month period when it was open. The data collected included type of injury, demographics, and need for surgical treatment.

Results: Over this period, 118 patients were seen in our ED (of the 135 referrals from the ice rink logbook); Of these, 43 (38%) required an orthopaedic consult and were evenly divided into upper (22) and lower extremity injuries (21). Sixty-seven percent of the patients were adults, and the most common fractures were ankle and distal radius fractures. There were two open fractures of the distal radius seen in the older patients (both in patients > 50). Overall 32% of patients needed operative treatment.

Of the non-orthopaedic injuries, the most common was head injury (25%).

Conclusions: An ice-rink may be “free” but adds significant burden to the healthcare system, and these costs should be factored in by both the sponsoring body and the healthcare system for treatment of these additional patients.

Seasonal ice skating rinks are popular in urban areas in the USA. In the past decade, we have experienced a rise in the popularity of ice skating, which has led to an increased amount of ice skating rinks being opened in urban centers. Injuries are known to occur among the many first-time skaters during the season, due to their lack of expertise in addition to the inherent risks of skating. The main danger in ice skating, due to its very nature, is falling on the ice, with the consequent risk of acute injuries such as fractures, abrasions, and sprains. The seasonal nature of the ice skating rinks raises concerns about safety. Less experienced skaters may have a tendency to take more risks or consume alcohol before or during ice skating. Previous reports in the literature from Europe and Asia cite an increased burden on the local emergency departments and orthopaedic services during the operational period of the ice skating rinks. Injuries in children are prevalent as well, despite the enforced supervision by an accompanying adult. This study was undertaken in order to report the incidence, characteristic, and severity of injuries during a full season at a large urban ice skating rink, as well as to quantify the added burden the ice skating rink places on the local emergency department and the orthopaedic service.

Methods

A retrospective review of all emergency department orthopaedic surgery consults at a single trauma referral institution from October 2010 to February 2011 was performed in order to identify patients who sustained orthopaedic injuries while ice skating. All orthopaedic consult notes and injury radiographs of the identified patients were assessed. All follow-up office visits from the orthopaedic fracture clinic and any additional available radiographic imaging
were reviewed to determine whether the patient underwent surgical intervention for the injury sustained during his or her ice skating experience. To confirm that all the patients that were included in the cohort sustained their injuries at the local urban ice skating rink of interest, the emergency medical service (EMS) logbook from the specific urban ice skating rink was used to cross reference patients that were referred to our institution. For each of these patients, demographic data, the type of injury sustained, the time of injury, and whether the injury would require operative intervention were recorded. For data analysis, patients were subdivided according to age.

The study was approved by our institutional review board (IRB).

### Results

During the 4-month study period in which the ice skating rink was open, 135 patients were transferred by EMS, and 113 (83.7%) of them were brought to our emergency room. Forty-three patients (38%) required an orthopaedic consult. Other reasons for transfer to the emergency room included head trauma, lacerations, neck and back pain, alcohol intoxication, asthma exacerbation, and chest pain. Table 1 includes a complete distribution of the injuries. Twenty-two of the injuries involved the upper extremity (51.2%), and 21 (48.8%) were to the lower extremity. Injuries were more likely to occur on weekends (72.1%) as compared to weekdays (27.9%). There was no significant difference in the prevalence of injuries based on time of day.

Of those patients who sustained orthopaedic injuries, 29 (67%) were female and 14 (33%) were male. The average age of those injured was 29.5 years of age. (range: 8 to 64 years of age). Twenty-nine (67%) of the patients were adult, while 14 (33%) were pediatric. The most common injuries were ankle fractures (19; 45.2% of all fractures) and distal radius fractures (14; 33.3% of all fractures). Fourteen patients (32.6%) sustained fractures that would require operative fixation. There were two open fractures of the distal radius. Other significant orthopaedic injuries included tibia fractures (N = 2), humeral shaft fractures (N = 3), and terrible triad elbow fracture dislocations (N = 2). Table 2 lists a breakdown of orthopaedic injury by age group.

### Discussion

With the increasing popularity of seasonal ice skating rinks, we sought to quantify the number and types of injuries encountered at our hospital’s emergency room. Our study shows that there is a wide array of orthopaedic injuries that can be sustained while ice skating. In our study, head trauma was the most common injury, accounting for 23% of the transfers to our emergency room. The increased number of

### Table 1 Patient Injury Breakdown

<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>Ankle fracture</th>
<th>Tibia fracture</th>
<th>Distal radius fracture</th>
<th>Scaphoid fracture</th>
<th>Radial head fracture</th>
<th>Elbow fracture dislocation</th>
<th>Humerus fracture</th>
<th>Wrist sprain</th>
<th>Back pain</th>
<th>Chest pain</th>
<th>Asthma exacerbation</th>
<th>Chin laceration</th>
<th>Alcohol intoxication</th>
<th>Face laceration</th>
<th>Finger laceration</th>
<th>Head laceration</th>
<th>Head trauma</th>
<th>Neck pain</th>
<th>Dental injury</th>
</tr>
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<tbody>
<tr>
<td>Total</td>
<td>19</td>
<td>2</td>
<td>14</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>2</td>
<td>10</td>
<td>11</td>
<td>3</td>
<td>26</td>
<td>4</td>
<td>2</td>
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</tbody>
</table>

### Table 2 Orthopaedic Injuries by Age Range

<table>
<thead>
<tr>
<th>Type of Injury</th>
<th>Age &lt; 18 (N = 14)</th>
<th>Age 18-30 (N = 10)</th>
<th>Age 31-40 (N = 7)</th>
<th>Age 40-50 (N = 6)</th>
<th>Age &gt; 50 (N = 6)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle fracture</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>19</td>
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<tr>
<td>Tibia fracture</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
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<tr>
<td>Distal radius fracture</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Scaphoid fracture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Radial head fracture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Elbow fracture dislocation</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Humerus fracture</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Wrist sprain</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
patients with head trauma suggests possible inexperience of the participants or injuries involving direct collision with either barriers or other participants. Prior studies have attempted to correlate the location of the musculoskeletal injury to the experience of the skater and how the skater had fallen. Barr and coworkers found that 98% of their fractures sustained during ice skating involved the upper extremity. These results were consistent with the distribution of injuries seen in prior studies by Clarke and associates, Murphy and colleagues, and Radford and coworkers. Conversely, Lam and associates found 83.8% of their fractures involved the lower extremity. Twenty of the 31 lower extremity fractures were spiral tibial shaft fractures. In our series, there was an equal distribution of upper and lower extremity injuries. This difference may be attributed to a different median age among the skaters or even a difference in the skating boots, but we lack enough information about these possibilities to make any conclusions concerning the differences reported.

The timing of the injuries emphasizes the importance of safety considerations for injury prevention. Our results showed an increased number of injuries occurred on weekends, likely related to the increased volume at the rink on those days. This distribution of the timing of injuries was consistent with Lam and associates who found that 70% of the injuries occurred on weekends or holidays. Larger numbers of participants on the ice predispose to more collisions between skaters and sustaining lacerations from skates. Prior studies have advised wearing gloves to prevent hand lacerations, wrist guards to protect against forearm fractures, or helmets to reduce head trauma. Currently, the skating rink from which the patients were referred does not have any mandatory safety apparel, and to the best of our knowledge, no such regulations are in force in the USA. We do think that in light of the high head trauma injuries proper protection in the form of a helmet for the novice skaters may be in order. Additional measures could include educating novice skaters on proper behavior and limiting the number of participants allowed on the ice at any one time.

There are limitations to our study, most notably the small sample size, and that it was limited to one ice skating rink in one city. However, our study did capture over 80% of the patients injured at the one rink. Further, we do not have an estimate of the number of total participants at the skating rink during the 4 months that it was open. The financial impact of these injuries is considerable. While the exact cost of an emergency room visit at our institution is not known, Caldwell and coworkers reported an average emergency room visit costs $2,168. Of the 135 patients who were seen by EMS at the ice skating rink, 113 were transferred to our emergency room. Given an average cost of $2,168 per visit, the injuries sustained at the ice skating rink resulted in $244,984 of emergency room fees. This does not include the costs of surgery for the 14 patients that required operative fixation or the outpatient follow-up appointments for the other 29 patients with orthopaedic injuries. Additionally, it is difficult to quantify the economic burden for time away from work.

In the current time of changing healthcare policies, it would seem reasonable for the ice rinks’ operators to make contributions to the local health centers for the cost of treatment of skaters injured at their rinks. This mandate may have the effect of keeping safety measures a top priority.

Disclosure Statement
None of the authors have a financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

References