Injury surveillance in an accident and emergency department: a year in the life of CHIRPP

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Abstract

Background—The design of childhood injury prevention programmes is hindered by a dearth of valid and reliable information on injury frequency, cause, and outcome. A number of local injury surveillance systems have been developed to address this issue. One example is CHIRPP (Canadian Hospitals Injury Reporting and Prevention Program), which has been imported into the accident and emergency department at the Royal Hospital for Sick Children, Glasgow. This paper examines a year of CHIRPP data.

Methods—A CHIRPP questionnaire was completed for 7940 children presenting in 1996 to the accident and emergency department with an injury or poisoning. The first part of the questionnaire was completed by the parent or accompanying adult, the second part by the clinician. These data were computerised and analysed using SPSSPC for Windows.

Results—Injuries commonly occurred in the child's own home, particularly in children aged 0–4 years. These children commonly presented with bruising, ingestions, and foreign bodies. With increasing age, higher proportions of children presented with injuries occurring outside the home. These were most commonly fractures, sprains, strains, and inflammation/oedema. Seasonal variations were evident, with presentations peaking in the summer.

Conclusions—There are several limitations to the current CHIRPP system in Glasgow: it is not population based, only injuries presented to the accident and emergency department are included, and injury severity is not recorded. Nevertheless, CHIRPP is a valuable source of information on patterns of childhood injury. It offers local professionals a comprehensive dataset that may be used to develop, implement, and evaluate child injury prevention activities.

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Injury is a leading cause of death and disability in children and young people worldwide.1,2 In the UK, injuries continue to be the most common cause of death and hospitalisation in children aged 5–16 years,3 and are a significant contributor to long term disability.4 The paucity of reliable and valid data on injury frequency, cause, and outcome has hindered the formulation, implementation, and evaluation of effective injury prevention programmes.5,6 Government mortality and morbidity statistics are useful for examining trends in injury at a national level. However, these national data do not include detailed information on the injury event, and are generally insensitive to differences in local patterns of injury.

Several local injury surveillance systems have been developed to fill this gap. One of these systems, CHIRPP (Canadian Hospitals Injury Reporting and Prevention Program), was first established in Canada in 19907 and imported to the accident and emergency (A&E) department at the Royal Hospital for Sick Children in Glasgow in 1993.2 CHIRPP is a computerised information system that collects and stores data on patients presenting with injuries or ingestions to A&E departments. The emphasis is on collecting injury event data rather than information on clinical outcomes.

Introduced initially as a pilot scheme,8 CHIRPP has become an integral part of the routine work in the Royal Hospital for Sick Children A&E department. Completion rates of CHIRPP forms have gradually improved, reaching over 90% of children presenting with injuries and ingestions by the end of 1996. Our paper provides an overview of the data collected in 1996.

Methods

We collected data using a standardised CHIRPP form. The first part of the questionnaire was completed by the parent or accompanying adult. Questions related to the incident location, circumstances, mechanism, and any products involved. The attending clinician then completed the second part of the questionnaire that records the nature of the injury, the part of the body affected, and whether the patient was treated at A&E or referred elsewhere. Data were cleaned, computerised, and analysed using SPSSPC for Windows. We assessed differences between groups using the χ² test. We used a one sample Student’s t test to assess the significance of seasonal variation in attendances.

Results

A total of 7940 CHIRPP forms were completed for children presenting to the A&E department with a history of injury or poisoning. Of these, 6950 (88%) children had 7539 injuries. No injuries were detected on clinical examination in the remaining 990, who presented with a history of trauma (12%). These children were sent home with no further
treatment or referral. Single injuries were detected in 6360 (80%) children and multiple injuries were identified in 590 (7%).

AGE AND SEX OF STUDY POPULATION
Over half (58%) of the children presenting were boys, with boys presenting more frequently than girls at all ages (table 1). Attendance numbers declined with increasing age, broadly reflecting the age distribution of children resident in the Glasgow city local authority area: in 1995, 35% of children resident in Glasgow were aged 0–4 years, 34% were aged 5–9 years, and the remaining 31% were aged 10–14 years.

SEASONAL VARIATION
A significant peak in presentations was seen in the summer months (June, July, and August) (p < 0.01) (fig 1), with the highest absolute number of attendances recorded in August, when 920 children presented. A peak occurred in the summer months for all age groups, and for most injury types. The exception was foreign body injuries, the number of presentations of which fluctuated throughout the year.

INJURY TYPE
Cuts and lacerations, haematoma and bruising, and fractures accounted for over half of the injuries presented (table 2). The small number of children admitted to hospital with these injuries had usually sustained multiple injuries. The highest proportion of hospital admissions was among children who had sustained a fracture (16%).

Boys presented significantly more frequently than girls with cuts and lacerations (p < 0.01). Conversely, girls presented significantly more frequently with sprains and strains and foreign bodies in soft tissue (p < 0.01). A higher proportion of the study population who sustained injuries from foreign bodies in soft tissue and ingestions were in the 0–4 year age group (p < 0.01). Most of these injuries occurred at home. In contrast, a significantly higher proportion of the study population who sustained fractures, sprains, strains, and inflammation/oedema were 10–14 years old (p < 0.01). Many of these injuries were sustained outside the home, most frequently on public footpaths, in playgrounds, and in sports areas.

INJURY LOCATION
Almost half (48%) of injuries could be described as “home accidents”—that is, injuries sustained either in the child’s or another person’s home. Other common injury locations were public footpaths (18%), school playgrounds (8%), public playgrounds (6%), school buildings (indoors) (4%), and private enterprises (shops, cinemas, and restaurants) (2%). The remaining 14% of injuries occurred in a diverse range of locations. The proportion of injuries occurring at home declined with age. Over three quarters (77%) of children aged 0–4 years at presentation were injured at home, compared with 40% of 5–9 year olds and 25% of 10–14 year olds.

BODY PART INJURED
The face, cheek, and scalp were the most commonly injured body parts with injuries caused by cuts and lacerations, haematoma and bruising, inflammation and oedema, and superficial abrasions. Sprains and strains of the ankle were most frequent. The radius and ulna were the most common body parts fractured. Foreign bodies were most frequently removed from the nose.

Discussion
Our data suggest that greater numbers of children are injured during the summer months. Injuries presenting to the A&E department peaked during August, when Scottish schools were on summer holiday. This is consistent with the findings of other studies. In Toronto, the highest numbers of presentations to A&E

<table>
<thead>
<tr>
<th>Injury type</th>
<th>n</th>
<th>% of all injuries</th>
<th>Age group most frequently presented</th>
<th>Sex most frequently presented</th>
<th>Most commonly injured body part</th>
<th>Occurring at home (%)</th>
<th>Admitted to hospital (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuts/lacerations</td>
<td>1611</td>
<td>21</td>
<td>5–9*</td>
<td>Boys*</td>
<td>Face/cheek/scalp</td>
<td>47</td>
<td>3</td>
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<tr>
<td>Haematoma/bruise</td>
<td>1435</td>
<td>19</td>
<td>0–4*</td>
<td>Boys</td>
<td>face/cheek/scalp</td>
<td>48</td>
<td>2</td>
</tr>
<tr>
<td>Fracture</td>
<td>946</td>
<td>13</td>
<td>10–14*</td>
<td>Boys</td>
<td>Radius/ulna</td>
<td>31</td>
<td>16</td>
</tr>
<tr>
<td>Sprain/strain</td>
<td>912</td>
<td>12</td>
<td>10–14*</td>
<td>Girls*</td>
<td>Ankle</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>Inflammation/oedema</td>
<td>897</td>
<td>12</td>
<td>10–14*</td>
<td>Girls</td>
<td>Face/cheek/scalp</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>Superficial abrasion</td>
<td>439</td>
<td>6</td>
<td>5–9</td>
<td>Boys</td>
<td>Face/cheek/scalp</td>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>Ingestion</td>
<td>260</td>
<td>3</td>
<td>0–4*</td>
<td>Girls</td>
<td>Via mouth</td>
<td>85</td>
<td>9</td>
</tr>
<tr>
<td>Foreign body</td>
<td>211</td>
<td>3</td>
<td>0–4*</td>
<td>Girls*</td>
<td>Nose</td>
<td>67</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>828</td>
<td>11</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Total</td>
<td>7539</td>
<td>100</td>
<td>0–4</td>
<td>Boys</td>
<td>Face/cheek/scalp</td>
<td>48</td>
<td>4</td>
</tr>
</tbody>
</table>

Other injuries include burns, crushing injury, soft tissue puncture, bites, concussion, and dental injury.

*p < 0.01.

NA, not applicable.
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40% of children were injured in the home. Data showed that almost half of the proportion of home injuries with increasing age. However, as children grow older, an increasing proportion of injuries occur outside the home: in playgrounds, on public footpaths, at sports venues, and on school premises. The Victorian Injury Surveillance System (VISS) in South Australia also identified a downward trend in the proportion of home injuries with increasing age. According to VISS, home injuries were 7.5 times more likely to occur to a child aged 1 year than a child aged 14 years. The high proportion of injuries occurring in the home might reflect the amount of time children spend at home, rather than the home being a more hazardous environment than elsewhere.

Location also appears to exert an effect on the type of injury children sustain at various stages of childhood. Fractures, for example, are a particular cause for concern because a high proportion require hospital admission. In our data, over two thirds of fractures in 10–14 year olds were sustained outside of the home. Further analysis of data on fractures revealed that concrete surfacing appeared to be a substantial problem on footpaths, playgrounds, and other sports surfaces. A recent study in Wales found that children sustained significantly more injuries in playgrounds with concrete surfaces than those with softer surfaces, such as bark and rubber. While emphasising that these surface types cannot be considered in isolation from the design of play-ground equipment, the authors supported the use of bark and rubberised surfaces in playground design. Similarly, as a result of injury surveillance findings in southern Australia, the injury control unit of the South Australian Health Commission has focused on improving playground surfaces as a target intervention.

Our CHIRPP data suggest that this would also be a sensible recommendation in Glasgow.

Ingestions seemed to affect 0–4 year olds disproportionately, with almost one in 10 presentations resulting in hospital admission. These incidents occurred mostly in the child’s home. This is consistent with the findings of CHIRPP in Canada, where ingestions were most common among 2 and 3 year olds. Further analysis of the Glasgow CHIRPP data showed that almost half of affected children ingested either capsule or liquid medications. This highlights the need to prevent young children from gaining access to such products.

The pattern of injuries varied with sex. For example, a significantly higher proportion of 5–9 year old boys had cuts and lacerations than did girls. Conversely, a significantly higher proportion of 10–14 year old girls had a sprain or strain than did boys in this age group. Overall, there was a disproportionately large number of boys in the study population. Whether this is because of a higher injury incidence among boys, or because of a greater tendency for injured boys to be brought by their parents to A&E departments is unclear.

Three methodological limitations of the Glasgow CHIRPP should be recognised. First, it is not population based. The RHSC is located to the north west of Glasgow city centre and as such attracts a disproportionate number of patients from the north and west of the city. Other A&E departments across Glasgow, although not exclusively for children, treat a large number of injured children each year. These presentations are not currently monitored. Second, CHIRPP contains no information on children presenting to primary care with minor injuries. Third, no formal measure of injury severity is recorded by CHIRPP. Future injury surveillance initiatives in the city need to address these problems.

Although national or regional data on injuries derived from mortality databases and hospital discharge records can provide limited information on the more severe end of the spectrum of injuries, the establishment of local injury surveillance systems has been advocated as a prerequisite for the development and evaluation of injury prevention strategies. CHIRPP generates valuable information on patient demographic characteristics, the circumstances leading to injuries, and the nature of the injured sustained, and helps identify population subgroups who may be at greater risk of injury. These insights are important for planning preventive strategies.

Although those involved in injury prevention require data on which to base their efforts, the implementation of an injury surveillance system for childhood injury is only a first step. The greater challenge is for professionals and agencies to use injury surveillance data to develop, implement, and evaluate specific injury prevention measures.

We are grateful to the staff from clinical audit at the Royal Hospital for Sick Children in Glasgow, particularly Liz Meenan and Stephen Beaton, for their assistance with the CHIRPP project. Thanks also go to the staff at the A&E department for their assistance with data collection.


