Injuries and their relation to potential hazards in child day care

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Abstract

Objectives—To prospectively determine the incidence rate of injuries that required medical attention among children in day care and to identify possible hazards related to these injuries.

Setting—King County, Washington.

Methods—Prospective cohort study of children in a sample of licensed day care facilities.

Results—From 1 July 1992 to 30 June 1993, 53 medically attended injuries were reported by 133 day care sites; incidence rate 1.9 per 100 000 hours of day care attendance. The rate of injury in 91 small family day care homes was essentially the same as that in 42 larger day care centers; relative rate 1.0 (95% confidence interval 0.6 to 1.9). Injuries that required sutures accounted for 39% of the cases, while 17% required a cast, splint, or sling. No child was hospitalized. Sixty nine sites were inspected and all had potentially correctable physical hazards, with a median of 15 hazards per site (range 7 to 26). These potential hazards had little relationship to the risk of injury and a case-by-case review identified only two injuries that might have been prevented by a more energy absorbent playground surface.

Conclusions—The incidence of medically attended injuries found in this study is consistent with other studies from the United States. Most injuries were minor and had little relation to physical hazards at day care locations.

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period. Slightly over half of the reporting day care sites were surveyed for physical hazards and this information was analyzed to see if these potential hazards were related to the risk of injury.

Methods

CASE ASCERTAINMENT

King County, which includes the city of Seattle, is the largest county in Washington State, with a population of 1 587 700 in 1993.¹³ In 1992, there were 2188 day care facilities licensed in King County. Facilities were selected randomly and invited to join the study, with a goal of recruiting 200 sites that would prospectively report injuries occurring between 1 July 1992 and 30 June 1993. Providers were not asked to participate unless they provided day care to children less than 5 years of age and planned to remain open during the study period. At the start of the reporting period, half the participating sites were randomly selected to undergo an inspection. Observations were recorded on a survey form to assess the presence of 28 potential indoor hazards (for example hot tap water > 120°F) and 40 potential outside hazards (for example climbing equipment ≥ 7.5 feet in height).

During the study period each day care provider was asked to complete a form which gave the actual hours of day care provided each week, stratified by child's age. Providers were also asked to report, by phone and mail, any injury to a child that involved medical attention. Medical attention was defined as a call or visit to a nurse, physician, dentist, clinic, or hospital. When an injury was reported, the day care provider was interviewed by phone to obtain information about the circumstances and nature of the injury and its treatment. For each such report, we sought permission from the day care provider to contact the parents, and when this was obtained, we attempted to phone the parents to confirm that the child received medical attention and to have them complete a questionnaire concerning further details about the injury and treatment.

ANALYSIS

Injuries were categorized by age and sex of the victim, circumstances of the injury, and characteristics of the injury and treatment. Total and age specific rates of injury per 100 000 hours of day care exposure were calculated. We compared injury rates for small day care homes, which by law have 12 or fewer children, and larger day care centers, which have 13 or more children and are almost always in facilities

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Previous studies of injuries in day care have varied from those focusing on all injuries, no matter how trivial,^{1–5} to studies that only counted injuries that received medical attention.^{6–12} In the United States, reported rates of medically attended injuries range from 1.5 to 2.5 per 100 000 hours of exposure at day care.^{6–10} A few studies have provided evidence that the rate of medically attended injuries in day care is less than the rate at home.^{7–9, 12}

In 1992 the Seattle-King County Department of Public Health initiated a voluntary reporting system in a sample of licensed day care settings. Participating day care operators were asked to report on all illnesses and injuries. This paper reviews the medically attended injuries reported over a one year

other than residential homes.^{14,15} Poisson regression was used to calculate relative incidence estimates,¹⁶ the association between the total number of potential physical hazards and the incidence of injury was explored using various transformations of the data on number of hazards,¹⁷ and forward stepwise variable selection was used to assess the association between items in the baseline hazard inspection and the subsequent risk of injury.

Results

Ultimately, 1107 day care facilities, slightly over half of all licensed day care sites in the county, were selected for possible participation in the study. Of these, 145 facilities could not be physically located, 223 were planning to close, and 51 did not provide care for children under 5 years of age. Of the remaining 688 selected sites, 255 agreed to participate and only 133 (19% of the eligible providers) submitted reports of hours of attendance during the study period. Many day care operators found the reporting burdensome and only 25 operators submitted reports for ≥ 50 weeks. Day care locations with greater numbers of children were over-represented in the sample compared with all day care providers in the county.

During the one year study period, day care staff reported a total of 56 injuries that they believed required medical attention. Phone follow up with parents revealed that three children had not received medical attention, leaving a total of 53 injuries for analysis. Children aged 1 and 2 years accounted for slightly over half of all the injuries and males accounted for 55%. Complete age specific hours of attendance were reported by 14 day care operators (11%). An additional 93 sites (70%) reported age specific attendance hours for some time period; for other periods, an estimate was made based on the average weekly hours of day care at that site. For the remaining 26 locations, hours of day care were estimated based on the sites' licensed capacity and the average number of hours per child for all sites.

A total of 2 738 279 hours of day care attendance were reported or estimated, resulting in a rate of medically attended injuries of 1.9 per 100 000 hours of day care attendance (95% confidence interval (CI) 1.4 to 2.5). Age specific rates of injury are lowest for infants, are more than fourfold greater for children 1–2 years of age, fall almost to infant levels for 3 and 4 year old children, and rise again for children over age 5 years (table 1).

Table 1 Age specific rates of injuries that received medical attention in King County, WA

Age group (years)	No of injured children	Hours of day care attendance	Injuries per 100 000 hours†	95% CI
<1	1	137 389	0.7	0.0 to 4.1
1 and 2	27	811 240	3.3	2.2 to 4.9
3 and 4	12	1 109 709	1.1	0.6 to 1.9
≥ 5	13	587 844	2.2	1.2 to 3.8
All ages	53	2 738 279	1.9	1.5 to 2.5

*Total hours are greater than the age specific hours because 92 097 attendance hours (3.4% of the total) were reported for children of unknown age. †A test for heterogeneity of the age specific incidence rates was statistically significant ($p = 0.01$).

The age adjusted rate of medically attended injury in 91 small day care homes (≤ 12 children) was the same as that for 42 larger day care centers (≥ 13 children): rate ratio 1.0 (95% CI 0.6 to 1.9). Assuming that attendance in day care was evenly divided by sex, the relative rate of injury was 1.2 (95% CI 0.7 to 2.1) for boys compared with girls.

Specific information could not be obtained concerning some aspects of some injuries. Sometimes the day care operators were not certain how the injury occurred. In some situations the parents either could not be reached for an interview or the interview was refused; interview information was obtained for 36 cases (68%). Only five injuries (9%) were related to climbers, while 21 injuries involved collisions with, or falls onto, ordinary furniture (tables, chairs) (table 2). Injuries occurred more frequently indoors than outdoors. Falls were involved in 70% of all injuries.

Injury to some part of the face or head accounted for 72% of the total (table 2). Sutures were needed by 39%, while 17% received a cast, splint, or sling. One child had outpatient surgery for fracture reduction, but no child was hospitalized. A parent missed one day of work for 29% of the cases, and two days for 12% of the injuries.

Table 2 Circumstances and characteristics of day care injuries that required medical attention (data missing from some categories)

Circumstance or characteristic	No (%)
Equipment (n = 53)	
Furniture	21 (40)
Toy	9 (17)
Climber	5 (9)
Playground surface	5 (9)
Slide	4 (8)
Swing	2 (4)
Other	7 (13)
Location of event (n = 45)	
Play area (indoors)	26 (58)
Eating area (indoors)	1 (2)
Playground (outdoors)	12 (27)
Other outside location	6 (13)
Cause of injury (n = 53)	
Fall from elevated surface	19 (36)
Fall on ground surface	18 (34)
Collision with object	8 (15)
Hit or pushed by child	3 (6)
Bitten by child	2 (4)
Injured by object	2 (4)
Other	1 (2)
Part of body injured (n = 53)	
Face/nose/eye	17 (32)
Mouth/tooth	14 (26)
Head	7 (13)
Arm/wrist/hand	9 (17)
Trunk	3 (6)
Leg/ankle/foot	3 (6)
Days needed to recover (n = 36)	
0	13 (36)
1	9 (22)
2–7	8 (22)
>7	6 (17)
Treatment (n = 36)	
Sutures	14 (39)
Cast/splint/sling	5 (17)
Dental extraction	2 (6)
Surgery	1 (3)
Days of day care missed by child (n = 36)	
0	24 (67)
0.5	2 (6)
1	8 (22)
2	2 (6)

We attempted to relate the survey of potential hazards to the risk of subsequent injury. Because not all day care locations were visited and not all places that had inspections actually contributed data, we obtained both indoor and outdoor hazard survey data for 67 sites with 36 injury events. There were 68 hazard items that could be classified as present or absent; all locations had at least some potential hazards, with a median of 15 (range 7 to 26). We ranked sites by their total number of hazards and divided them into three groups with roughly equal amounts of day care exposure time: locations with < 13 hazards, 13 to 18 hazards, and > 18 hazards. There was no clear tendency for the relative risk of injury to increase across these three groups: compared with sites with < 13 hazards, sites with 13 to 18 hazards had a relative risk for injury of 0.6 (95% CI 0.2 to 1.6) and sites with > 18 hazards had a relative risk of 1.7 (95% CI 0.8 to 3.5); the test for a trend across these categories was not statistically significant ($p = 0.1$). Other transformations of the number of physical hazards (log, square root, first order polynomial, etc) showed no statistically significant association between the number of potential hazards and the incidence of injuries.

We also attempted to measure the association of individual possible hazards with the risk of injury. The single item most closely associated with risk of injury was lack of a smoke detector; the relative risk of injury was 5.3 (95% CI 2.6 to 10.6) in facilities without a smoke detector compared with those with this device. As no child had an injury due to smoke or fire, this association is not likely to be causal. When we eliminated lack of a smoke detector as a candidate variable, two potential hazards were statistically associated with injury: swing without safety straps for children less than 3 years of age and entrapment spaces in a merry-go-round. Neither of these potential hazards, however, was involved in any of the identified injuries. In a case-by-case review, only two injuries could be related to physical hazards: a 4 year old child who fell four feet to pea gravel that was only three inches deep and suffered a fractured elbow, and a 2 year old child who fell three feet to concrete and suffered a possible concussion. Both these injuries might have been prevented by softer surfacing material.

Discussion

Over a one year interval, a sample of day care providers were asked to report all injuries that

required medical attention. The incidence rate of medically attended injuries was 1.9 per 100 000 hours of day care. This estimate could be biased upwards if day care operators erroneously reported that injured children had received medical attention. In 39 cases where we were able to interview a parent, three (8%) reported that no medical care had been sought for the child, and we eliminated those reports. Alternatively, we may have underestimated the true incidence of injury if some day care operators either failed to report that a medically attended injury had occurred or were unaware that a child was taken for treatment after the child left their care. Although we attempted to randomly sample day care locations, most operators either refused to participate or failed to contribute data because they found the reporting system too onerous; therefore, our injury rate estimates may not accurately represent the experience of all King County day care settings.

Nevertheless, the injury rate we estimated is close to that reported by other studies of medically treated day care injuries (table 3). Landman and Landman telephoned Maryland day care centers and asked if any injuries had occurred in the previous five days.⁶ If we assume that the children in that study were in day care for an average of eight hours per day, the incidence rate is 2.4 per 100 000 hours. Sacks and co-workers asked Atlanta day care centers to report medically attended injuries at monthly intervals and found an incidence of 1.8 per 100 000 hours.⁷ Similarly, a study of children attending a medical clinic in Seattle calculated a rate of 2.5 injuries per 100 000 hours of day care.⁸ A nationwide telephone survey of households estimated the rate of injury for 2250 children under age 5, and found an incidence of 2.2 per 100 000 hours of day care.⁹ A nationwide telephone survey of day care centers asked about injuries in the previous two months and reported an incidence of 1.5 per 100 000 hours.¹⁰ All these studies of medically attended injuries in United States day care settings found rates between 1.5 and 2.5 per 100 000 hours, despite different ascertainment sources and methods. In Stavanger, Norway, the incidence of injuries in day care was 1.3 per 100 000, not too dissimilar from the US reports.¹²

The age specific injury rates in our study agree fairly closely with a similar study from Atlanta.⁷ Both found the lowest rates in children less than 1 year of age, and the highest rates for 1–2 year old children and those over age 5 years. These findings are generally consistent with an earlier Seattle study, but the number of cases was small in that study, making the age specific rates less stable.⁸ We found that boys were slightly more at risk for injury (relative risk estimate of 1.2). Although the confidence interval around this estimate included 1, it was consistent with the estimate of 1.14 found in Atlanta day care centers.⁷

In Atlanta, 54% of all day care injuries occurred outdoors and 47% were on a playground.⁷ A national survey reported that 51% of medically attended injuries occurred in a

Table 3 Incidence of medically attended injuries to children in day care from reported studies

Study site	Method of ascertainment	No of injuries	Age range (years)	Incidence per 100 000 hours
Maryland ⁶	Telephone survey of centers	18	2–6	2.4
Atlanta ⁷	Monthly reports from day care operators	143	0–12	1.8
Seattle ⁸	Injuries identified by a prepaid health plan	29	0–5	2.5
USA ⁹	Telephone survey of parents	?	0–4	2.2
USA ¹⁰	Telephone survey of day care operators	566	?	1.5
Norway ¹²	Hospital and emergency department records	96	0.5–6	1.3
This study	Reports from day care operators	53	0–10	1.9

playground.¹⁰ In contrast, we found that only 40% of all injuries happened outside and only 27% were in a playground. This lower proportion of outdoor and playground injuries might be due to chance, but it also may reflect less use of outdoor locations during inclement North-west weather. Indoor play areas and outdoor playgrounds together accounted for 84% of the injuries with a known location in this study; the remaining injuries were either in a dining area or other outdoor locations.

An analysis of playground injuries in Atlanta day care centers revealed that centers with a greater number of playground hazards were more likely to report a medically attended injury.¹⁸ The Atlanta authors also found that taller climbing equipment was associated with fall injuries. These estimates were not adjusted for hours of exposure to day care.

We found little evidence that the number of potential hazards identified by an inspection at the start of the study had any relationship to the risk of injury. While a larger study with more injuries might have more power to evaluate the risk associated with physical hazards, most day care injuries may have little relationship to these potential hazards. We identified only two injuries that might have been due to a physical hazard, whereas most injuries were either due to falls at ground level or collisions with other children and with ordinary furniture. Other studies suggest that day care is relatively safe compared with the home,^{8-10,12} and the injury rate estimated in our data is consistent with that conclusion. In addition, we found no evidence that the risk of injury differed between day care homes and larger day care centers.

The published studies suggest to us that the day care environment is relatively safe for children and current regulations regarding day care safety may be adequate. Large reductions in serious childhood injuries are unlikely to result from further regulation of day care.

Furthermore, surveillance of day care injuries is difficult and time consuming and may not be worth the effort.

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US Congress kills national speed limits

As noted elsewhere, a new act repealing the maximum national speed limit in the US is likely to lead to 'an immediate jump in both travel speeds and crash deaths'. This is what happened in 1987 when states were permitted to raise speed limits on rural interstate highways to 65 mph.

... And motorcycle helmet use laws??

The laws may also be at risk from the same legislation by permitting states to repeal or weaken existing laws in response to congressional abandonment of federal incentives.

... But the good news is less DWI??

The new highway safety law creates an incentive for states to combat alcohol impaired driving among underage drinkers by insisting on 'zero tolerance', under penalty of losing 5 to 10% of their federal highway funds (*Status Report* 1996; 31: 1).