SHORT REPORT

A study of childhood attendance at emergency departments in the West Midlands region

A Downing, G Rudge

Emerg Med J 2006;23:391–393. doi: 10.1136/emj.2005.025411

Introduction: Research into childhood attendance at EDs in the UK has focused mainly on injury rather than medical conditions and studies have been relatively small. This study looks at all types of ED attendance by children across a large population.

Data and methods: Routine data on all new attendances by children under 16 years were available for 12 EDs in the West Midlands (period: 1 April 2002 to 31 March 2004, 365 695 records). The data were split into four age groups (<1, 1–4, 5–9, and 10–15 years).

Results: Injury related conditions increased with age (with the exception of head injury). Respiratory and gastrointestinal were the most common medical conditions decreased with age. 11.5% of children were admitted to hospital and this varied from 8.2% (10–15 years) to 24.2% (<1 year).

Conclusions: This study has shown substantial variations in ED attendance by age and has given an insight into the variation among hospitals. This is the largest study of childhood ED attendance undertaken in the UK, and it is hoped that the questions raised will prompt more research in this field.

Research into childhood attendance at emergency departments (EDs) in the UK has focused mainly on injury related conditions. Many of these have looked at specific types of injury, such as sports injuries¹ and fractures,^{2,3} and most were based in a single ED. There have been few studies focusing on attendance for medical conditions. One such study by Armon *et al* found that breathing difficulty, febrile illness, and diarrhoea and/or vomiting accounted were the most common medical conditions in 0–15 year olds.⁴ Several studies have looked at all types of ED attendance, both injury and non-injury—for example, Boyle *et al* looked at the changing use of one children's ED over a 12 year period.⁵ Another study by Simons looked at 375 children under five years of age attending a district general ED.⁶

This study looks at all types of ED attendance at a number of hospitals in order to report on the use of EDs by children across a large population. It looks at the most common conditions diagnosed and the outcome of attendance, and how these vary by age. It also looks at some of the variation among different EDs.

DATA AND METHODS

The Accident & Emergency Commissioning Data Set (CDS)⁷ is collected in computerised EDs and records information on every attendance made. In the West Midlands region (consisting of Birmingham and the Black Country, Shropshire and Staffordshire, and West Midlands South Strategic Health Authorities), the CDS is collected by the West Midlands Accident & Emergency Surveillance Centre,

located at the University of Birmingham. Data on all new ED attendances by children aged under 16 years of age were available for 12 departments in the West Midlands for the period 1 April 2002 to 31 March 2004 (365 695 records). The remaining eight departments had not submitted any data or had not submitted data for the time period required. The data were split into four age groups for comparison: <1 (n = 22 039), 1–4 (n = 131 321), 5–9 (n = 84 275) and 10–15 years (n = 128 060). The number of attendances by hospital is shown in table 1 along with other information, such as hospital type.

RESULTS

In general, injury related conditions such as soft tissue inflammation and fracture/joint injury increased with age (table 2). The exception to this was head injury, which was more common in those under five years of age. Overall, injuries accounted for 63.0% of all diagnoses. When split by age group, injuries accounted for 16.1% in the under 1 year, 48.4% in the 1–4 years, 68.3% in the 5–9 years, and 76.8% of the 10–15 years.

Looking at medical conditions, these accounted for 21.9% of attendances. The most common medical diagnoses were respiratory (5.7% of attendances) and gastrointestinal conditions (3.7% of attendances). In contrast to injuries, the proportion of these conditions decreased substantially with age.

Table 1 shows the percentage of attendances by each age group at each hospital. Overall, 6.0% of attendances were by the less than 1 year group, 35.9% by the 1–4 years, 23.1% by the 5–9 years, and 35.6% by the 10–15 years. Generally, the hospitals followed the same pattern, with most attendees in the 1–4 and 10–15 years age groups. Hospital 3, the children's hospital, showed a different pattern with a much higher proportion of attendances by younger children and a lower proportion by older children.

There was a large variation among the hospitals in the proportion of children admitted from the ED and this was most apparent in the younger age groups (table 3). In the <1 year the figure varied from 12.4% in hospital 3 to 55.9% in hospital 7, and in the 1–4 years it varied from 6.8% in hospital 3 to 26.9% in hospital 7. There was less variation between the hospitals in the 5–9 and 10–15 year age groups.

DISCUSSION

In this study, injuries accounted for 63% of all attendances by children aged less than 16 years. The figures reported in previous studies vary from 34.4–52.1%.^{6,8} It is likely that these differences are because of the categorisations used, as well as the study sizes.

The frequency of injury related conditions increased with age. Some of the factors associated with this include

Abbreviations: CDS, Commissioning Data Set; ED, emergency department

Table 1 Hospital characteristics, number of attendances, and percentage by each age group

Hospital ID	Type	Location*	All age attendances	Child attendances	Percentage of child attendances			
					<1 years	1–4 years	5–9 years	10–15 years
1	DGH	Rural	85 400	18 723	3.4	30.4	23.4	42.9
2	DGH	Rural	98 712	19 662	2.9	28.7	24.2	44.3
3	CH	Urban	82 117	80 593	10.7	46.7	21.6	21.0
4	TH	Urban	179 419	26 730	8.7	37.9	22.7	30.7
5	DGH	Urban	179 219	37 454	4.0	32.7	23.7	39.7
6	DGH	Rural	110 752	22,870	3.0	29.9	24.0	43.0
7	DGH	Rural	103 871	19 679	2.9	27.9	23.5	45.7
8	TH	Urban	125 915	25 492	5.3	35.4	24.0	35.3
9	DGH	Rural	80 134	16 567	2.9	30.5	24.0	42.7
10	TH	Urban	226 400	46 976	7.1	35.7	22.1	35.1
11	DGH	Urban	134 821	30 002	5.1	35.3	23.9	35.6
12	DGH	Rural	102 345	20 947	2.5	29.6	23.9	44.1
All			1 509 105	365 695	6.0	35.9	23.1	35.0

CH, Children's Hospital; DGH, District General Hospital; TH, Teaching Hospital.

*Urban: within Birmingham and the Black Country, and Coventry conurbations; rural: outside the main conurbations.

Table 2 Twenty most common diagnoses by age group (percentage and total number*)

Diagnosis	<1 year	1–4 years	5–9 years	10–15 years	All ages	Total attendance
Soft tissue inflammation	2.6	8.3	14.9	23.7	15.7	23 357
Diagnosis not classifiable	36.3	13.3	9.8	8.8	11.7	17 385
Laceration	0.5	12.3	16.5	9.4	11.6	17 265
Dislocation/fracture/joint injury	0.7	4.2	10.0	14.3	9.4	14 037
Head injury	9.4	10.9	7.7	4.6	7.6	11 269
Contusion/abrasion	1.3	4.6	7.2	9.1	6.9	10 221
Respiratory conditions	15.3	10.5	4.1	1.7	5.7	8514
Sprain/ligament injury	0.1	1.1	4.2	9.3	5.1	7525
Local infection	7.8	7.4	4.2	1.9	4.5	6696
Gastrointestinal conditions	9.7	5.0	3.0	2.5	3.7	5559
Foreign body	0.3	3.4	3.9	1.7	2.7	4081
Nothing abnormal detected	5.0	2.4	1.6	1.0	1.8	2659
Ophthalmological conditions	1.3	1.5	2.0	1.8	1.7	2574
Muscle/tendon injury	0.1	0.5	1.5	3.0	1.7	2533
ENT conditions	0.6	2.2	2.1	1.1	1.7	2482
Poisoning	0.5	2.7	0.5	1.3	1.5	2288
Burns and scalds	0.9	2.3	1.1	0.7	1.3	1965
CNS conditions	0.8	2.2	0.8	0.8	1.3	1870
Allergy	1.2	1.2	1.0	0.5	0.9	1318
Bites/stings	0.1	0.7	1.2	0.9	0.9	1315
Percentage of all diagnoses	94.6	96.8	97.5	98.1	97.4	144 913

*Based on those records with complete/valid information (87.3%). CNS, central nervous system; ENT, ear, nose, and throat.

increased mobility and increased participation in sport. Head injury was more common in the younger age groups, as has previously been shown.^{9–11} It is likely that a high proportion

of these were caused by a fall. However, the CDS does not record falls. Data on the circumstances of injuries, such as the activity at the time and the location, are currently not well captured by routine data.¹²

Respiratory disorders have been reported to be the most common medical conditions diagnosed in children followed by gastrointestinal problems.¹³ The same results were found in this study. The proportion of these conditions decreased substantially with age. This is in agreement with previous studies reporting that medical conditions are more common in younger children.^{13–14}

The CDS diagnosis coding scheme consists of 39 broad condition groups. A high percentage of diagnoses (11.7%) were recorded as “not classifiable”—the category used when the presenting symptoms do not fit into any of the condition groups. This may indicate that the current categories do not cover a wide enough spectrum of conditions or it may be that the presenting symptoms are unspecific and a rapid diagnosis is not possible. In this study, medical conditions accounted for 21.9% of attendances. It is likely that a high proportion of the “not classifiable” attendances were actually for medical conditions and so this figure would be an underestimate. The percentage recorded as “not classifiable” was highest in the

Table 3 Admissions from the ED by age group and hospital (percentage of all attendances)

Hospital ID	<1 year	1–4 years	5–9 years	10–15 years	All ages
1	27.3	13.9	9.4	9.1	11.2
2	36.3	15.8	9.4	6.7	10.8
3	12.4	6.8	7.3	8.8	7.9
4	25.3	13.9	8.5	8.7	12.1
5	22.8	12.6	8.2	6.8	9.7
6	22.8	10.5	6.9	6.2	8.2
7	55.9	26.9	13.9	9.3	16.6
8	36.8	19.8	10.7	8.3	14.4
9	35.3	18.7	10.7	7.6	12.5
10	26.2	14.3	9.6	9.2	12.3
11	47.1	22.9	13.5	9.8	17.2
12	44.8	20.5	10.1	7.9	13.0
All hospitals	24.2	13.9	9.4	8.2	11.5

<1 year age group (36.3%). It has been reported that it can be difficult to assess symptoms in very young children as they tend to be unspecific such as crying and feeding difficulties,¹⁴ which may be one reason for the high figure in this group. At present, the only way to investigate this further is to refer back to the original hospital notes.

Several diagnosis coding schemes are in use in the West Midlands and these are not directly comparable. Only six of the hospitals in this study coded diagnosis using the CDS categories. The children's hospital was not one of these and so no comparison could be made with other hospitals about the types of conditions requiring treatment. Another problem with the diagnostic data is that 12.7% of attendances had no diagnosis or an invalid code recorded. Again, the only way to investigate this is to go back to the hospital notes.

Looking at attendances by hospital, the children's hospital saw a higher proportion of younger children. A previous study of injuries in children found that a children's ED dealt with a larger number of under five year olds than a general ED.¹⁵ They suggest that parents of very young children may prefer to take them to a dedicated children's hospital with a less threatening environment. It may also be the case that parents think that a children's hospital will provide higher quality care.

There were also large variations among the hospitals about admissions and this was most apparent in the younger age groups. These variations could be explained by a number of factors: those related to the attending physician, such as training and experience, those related to the patient, such as the severity of the presenting conditions, and those related to the hospital, such as bed availability.

The assessment of acute medical problems in young children requires specialised expertise that does not overlap with that required in adult emergency medicine.¹³ It has been suggested that doctors working in a general hospital are concerned about missing a serious condition, such as meningitis, and so exercise caution and admit more readily.^{16 17}

Severity is difficult to assess. The diagnostic information recorded in the CDS does not provide any indicator of severity. This type of information would be available from triage categories, assigned when a patient is initially assessed, but these do not form part of the CDS and so were not available for analysis.

Further possible explanations include GP referrals, as a higher number of referrals may lead to a higher number of admissions, and transfers, as patients transferred from a general ED to the children's hospital may bypass the ED and go straight to a ward. The effect of deprivation was also considered as higher levels of deprivation are associated with increased attendances^{18 19} and admissions.²⁰ Although there was huge variation among the hospitals when looking at these factors, there was no clear association with the percentage of children admitted (results not presented).

Information relating to the hospital, such as bed availability or the number and type of staff working in the ED, is not available from routine data and so could not be investigated in this study. Type of hospital, whether a teaching hospital or a district general hospital, did not appear to have an effect on the proportion of children admitted.

This is the largest study of childhood ED attendance undertaken in the UK and used data from 12 hospitals in the West Midlands. It has shown substantial variations by age and has given an insight into the variation amongst hospitals. However, there is only one designated children's hospital in the study area and it is not known whether these results would be replicated in other areas of the UK. Many of the questions raised cannot at present be answered using

routine data. It is hoped that this study will prompt more research in this field and that future developments of the dataset will aid this.

ACKNOWLEDGEMENTS

We would like to thank the hospitals and Primary Care Trusts involved in the project.

Authors' affiliations

A Downing, Centre for Epidemiology & Biostatistics, University of Leeds, UK

G Rudge, Department of Public Health & Epidemiology, University of Birmingham, Edgbaston, Birmingham, UK

Funding: The A&E Surveillance Centre was initially funded by the Department of Health and is now funded by the West Midlands Public Health Levy.

Competing interests: none declared

Correspondence to: Dr Amy Downing, Northern & Yorkshire Cancer Registry & Information Service, Arthington House, Hospital Lane, Cookridge, Leeds, LS16 6BQ; a.downing@leeds.ac.uk

Accepted for publication 19 August 2005

REFERENCES

- 1 **Abernethy L**, MacAuley D. Impact of school sports injury. *Br J Sports Med* 2003;**37**(4):354–5.
- 2 **Hassan I**, Dorani BJ. Sports related fractures in children in North East England. *Emerg Med* 2001;**18**(3):167–71.
- 3 **Lyons RA**, Delahunty AM, Kraus D, *et al*. Children's fractures: a population based study. *Inj Prev* 1999;**5**(2):129–32.
- 4 **Boyle R**, Smith C, McIntyre J. The changing utilization of a children's emergency department. *Ambulatory Child Health* 2000;**6**:39–43.
- 5 **Armon K**, Stephenson T, Gabriel V, *et al*. Determining the common medical presenting problems to an accident and emergency department. *Arch Dis Child* 2001;**84**:390–2.
- 6 **Simons JM**. Young children in A&E: a local review. *Paediatr Nurs* 1999;**11**(7):24–7.
- 7 **NHS Information Authority**. NHS Data Dictionary: Accident and Emergency attendance CDS. http://www.nhs.uk/datastandards/pages/ddm/web_site_content/pages/cds_cmds_hes_indices/cds_type_list.asp?shownav=1. Last updated 27 July 04. Last accessed 25 January 06.
- 8 **Cullen A**, Keenan P, Kiberd B, *et al*. A profile of attenders at the A&E department of the Children's Hospital, Temple Street, Dublin. *Ir Med J* 1997;**90**(7):266–7.
- 9 **Brownscombe J**, Simpson N, Lenton S, *et al*. The potential of emergency department injury surveillance data: an illustration using descriptive analysis of data in 0–4 year olds from the Bath injury surveillance system. *Child Care Health Dev* 2004;**30**(2):161–6.
- 10 **Carter YH**, Jones PW. Accidents among children under five years old: a general practice based study in north Staffordshire. *Br J Gen Pract* 1993;**43**:159–63.
- 11 **Macgregor DM**. Accident and emergency attendances by children under the age of 1 year as a result of injury. *Emerg Med J* 2003;**20**:21–4.
- 12 **Gorman DR**, Ramsay LJ, Wilson GS, *et al*. Using routine accident and emergency department data to describe local injury epidemiology. *Public Health* 1999;**113**:285–9.
- 13 **Kiberd B**, Sinclair H. A survey of new attenders at a paediatric accident and emergency department. *Ir J Med Sci* 1994;**163**(6):282–6.
- 14 **Bedford HE**, Jenkins SM, Shore C, *et al*. Use of an east end children's accident and emergency department for infants: a failure of primary health care? *Qual Health Care* 1992;**1**(1):29–33.
- 15 **Ness V**, Hoskins R, Robb A. The use of childhood injury surveillance within a general accident and emergency department. *Accid Emerg Nurs* 2002;**10**:170–6.
- 16 **Issacman DJ**, Kaminer K, Veligeti H, *et al*. Comparative practice patterns of emergency medicine physicians and pediatric emergency medicine physicians managing fever in young children. *Pediatrics* 2001;**108**(2):354–8.
- 17 **Johnson DW**, Adair C, Brant R, *et al*. Differences in admission rates in children with bronchiolitis by pediatric and general emergency departments. *Pediatrics* 2002;**110**(4):e49.
- 18 **Beattie TF**, Gorman DR, Walker JJ. The association between deprivation levels, attendance rate and triage category of children attending a children's accident and emergency department. *Emerg Med J* 2001;**18**:110–11.
- 19 **Laing GJ**, Logan S. Patterns of unintentional injury in childhood and their relation to socio-economic factors. *Public Health* 1999;**113**:291–4.
- 20 **Hippisley-Cox J**, Groom L, Kendrick D, *et al*. Cross sectional survey of socioeconomic variations in severity and mechanism of childhood injuries in Trent 1992–7. *BMJ* 2002;**324**(7346):1132–7.