

# Appropriateness of paediatric admission

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## Abstract

**A study on the 'appropriateness' of 267 consecutive emergency admissions to a district paediatric department showed that admission was at a peak in the evening and night time. Breathing difficulty, head injury, and fever were the commonest presenting problems. Sixty three per cent of admissions occurred between 6 pm and 8 am and these were more likely to be after self referral to the accident and emergency department and were evenly distributed through the social classes. Overall 80.5% of admissions were considered to be necessary on medical grounds by the consultants at the time of discharge. Parental assessment of severity of illness and need for admission correlated well with that of the doctors. Fifty two per cent of all admissions took place through the accident and emergency department, and although a higher number of these were from disadvantaged families these were equally appropriate on medical grounds to those sent for admission by the general practitioner. Altogether 26.5% of admissions were for less than 24 hours and half of these were judged to be unnecessary. Implications for the organisation of inpatient care are discussed.**

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Paediatric medical admission rates rose nationally, between 1975 and 1985 by 62% and between 1985 and 1989 by approximately a further 30% (see table 1). The rise occurred coincidentally with improving health and socioeconomic conditions for most, though not all, children<sup>7</sup>; improved training in

paediatrics for general practitioners (GPs); increasing GP consultation rates and availability; more paediatric services; greater attempts to improve levels of parental education about health matters; better community child health services; falling infant and child mortality; and reduction in the number of available beds for children, with associated increased throughput and halved length of stay (C Woodroffe; BPA unpublished).

As many as 40% to 65% of paediatric admissions occur after self referral to accident and emergency departments with admission of children who might not have been admitted by their own GP.<sup>1 8 9</sup>

At present, by the age of 12 months, 11% of children are likely to have been admitted to hospital on one or more occasions, 20% to 24% by 2 years (see table 1), and by the age of 4.5 years as many as 33% of children will have experienced a hospital admission.<sup>10</sup> Approximately half will have been under the care of a paediatrician, usually after emergency admission, with a higher proportion in those aged under 2 years and especially under 12 months. The small number of studies examining this increased service usage have mainly been on numbers and rates of admission. There have been few studies,<sup>11-13</sup> and none published in the UK,<sup>14</sup> on the appropriateness of paediatric admission and none on means of reducing them; although this was attempted in Grimsby,<sup>15 16</sup> few data are provided. Such a study was suggested by Hill<sup>2</sup> referring to an American study.<sup>13</sup>

This study was carried out in a district general hospital in Yorkshire, to develop a means of assessing appropriateness of paediatric medical admissions. Presenting problem, discharge diagnosis, and time of presentation to hospital were examined as well as an evaluation of illness severity by parent and medical staff. Social class of the parent and GP contacts with the child before admission were also recorded.

Table 1 Previous studies on paediatric admission

	1975	1985	
Durojaiye <i>et al</i> (1989) <sup>1</sup>			
Admission rate/1000 pa (0-14 years)	8.2	21.8	
Via accident and emergency (%)	65	65	
Length of stay (days)	5.0	3.6	
Admissions under 12 months (%)	28	43	
Woodroffe (1989) (BPA, unpublished)			
Admission rate/1000 pa (0-14 years)	22.6	42.9	
Paediatric bed supply/1000 (0-14 years)	0.72	0.73	
Hill (1989) <sup>2</sup>			
Admission rate/1000 pa (0-14 years) in Oxford region	16.4	30.9	
Admission rate/1000 pa (under 12 months) in Oxford region	70.5	147.8	
Admission rate/1000 pa (0-14 years) in England	21.0	34.0	
Spencer and Lewis (1991) <sup>3</sup>	1980	1985	
Child population admitted $\geq 1$ times (under 2 years) (%)	20.9	24.7	
Mutch <i>et al</i> (1992) <sup>4</sup>	1968-72	1974-8	1979-83
Child population admitted $\geq 1$ times (under 2 years) (%)	11.9	11.8	17.6
Lloyd <i>et al</i> (1981) <sup>5</sup>	1975-8		
Child population admitted $\geq 1$ times (under 12 months) (%)	11		
Health service indicators <sup>6</sup>	1990		
Admission rate/1000 pa (0-15 years)	46.6		

pa=per annum.

## Method

The study was carried out at Pinderfields Hospital, Wakefield, which provides a district paediatric service to a population of approximately 46000 children. The department is staffed by three consultant paediatricians, one registrar, one staff grade doctor, and six senior house officers (SHOs) of whom three are usually GP trainees. Children referred by their GP are all accepted by the SHO and admitted directly to the ward; children attending the accident and emergency department are referred to the paediatric SHO after assessment by the accident and emergency staff. Three forms were completed for each emergency admission: the

Table 2 Presenting problems and diagnoses

Presenting problem	No	Discharge diagnosis	No		
Breathing difficulty	69	Asthma	36		
		Croup	21		
		Upper respiratory tract infection	5		
		Pertussis	2		
		Bronchiectasis	1		
		Viral	1		
		Spinal muscular atrophy	1		
		Breast milk jaundice	1		
		Breathing difficulty	1		
		Fever	34	Viral infection	8
		Otitis media	3		
		Gastroenteritis	3		
		Upper respiratory tract infection	3		
		Urinary tract infection	2		
		Lobar pneumonia	2		
		Tonsillitis	2		
		Pneumonia	2		
		Pneumococcal septicaemia	2		
		Stomatitis	1		
		<i>Haemophilus influenzae</i> meningitis	1		
		Bacterial meningitis (organism not identified)	1		
		<i>Haemophilus influenzae</i> septicaemia	1		
		No diagnosis	1		
		Grand mal status	1		
		Septicaemia (organism not identified)	1		
Head injury	29	Head injury	28		
		Child abuse	1		
Vomiting	27	Gastroenteritis	13		
		Upper respiratory tract infection	3		
		Vomiting	2		
		Tonsillitis	1		
		Asthma	1		
		Reflux oesophagitis	1		
		Otitis media	1		
		Campylobacter enteritis	1		
		Rifampicin for meningococcus contact	1		
		Pyloric stenosis	1		
		Meningococcal septicaemia	1		
		Viral infection	1		
		Ingestion	23	Ingestion	23
		Fit	23	Febrile convulsion	10
		Epilepsy	5		
		Apnoea attack	4		
		Fit not specified	4		
Abdominal pain	7	Vaginitis	1		
		Mesenteric adenitis	2		
		Tonsillitis	1		
Feeding problem	6	Rectal bleeding	1		
		Bronchopneumonia	1		
		Gastroenteritis	1		
		Feeding problem	3		
Rash	5	Urinary tract infection	2		
		Henoch-Schönlein purpura	1		
Apnoea choking	5	Viral	1		
		Tonsillitis	1		
		Napkin rash	1		
		Herpetic varicelliform eruption	1		
		Aspiration	1		
Constipation	3	Tonsillitis	1		
		Apnoea attack	2		
		Upper respiratory tract infection	1		
Headache	3	Gastroenteritis	1		
		Constipation	2		
Diarrhoea	2	Viral infection	2		
		Meningococcal meningitis	1		
Neonatal jaundice	2	Gastroenteritis	1		
		Upper respiratory tract infection	1		
Rectal bleeding	2	Urinary tract infection	1		
		Neonatal jaundice	1		
Otagia	2	Anal fissure	1		
		Salmonella enteritis	1		
Diabetes	2	Otitis media	2		
		Diabetes	2		
Haemoptysis	1	Tonsillitis	1		
		Cervical lymphadenitis	2		
Neck swelling	2	Irritable hip	1		
		Penile cellulitis	1		
Limp	1	Penile cellulitis	1		
		Asthma	1		
Pharyngitis	1	Tonsillitis	1		
		Herpes stomatitis	1		
Herpes stomatitis	1	Herpes stomatitis	1		
		Upper respiratory tract infection	1		
Nasal discharge	1	Upper respiratory tract infection	1		
		Collapse	1		
Chest pain	2	Collapse	1		
		Viral infection	2		
Smoke inhalation	1	Smoke inhalation	1		
		Fracture of humerus	1		
Child abuse	1	Child abuse	1		
		Vaginal bleed	1		
Not recorded	1	Lobar pneumonia	1		
		Not recorded	1		
Not recorded	1	Not recorded	6		
		Not recorded	6		
Total	267		267		

SHO's opinion admission was needed and the procedures carried out; and the third by one of the three consultants when producing the discharge summary.

The consultant recorded the discharge diagnosis and made a judgment on whether the admission was appropriate; that is, it was either 'not needed', 'required', or 'definitely needed'. The judgment not needed or required was subjective and made taking into account medical and all other factors, including social and family ones as well as pre-existing medical problems such as failure to thrive or disability. An admission was judged definitely needed, on medical grounds, when it was for a condition on a predetermined list of problems as follows: acute croup and airway obstruction; asthma requiring oxygen or intravenous drugs; gastroenteritis requiring intravenous fluids; pyloric stenosis; first febrile convulsion; fever above 38.5°C in a child under 3 months or over 40 under age 12 months; bronchiolitis needing oxygen; head injury with loss of consciousness, symptoms, skull fracture, or - in a child age under 18 months - convulsion lasting over 20 minutes; petechial rash; a child who had a lumbar puncture, intravenous drugs, oxygen, intravenous fluids or artificial ventilation; coma; intussusception; poisoning (rather than ingestion); arthritis; collapse or apnoea; septicaemia; meningitis; pyelonephritis; diabetic ketoacidosis; serious disorder of organ function (liver, kidney, heart); readmission of newborn infant with significant problem. The ward clerk ensured that, as far as possible, all three forms were completed (the forms are shown in the appendix).

Presenting problem and discharge diagnosis were coded using Read coding and data entered into a Paradox database by the medical audit department at Pinderfields Hospital.

## Results

### STUDY SIZE

On 60 of the 67 days, between 24.9.92 to 30.11.92, forms were collected on 267 paediatric admissions onto B ward at Pinderfields Hospital, which has 19 of the 42 children's beds in the two wards in the department. Over this period there were 284 emergency admissions to the ward (thus data collection was missed on 17 acute admissions). Children over the age of 10 years were usually admitted to another children's ward and were not included in this study. Planned or elective admissions were excluded. The ward clerk was on leave for one week and no forms were completed over that period.

The usual annual numbers of paediatric admissions to this hospital are about 2400 and the study sample represents approximately 11% of the annual paediatric workload. Details of the paediatric outpatient workload in this hospital have been reported.<sup>17</sup>

The results of the study are given below. Numbers vary slightly between tables where incomplete data have been collected when completing the forms.

first by the parent, identifying their perception of the child's illness and the need for admission; the second by the paediatric SHO, at admission, recording the reason for presentation, severity of the illness, whether in the

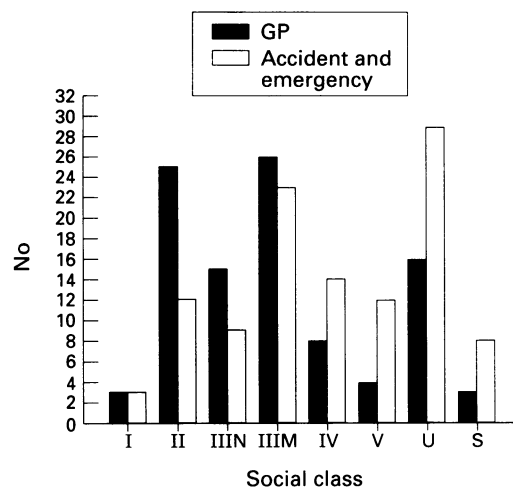


Figure 1 Route of admission via the accident and emergency department or via GP by social class. Social class I to V by occupation of father according to registrar general's classification. U=unemployed, S=single parent.

#### AGE OF CHILDREN

Thirty per cent of admissions were in children aged under 12 months and 46% were under 2 years of age.

#### CAUSE OF ADMISSION

The presenting problems and discharge diagnosis are shown in table 2.

Of the 267 admissions analysed, 215 were for acute illness and 52 for 'injury' that is, for head injury or ingestion. Some of the analysis for clinical casemix and assessment of severity has been done with the head injury and ingestion group excluded because attendance at the accident and emergency department for these problems was regarded as appropriate use of the service.

The most frequent presenting problem for admission was difficulty with breathing (69); 36 (52%) of these children had asthma (which was the commonest discharge diagnosis at 14.2% of all) and 30% had croup. Breathing difficulty was also the commonest (45%) night time presenting problem. The second most common presenting problem was fever, 60% of patients being under 2 years of age,

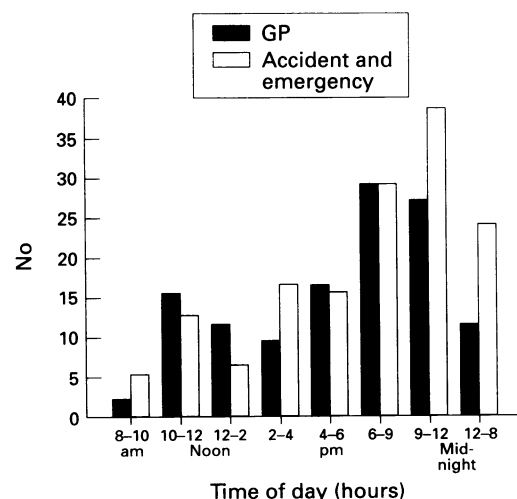


Figure 2 Route of admission via the accident and emergency department or via GP by time of day/night.

Table 3 Presenting problem by route of admission

Problem	No (%) via accident and emergency	No via GP	Total
Breathing difficulty	26 (37.7)	43	69
Fever	10 (28.6)	25	35
Head injury	28 (96.6)	1	29
Vomiting	8 (32.0)	17	25
Ingestion	23 (100.0)	0	23
Fit	13 (68.4)	6	19
Apnoea	7 (100.0)	0	7
Abdominal pain	4 (57.1)	3	7
Feeding problem	2 (33.3)	4	6
Rash	1 (20.0)	4	5
Headache	1 (33.3)	2	3
Constipation	2 (66.7)	1	3
Diarrhoea	1 (50.0)	1	2
Otalgia	2 (100.0)	0	2
Rectal bleeding	2 (100.0)	0	2
Neonatal jaundice	2 (100.0)	0	2
Other	16 (100.0)	0	16
Total	148	107	255

compared with 45% of children presenting with other problems; half received intravenous antibiotics and 35.3% were judged to have had a definite need for antibiotic treatment because of evidence of bacterial infection. There was no difference observed between those admitted via the accident and emergency or GP in the requirement for antibiotic treatment. The third commonest presenting problem was head injury, which was also the second most common discharge diagnosis (10.4%). Of those children presenting to the accident and emergency department over the study period with a head injury, 15% were referred for admission (20% aged under 12 months and 5% aged 6 to 10 years). Head injury admissions tended to be short and 46% stayed for less than 24 hours.

#### ROUTE OF ADMISSION

Figures 1 and 2 show the variation in route of admission through the accident and emergency department or GP according to social class of parent or time of day/night and table 3 shows how this was related to the nature of the presenting problem.

#### ACCIDENT AND EMERGENCY ADMISSIONS

Fifty three per cent of all admissions occurred through the accident and emergency department, reduced to 45% if admissions for head injury (29) and ingestion (23) were excluded. A significantly higher number of admissions through the accident and emergency department were of children of parents of social class IV or V, single mothers, or unemployed (see table 4).

#### TIME OF ADMISSION

Forty two per cent of all admissions occurred at night, that is between 9 pm and 8 am, with asthma, croup, and viral infection forming the first three most common diagnoses. Night time admissions were more likely to have a short admission (mean length of stay 1.64 days compared with day time admissions, 2.73 days). Twice as many were admitted through the accident and emergency

Table 4 Relation between variables; figures are number (%)

Variable	Route of admission		Significance	Appropriateness		
	Accident and emergency	GP		Not needed	Required/needed	Significance
Length of stay (days)						
≤2	126 (48.0)	91 (34.9)	$\chi^2=3.69$	48	4	$\chi^2=2.93$
>2	18 (6.9)	26 (9.9)	$p=0.055$	169	39	$p=0.088$
Appropriateness						
Not needed	25 (11.5)	24 (11.0)	$\chi^2=0.6$	-	-	-
Required/needed	73 (33.6)	95 (43.7)	$p=0.044$	-	-	-
Time						
Day	77 (29.6)	81 (31.1)	$\chi^2=5.03$	28	135	$\chi^2=1.06$
Night	65 (25.0)	37 (14.2)	$p=0.025$	24	80	$p=0.304$
Social class*						
I, II, III	47 (22.3)	69 (32.8)	$\chi^2=13.58$	17	99	$\chi^2=2.08$
IV, V, U, S	63 (30.0)	31 (14.7)	$p=0.000$	22	72	$p=0.15$
Short admission†						
Short	53 (20.4)	15 (5.8)	$\chi^2=18.35$	23	48	$\chi^2=8.71$
Longer	90 (34.6)	102 (39.2)	$p=0.000$	29	163	$p=0.003$

\*Social classes by registrar general's classification; U=unemployed, S=single parent.

†Short admission in less than 24 hours.

Variation in completion of questionnaire leads to differing totals in table.

department as via the GP. More were judged not needed. There was no difference in the time of admission in relation to social class. Evening admissions between 6 pm and 9 pm formed a further 21% of the total.

DIAGNOSIS

Presenting problems varied according to the route of admission. See table 3.

Only 16% of the admissions through the accident and emergency department arrived by ambulance and 79.9% by their own transport. Variation in the proportion of admissions via the accident and emergency department was probably not attributable to proximity to the hospital and there is some evidence to the contrary in this locality<sup>8</sup> where the only significant factor affecting route of admission was found to be the size of GP practice (the larger the GP practice, the lower the proportion of admissions occurring through accident and emergency).

LENGTH OF STAY

Altogether 26.5% had short admissions (less than 24 hours). This figure was determined by adding those children whose length of stay was 0 days to those who were discharged the day after admission but who had been admitted after 9 pm the previous night. The discharge diagnosis in the short admissions is given in table 5. Length of stay was significantly shorter

Table 5 Diagnosis in short admission

Short admission discharge diagnosis	No
Head injury	13
Croup	12
Ingestion	10
Upper respiratory tract infection	5
Asthma	4
Gastroenteritis	3
Tonsillitis	3
Otitis media	3
Viral infection	4
Other*	12
Total	69

\*Other (one each)=child abuse, apnoea attack, breathing difficulty, febrile convulsion, vaginitis, penile cellulitis, urinary tract infection, bronchopneumonia, mesenteric adenitis, Henoch-Schönlein purpura, diabetes, and smoke inhalation.

Table 6 Appropriateness of admission for all children

Consultant judgment	No (%) via accident and emergency	No (%) via GP	Total (%)
Not needed	28 (18.9)	24 (20.2)	52 (19.5)
Required	39 (26.4)	43 (36.1)	82 (30.7)
Definitely needed	81 (54.7)	52 (43.7)	133 (49.8)
Total	148 (100.0)	119 (100.0)	267 (100.0)

when the admission had occurred via the accident and emergency department (see table 4).

APPROPRIATENESS OF ADMISSION

Table 6 shows the results of the consultant judgment of the appropriateness of admission. Nineteen and a half per cent of all admissions were judged not to be needed and 49.8% were definitely needed. These figures were similar for accident and emergency and GP admissions, differing social class, and time of day/night.

Diagnoses in those judged inappropriate were as follows: upper respiratory infection (10), viral infection (5), croup (5), gastroenteritis (4), tonsillitis (3), otitis media (3), asthma (3), constipation (3), head injury (3), vulvitis (3), and one each of the following: whooping cough, diabetes mellitus, mesenteric adenitis, anxiety, balanitis, penile cellulitis, napkin rash, faint, febrile convulsion, feeding problem.

Similar discharge diagnoses were recorded in children whose admission was judged by the consultant to be appropriate. This was because other factors were present including type of presenting problem (for example, febrile infant requiring exclusion of more serious disorder), severity of illness, or underlying factors such as failure to thrive or social problems.

The parent and consultant assessment of severity of illness is compared in table 7 and of need for admission in table 8. Consultant judgment about appropriateness of admission was retrospective. The parent and SHO assessment was made at the time of admission. The admitting doctor felt that 14.6% had not needed admission and 38% had definitely needed admission. All GP admissions are accepted in this unit and it is policy to admit children attending the accident and emergency department under age 3 years after 9 pm (14 children were admitted for this reason). A further nine were admitted for social reasons. Of those 39 children for whom the SHO judged admission not needed, the consultant judged that 23 (59%) needed admission.

GENERAL PRACTITIONER ATTENDANCES BEFORE ADMISSION

(A) Accident and emergency attenders

Where the information was recorded, of 142 children admitted via the accident and emergency department, 34 (24%) had attended their GP over the five days before admission. Of the 34 children, six had attended with a head injury or ingestion and had been advised by their GP to attend the

Table 7 Comparison of parent and consultant assessment of severity of illness

	No	Parent grade illness				Not ill
		Danger of dying	Severely ill	Medium illness	Mildly ill	
Consultant grade illness						
Danger of dying	3		2	1		
Severely ill	5	1	1	3		
Medium illness	54		12	36	6	
Mildly ill	94	2	9	49	32	2
Not ill	20		1	7	8	4
Total	176	3	25	96	46	6

accident and emergency department; six (4%) had seen their GP the same day, six (4%) the day before, and 16 (47%) between two and eight days before they attended accident and emergency. (Two on two occasions and three on three occasions; the diagnosis in two of these 16 children was urinary infection and in the others were viral or upper respiratory infection.) For 36 of the 98 admissions, after self referral for reasons other than head injury or ingestion, the parent answered the question about whether they had tried to see the GP: nine of 36 stated they had done so, eight had been unsuccessful, and one self referred after having been seen by the GP.

#### (B) GP admissions

Of the 119 children admitted by their GP, where the information was recorded, 50 were seen once on the day when the admission was arranged and 11 were seen more than once on the day of admission. Altogether 32 children were seen more than once, seven children three times, and one child four times. The data were not recorded on the remaining 37 children.

#### PARENTAL VIEWS

Parental views were obtained on (a) expectation of admission, (b) assessment of need for admission, and (c) assessment of severity of illness.

Parent assessment of need for admission was based on a three point scale: 1=not needing admission; 2=possibly needing admission; and 3=definitely needing admission.

#### Parental assessment in head injury and ingestion

Results were analysed separately for those attending the accident and emergency department with head injury or ingestion. For head injury, where these data were recorded (23 children), the parent did not expect admission in four (17%), expected it in another four, and

the remainder were uncertain. For ingestion the results were similar with four of 19 (21%) not expecting admission and five (26%) expecting it.

#### Non-injury admissions

Data were available from parents of 178 of the 216 admissions for problems other than head injury or ingestion. Parents of 33 children (18%) did not expect admission, were uncertain in 86 (48%), and expected it in 59 (33%). Of parents who did not expect admission, 30% felt that their children did not need it. However, the consultant judged that 60% of these patients did require or need admission. For parents who had attended accident and emergency (72), 19.4% did not expect and 32% expected admission. For GP admissions (107), 18.7% did not expect and 34% expected admission.

When parents expected admission (59), it was thought by them to be needed in 61%, probably needed in 37%, and not needed in one child. The consultant judged admission definitely needed in 61% of those whose parents expected admission, required in 29%, and not needed in 10%.

The diagnoses in GP admissions where parents did not expect admission were as follows: bacterial meningitis, campylobacter enteritis, constipation, croup, feeding problem, head injury, napkin rash, rectal bleeding, salmonella enteritis, stomatitis, tonsillitis, urinary tract infection, asthma, viral infections, and gastroenteritis.

The diagnoses in accident and emergency attenders where parents did not expect admission were as follows: apnoea attack, aspiration, asthma, croup, febrile convulsion, head injury, ingestion, irritable hip, lobar pneumonia, reflux oesophagitis, urinary tract infection, upper respiratory tract infection, vaginitis, and vomiting.

#### Parental assessment of severity of illness

This was assessed on a five point scale and compared with the consultant assessment as the standard. Table 7 shows the results.

Parental awareness of severity of the child's illness correlated reasonably well with that of the consultant. Parents, on the whole, viewed their child as more ill at the time of admission than the consultant on discharge. All three children whose parents graded 'in danger of dying' were admitted having had a fit, two of which were febrile.

The diagnoses when the consultant judged the child to be severely ill were gastroenteritis, epilepsy, grand mal status, and croup. When the parent judged the child to be severely ill the diagnoses were gastroenteritis, pneumococcal septicaemia, diabetes, bacterial meningitis (organism not identified), *Haemophilus influenzae* meningitis, croup, upper respiratory tract infection, lobar pneumonia, pneumonia, asthma, urinary tract infection, febrile convulsions, and fit.

Table 8 Comparison of parental and consultant judgment about need for admission

	No	Parental judgment			
		No information	Not needed	Possibly needed	Definitely needed
Consultant judgment					
Not needed	49	14	8	21	6
Required	80	13	5	53	9
Definitely needed	86	11	3	34	38
Total	215	38	16	108	53

## Discussion

Recent improvements in primary care and community paediatric services could be expected to lead to a reduction in unnecessary admissions and there is no ready explanation for the rise in paediatric admissions over the past 15 years.

After a study in Nottingham, Wynne and Hull concluded that improvements in primary and community care may reduce admission rates.<sup>9</sup> Ten years later in the same city, another study showed an *increased* admission rate after improvements had taken place including an increased number of better qualified GPs with increased availability and consultation rates and no change in the use of deputising services; development of community paediatric teams concentrated on deprived areas of the city and major training programmes for health visitors with allocation on the basis of need.<sup>1</sup> However, this rise occurred at the same time regionally and nationally.

Studies in Sheffield, on young children aged under 12 months<sup>5</sup> and under 2 years,<sup>3</sup> based on large numbers of admissions, confirmed the trend for increasing admission (see table 1). They documented the contribution from multiple admission and observed similar patterns of diagnoses to other studies (infection being the most common cause with peak admission rates occurring in children aged between 2 and 3 months). Discriminant functions that identified infants liable to unexpected death, also identified children requiring admission to hospital.

Some of the increase appears to be from readmission; in one study 30% of admissions aged under 2 years were children admitted three times or more<sup>3</sup> and in another, 32% of all admissions under 2 years were in the 2.8% of children who were admitted three times or more.<sup>8</sup>

Mutch *et al*,<sup>4</sup> in 1992 confirmed others' observations<sup>1,2</sup> that low birthweight survivors of neonatal intensive care contributed significantly to paediatric admissions. Although the numbers were small, readmission and longer stay led to their occupying approximately 10% of paediatric bed days.

Hill, in a study based on a large population in Oxford, showed increased admission numbers and rates regionally and nationally (62% increase between 1975 and 1985) with increases in head injury, infection, and respiratory disorders (especially for asthma: rising from 4.7 to 13.1 per thousand child population).<sup>2</sup> Hill found, as did others,<sup>1,5</sup> that ill defined conditions contributed significantly to the numbers and readmissions accounted for 26% of the rise. The number of available beds per child remained nearly constant in the region during 1975 to 1985 and Hill concluded that the rise in admissions must have reflected changing thresholds for admission by paediatricians and GPs and that parents' expectation of admission had changed. The model observed was of brief spells of admission and rapid discharge, with shorter stays increasing bed availability by freeing

occupied beds. With parents having ready access to their children, the concern about the adverse effects of admission had diminished and Hill concluded that this, in itself, may be a further factor contributing to the rising admission rates. One major deficit of this important study was the lack of detail of the proportion of admissions that occurred after self referral to accident and emergency which probably reflects parental expectation and demand (but not necessarily need).

Stewart *et al* in an unpublished study (M Stewart, J M Savage, M J Scott) in Belfast of 166 paediatric emergency admissions (including accidents), concluded that improved screening by GPs or in the accident and emergency department might lead to a reduction of up to a quarter of admissions. Shorter admissions occurred in older children and in those admitted at night and 32% of all admissions stayed for less than a day. Inappropriate admissions were defined as those 'who did not receive a hospital resource'; 30% of all admissions were in this category (26% of admissions in daytime and 40% of those at night). Provision of medical and nursing observation and support did not appear to have been regarded by the authors as a hospital resource and some of their inappropriate admissions stayed for longer than five days.

Forfar, commenting on Hill's suggestion that a significant proportion of admissions may be inappropriate stated<sup>18</sup>: 'The reasons that Dr Hill advances for the change and some of her conclusions lack clinical insight and if accepted might well put children at unnecessary risk. The role of a children's hospital and department is no longer that children should be admitted only when they are seriously ill, and this concept should not determine bed complements. Accurate early diagnosis and treatment have played an important part in reducing mortality in many childhood diseases. ... In childhood early signs of serious disease may differ little from those of minor illnesses. Any suspicion of serious disease demands early accurate diagnosis, which is often impossible without using modern hospital techniques. Waiting to see if an early suspicion of meningitis is fulfilled, or if mild croup will develop into obstructive laryngotracheitis can put a child at serious risk. ... Paediatricians are anxious to keep children out of hospital, but not to an extent that puts their patients at risk. Ready recourse to early hospital admission, with mother staying with her children whenever possible, is an important preventive measure'.

Forfar's views were, however, challenged by Davies *et al* who stated that 'benefits of early diagnosis in the minority of severe illnesses can be achieved more cheaply through prompt access to an experienced paediatrician and willingness to undertake frequent clinical review as necessary; happily most suspicion of serious illness is misplaced'.<sup>16</sup> They referred to their own work as a means of reducing hospital admission but no data were given to support this.

The comments made by Forfar were in keeping with the conclusions of Spencer and Lewis<sup>3</sup> and Durojaiye *et al*<sup>1</sup> who point out that GPs know what the danger signs are and take fewer risks with their patients so that admission may in fact be an appropriate way of managing childhood illness. Their view was, that '... it is not a trend that should be resisted, but one that should be planned for and viewed as a positive development. A flexible, sympathetic hospital environment is part of the community, and should be the conscientious GP's best friend'.

Spencer and Lewis conclude similarly that 'Hospital based practice continues to have a major role. This could be construed as a failure with negative consequences, given the family and service problems associated with hospital admission, or as resulting primarily from the increased availability of beds due to shorter length of stay. Equally it could reflect changes in primary care and community child health services, which have produced a greater awareness of illness in infancy, improved liaison of primary and secondary services and a consequent increased willingness to admit children'.<sup>3</sup>

Spencer and Lewis<sup>3</sup> and Hill<sup>2</sup> both called for further studies to clarify the causes of the upward trend in paediatric hospital admissions.

In our Wakefield study, consultants judged that 19.5% of patients were admitted inappropriately and this compares with the unpublished Belfast study (M Stewart, J M Savage, M J Scott) where 30% were judged inappropriately, with 21.4% in an American study<sup>12</sup> and with 19% of non-surgical children's admissions and 14% of emergency admissions over age 6 months in Vancouver.<sup>14</sup> The consultants' judgment in our study was used as the 'standard' for appropriateness. Its validity is limited by being made retrospectively, in contrast to that of the parent or admitting paediatric junior doctor. Differing methods were used for these different studies; research based in British hospitals is needed, taking account of parental expectation, social and seasonal factors and multiple admission, to develop an objective paediatric appropriateness of admission 'tool' for use in this country.

The Wakefield study confirms a high usage of the accident and emergency department for acute illness by parents, bypassing primary care services, especially among children of lower social classes. However, admissions via accident and emergency were as likely as GP admissions to be judged appropriate.

The commonest presenting problem was breathing difficulty and asthma was the commonest discharge diagnosis. The proportion of asthma admissions judged to be definitely needed was the same as for other conditions in the study, but only 7.8% of asthma admissions were judged not needed – substantially lower than for other types of admissions. This low figure indicates need for a further study and refinement of our criteria. Admission rates for asthma have been reduced by alternative methods of managing the disorder from

a hospital base: for example experienced paediatric staff available to the accident and emergency department and GP usage of nebulisers.<sup>19</sup>

The second commonest presenting problem was with fever and a surprisingly high proportion (35%) (see table 2) were judged retrospectively to have required antibiotic treatment based upon laboratory evidence of bacterial infection or x ray finding of pneumonia. Although head injury was the second commonest discharge diagnosis (and third commonest presenting problem), only 15% of children who had attended accident and emergency over this period were admitted.

Some parents did not expect their child to be admitted, and others felt that they did not need it. Generally, however, parental assessment of severity correlated reasonably well with that of the senior and junior doctors.

Fifty nine per cent of the admissions that the paediatric SHO thought inappropriate were judged by the consultant to be appropriate. This suggests that an SHO cannot be relied on to screen ill children for admission and the observation deserves further study.

With 26.5% of admissions staying for less than 24 hours, this children's ward is used as a short term observation facility as well as providing care for more ill children. Such short admissions were more likely to be judged not necessary, to have occurred through accident and emergency and at night. Very short admissions affect the calculation of overall length of stay, which for the study was 1.99 days. Analyses of admissions that exclude a length of stay of zero (less than one) days, which is sometimes done to avoid confusion with day case work, would lead to a serious underestimate of paediatric workload if other paediatric units have similar patterns of care.

The proportion of children who subsequently prove not to have required admission will vary between hospitals and populations. This study was conducted in one hospital and it is not clear how representative it is of practice in other units (for example some paediatric departments do not care for minor head injury). From health service indicators (HSI)<sup>6</sup> there is evidence of considerable variation in admission rates between districts. The Wakefield HSI 1990 admission rate was 48.2 admissions per thousand child population aged 0–15 per annum (at 2240 per annum) the national mean (SD) being 46.6 (21.3).

A proportion of admissions that prove inappropriate is a price which probably needs to be paid to ensure admission for those who actually require it. A period of observation in hospital with or without investigations is often the only way of identifying clearly those who require inpatient care, especially among young infants. Selection for admission in the accident and emergency department is limited by the need for a short period of observation. The Audit Commission recommended an observation facility for a period of up to eight hours and acknowledged a greater opportunity for reducing the length of stay rather than admission numbers.<sup>20</sup> This Wakefield study

shows a high proportion of children presenting in the evening and night time with an overnight admission then becoming inevitable if observation is to take place. The seriousness of some of the illnesses seen during this study reinforces the need for this observation and the opportunity so created for investigation and early treatment. The observed peak time of presentation means that attempts to reduce admission rates would require a change in parental presentation of the child to health services. Possible explanations, other than night time occurrence of asthma and croup, could be availability of the family car as fathers return from work or an unsettled child at bedtime. Although overall, social factors have been found to have significant influence on admission rates<sup>9 21</sup> and to affect accident and emergency usage, in our study night time admissions were equally common across the social classes.

Further study is needed on paediatric workload to identify why peak presentation occurs in the evening and at night. Major changes in hospital and paediatric provision, such as replacement of inpatient facilities by extended day care (or night care?) or emergency clinic arrangements<sup>22</sup> should await research which demonstrates that admissions can safely be reduced by such means as emergency assessment clinics, placement of GPs in the accident and emergency department, or improved community paediatric services.

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**Appendix**

**(1) Parent's form**

1. Have you seen your GP with this problem Yes/no  
If YES, when? (Please give dates, days and times)  
.....  
.....  
If you did not see your GP, have you tried to see him with this problem? Yes/no
2. How was your child admitted to hospital?  
GP arranged  
Child brought to accident and emergency in ambulance  
Child brought to accident and emergency by own transport
3. Did you expect your child to be admitted? Yes/no/not sure
4. How ill did you think your child was on admission? (please ring the most appropriate number)  
In danger of dying 5  
Severely ill 4  
Medium type illness 3  
Mildly ill 2  
Not ill 1
5. Did you think your child needed admission to hospital? (please ring the most appropriate number)  
Definitely 3  
Possibly 2  
Not 1
6. What do you think was wrong with your child?  
.....  
.....  
.....

Child's name .....DOB .....

Date of admission .....Time .....

Child's unit number .....

**(2) Admitting doctor form**

Name .....DOB .....

Hospital unit number .....

Date of admission .....Time first seen (24 hour clock) .....

Father's occupation .....

AD 1. Grade of illness on admission  
Not ill 1  
Mildly ill 2  
Moderately ill 3  
Severely ill 4  
Life threatening 5  
(ring appropriate number)

AD 2. Necessity for admission in your opinion (ring one only, that is the most appropriate)  
Not needed NN  
Social reasons SR  
Attended at accident and emergency after 9pm AE  
Probably necessary PN  
Definitely needed DN  
If seen in accident and emergency and you assessed needed admission only because you could not follow up NFU  
Could have gone home after a number of investigations with follow up HIX

AD 3. Admission procedures done (ring all done)  
Lumbar puncture LP  
Intravenous fluids IV  
Intravenous drugs IVD  
Operation OP  
Intravenous cannula no drip CAN

AD 4. Presenting problem (one only)  
Apnoea (choking) (R002) ..... Convulsion (R003) .....

Fever (R0062)..... Cyanotic attack (R025) ...

Feeding problem (R0330)..... Headache (R040).....

Breathing difficulty (R06)..... Vomiting (R0701).....

(stridor/wheezing)..... Diarrhoea (R077).....

Dysuria (R081)..... Abdominal pain (R090) ...

Limp (NZ)..... Head injury (S60).....

Ingestion (SL)..... Collapse (IB65).....

Other..... Rash (R021).....

**(3) Consultant discharge form**

Name .....DOB .....

Hospital unit number .....

Date of admission .....Date of discharge .....

CD 1. Discharge diagnosis (text - we will code later)  
1.....  
2.....  
3.....  
4.....

CD 2. Presenting problem code (we will complete)

CD 3. Procedures done (ring all procedures done)

Intravenous fluids	Intravenous drugs	IV	IVD
Lumbar puncture	Oxygen therapy	LP	OT
Monitoring	Operation	M	OP
Ventilation		V	
Computed tomogram			CT



CD 4. Did the child require admission?	Yes/no	Pyloric stenosis	Apnoea
CD 5. Could this have been dealt with as a day case?	Yes/no	Febrile convulsions (first)	Intravenous drugs
CD 6. How ill was the child during admission score?		Temperature above 38.5°C under 3 months	Oxygen
Nought	1	Temperature above 40°C under 12 months	Septicaemia
Mild	2	Bronchiolitis requiring oxygen	Meningitis
Moderate	3	Bronchopneumonia requiring oxygen	Pyelonephritis
Severe	4	Head injury with loss of consciousness	Needed intravenous fluid
Life threatening	5	Ingestion without poisoning for observation	Diabetic ketoacidosis
CD 7. Definite need for admission from following checklist	Y/N	Head injury with skull fracture	Other text
		Head injury under 18 months	Serious disorder of organ (for example liver, kidney, heart)
		Head injury with symptoms	Readmit newborn, significant problem
		Epileptic fit over 20 minutes' duration	
		Petechial rash	
Acute croup and airway obstruction	Coma	Lumbar puncture	
Asthma requiring oxygen	Poisoning	Ventilation	
Asthma requiring intravenous drugs	Arthritis	Intussusception	
Gastroenteritis requiring drip	Collapse		