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Generation differences in hospital inpatient care of children aged 1 to 5 years

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Abstract

***Study objective*—To describe differences in childhood hospital admissions at ages 1 to 5 years in two generations, and to compare the intergenerational differences in risks of admission.**

***Design*—Information was taken from a longitudinal birth cohort study of a national sample and their firstborn offspring.**

***Setting*—England, Wales, and Scotland.**

***Subjects*—the 5022 birth cohort members for whom information is available from ages 1 to 5 years and their 2205 firstborn offspring.**

***Measurements and main results*—Data comprised reports of hospital admissions, which were checked with hospitals. Mean numbers of days spent in hospital were fewer in the offspring generation than in their parents, but the proportion ever admitted fell by only 1%. Low birth weight babies (<2500 g), who comprised 6% of cohort births and 7% of the following generation, used a high proportion of all inpatient time in the offspring population, rising from 3% to 14% of all days of admission.**

***Conclusions*—Compared with the early years of the NHS, published statistics show that the effectiveness of paediatric care has improved greatly, and that childhood mortality and the risk of serious illness have decreased significantly. This study reports intergenerational changes in the reasons for hospital admission and shows, with the benefit of good denominator data, that although there was only a small intergenerational decrease in the proportion of children treated in hospital, there was a large reduction in the time spent in hospital and an increase in admissions of children of low birth weight.**

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The 44 years of the National Health Service (NHS) have been a time of development and expansion in diagnostic techniques, in curative and aetiological knowledge, and in public health,[1] and inevitably a time of growth in specialist manpower. In paediatric hospital care, for example, as numbers of children in the population fell and numbers of medically qualified staff in paediatric jobs increased, the ratio of English and Welsh children (aged 14 years and under) to paediatric hospital staff changed from an estimated 23·9 thousand children per medically qualified paediatric staff member in 1957,[2] to actual ratios of 12·7 thousand children per medically qualified paediatric staff in 1967,[3] 5·4 thousand in 1977,[4 5] and 3·5 thousand in 1987.[4 6] The outcome of this investment in knowledge, manpower, health education, and the 'social and educational approach',[7] has been a dramatic improvement in most aspects of survival in infancy, and a considerable reduction in the risk of many kinds of illness in childhood.[8 9]

Despite these improvements, concerns remain about NHS costs. Birth and old age are the two most costly times of life in terms of hospital care. In 1988–89 the annual costs for hospital and community health services per head of the population were highest for those aged 85 years and over (£1995) and for births (£1383); the least expensive ages were 16–44 years (£85), 5–15 years (£113), 45–66 years (£193), and 0–4 years (£229).[10]

There is concern that continuing improvements in survival rates in both the old and young (these already costly sections of the population in terms of medical care) will mean rising expenditure to meet the anticipated greater morbidity of these groups. Among children, the increased survival of those of low and very low birth weight seems more likely to be a source of commensurate increase in handicap and impairment[11] and in demand for medical care[12–14] than was once believed.[15 16]

There has been, in general, a rise in the rate of children's admissions to hospital,[17 18] and in the numbers of admissions of children.[19] Comparison of numbers of admissions of children from the same catchment area over 10 years in an English industrial city showed an increase of 100%.[17] Comparison of admissions before the age of 5 years among representative national populations showed a rise from 18·5% admitted of the study population born in 1946 to 25·5% admitted of those born in 1970.[20] Admissions of children under age 14 years have also risen, for example, from 22·3 per thousand of the population of that age in 1974 to 38·6 per thousand in 1984.[1] This rise has been attributed to an increase in early diagnoses and treatment of serious illness,[21] to new possibilities for the treatment of such previously practically untreatable problems as 'congenital heart disease, certain renal disorders, and malignancies', and to admission 'as a protective measure against a possible risk of legal claims'.[1] Some admissions, found to be as much as 20% in 1977[22] and 9% in a recent study[17] in the same industrial city, may also be undertaken or prolonged because of poor home circumstances.

This paper uses data from a national birth cohort study and its offspring to compare hospital admissions among children aged 1–5 years in the two generations. Such good denominator data allow comparison of risks of admission to be expressed per head of the 'at risk' population.

Methods

Findings are reported from the Medical Research Council's National Survey of Health and Development (NSHD) a longitudinal study, so far from birth to age 43 years, of a national class stratified sample (n=5362) of all births that occurred in one week in 1946 in England, Wales, and Scotland. Up to age 15 years, data were collected 10 times on this cohort's health, growth, development, and home and family circumstances, and a further nine times in adult life. Information on hospital admissions was collected on each occasion retrospectively to the last time of contact and checked with hospital records.

The first offspring born to this cohort while they were aged 19 to 25 years (n=2205) were studied twice in childhood, and information on their hospital admissions was collected in the same way as for their parents.[23 24]

Hospital admissions were coded using information collected between ages 1 to 5 years in each generation. Since admissions during the first year of life did not always report neonatal care, this period has been omitted. Mothers' reports of admissions were checked with hospital records, and final diagnoses were coded using the *International Standard Classification Code of Diseases and Causes of Death* (ICD).[25]

Since the offspring generation comprise only firstborn children of cohort members aged 19–25 years, the findings are compared between the generations using the offspring generation in comparison with both the whole cohort and with cohort members who were the firstborn of mothers aged 19–25 years.

Relative risks and their confidence intervals were calculated to compare rates of admission among sub groups of cohort members and offspring. Median lengths of stay in hospital were compared using the Wilcoxon test for two independent samples; for more than two samples the Kruskal-Wallis statistic was calculated.

Results

THE EXTENT OF HOSPITAL ADMISSION

Hospital admissions at ages one to five years are shown in table 1. Despite an intergenerational fall of 1% in the proportion ever admitted there was an increase among those admitted more than once.

Risk of admission among all cohort members whose fathers were in manual occupations was not significantly different to that among all those whose fathers were in non-manual social class occupations (RR=1·09, 95% CI=0·95, 1·24; p=NS), or among those who were firstborn (RR=0·89, 95% CI=0·68, 1·30; p=NS).

Among the offspring there was a significantly lesser risk of hospital admission in those whose fathers worked in non-manual occupations than in those who were unemployed (RR=0·66, CI=0·46, 0·96; p<0·05), but there was no difference in rates of admission between those with fathers in manual occupatios and those with fathers in non-manual occupations (RR=0·89, CI=0·72, 1·11; p=NS).

The median time spent in hospital was significantly longer in the cohort children from manual social class families (median stay 11·0 days), and those whose fathers were unemployed or absent (median 11·5 days), compared with those whose fathers were in non-manual employment (median 7·0 days) (p<·05). Among cohort firstborn children, the length of stay in hospital did not differ significantly between the social groups. Median times spent in hospital by the offspring were shorter, but did not differ significantly between those whose fathers were in non-manual occupations (median 3 days), manual occupations (4 days), or unemployed (4 days).

There was no change in the risk of admission to hospital between the two generations for children from non-manual or manual backgrounds.

REASONS FOR ADMISSION

In the offspring generation, injury was the most common reason for admission, compared with respiratory illness in the original cohort. Inpatient care for infection was no longer in the top seven reasons for hospital admission in the offspring generation (it accounted for 18·7% of all cohort admissions and 1·6% of admissions of offspring), and ill defined conditions and genitourinary and congenital problems received more hospital inpatient care in the offspring generation than among their parents (table II).

TIME SPENT IN HOSPITAL

There were also generation difference in terms of the time spent in hospital (table III). Mean times spent in hospital per person admitted fell from 22 to 9 days (table IV). The mean number of days for each admission also fell.

The ranking of reasons for hospital admission according to the time spent in hospital showed the great reduction in days of admission for the care of infection (from 43·2% of all days of admission experienced by the cohort to 1·4% of days the offspring were admitted) (table III). Mean times spent in hospital by the offspring generation were mostly a third of those spent by the cohort for similar sets of conditions, but average days spent in hospital for the care of infectious disease fell from 36·4 to 4·9 days.

Table I Percentage of children admitted to hospital between age 1 and 5 years in the birth cohort (born 1946) and their firstborn offspring (born 1965–1971)

	Cohort	*Offspring*
% admitted once	13·4 (13·6)*	11·6
% admitted more than once	2·6 (2·5)*	3·4
% not admitted	84·0 (84·0)*	85·0
Total (=100%)	5022 (848)*	2205

*Figure in brackets are findings for first born cohort members born to mothers aged 19–25 years.

Table II Comparison of the seven most common reasons for hospital admission, and the % of admissions attributed to that reason, in the birth cohort (total and firstborn) and their firstborn offspring aged 1–5 years

	Total cohort (admitted 1947–51)		*Firstborn cohort members* (admitted 1947–51)*		*Offspring (admitted 1966–76)*	
Most common reason	Respiratory	(37·3%)	Respiratory	(40·8%)	Injury	(21·0%)
2nd reason	Infections	(18·7%)	Infections	(13·6%)	Respiratory	(19·9%)
3rd reason	Digestive	(9·2%)	Injury	(13·0%)	Genitourinary	(12·9%)
4th reason	Injury	(8·7%)	Digestive	(8·3%)	Ill defined	(10·1%)
5th reason	Eye and ear	(8·3%)	Eye and ear	(7·7%)	Digestive	(9·7%)
6th reason	Ill defined	(4·5%)	Ill defined	(5·9%)	Congentital	(8·3%)
7th reason	Genitourinary	(3·8%)	Genitourinary	(3·6%)	Eye and ear	(6·1%)
Total number of admissions for all causes including those not shown here.	1000		169		443	

*Born to mothers aged 19–25 years.

LOW BIRTH WEIGHT

In the cohort, 6·0% of babies were of low birth weight (2500 g or less) (5·4% of firstborn cohort children) compared with 7·1% of babies who were firstborn to cohort women between 1965 and 1971. Altogether 17·6% of low birth weight cohort children were admitted to hospital at aged 1–5 years, compared with 29·0% of offspring children at the same ages.

At ages 1 to 5 years in the cohort, low birth weight children spent less time in hospital than others (median 7·0 days, compared with a median of 9·0 days for others; for firstborn cohort children medians were 10·0 days and 6·0 days). In the offspring population, however, children who had been of low birth weight spent more days in hospital (median 6·0 days) than others (median 4·0 days). There were no significant differences in median lengths of stay within the generations.

Low birth weight babies in the cohort consumed a much smaller proportion of all hospital inpatient days (3·3%—firstborn cohort members consumed 2·6% of days) than low birth weight offspring in the following generation (13·7%).

Discussion

There continues to be concern about the apparently rising numbers of children admitted to hospital, the seeming increasing numbers of admissions, and the extent to which these changes represent improvements in health care.[18 21 26 28] During the life span of the NHS infant and childhood mortality and morbidity have been reduced and, as the study reported here shows, for individual children the length of hospital admission has fallen. Unlike the study of admissions in the Oxford region in 1975 and 1984, however,[29] there was little generation difference in the risk of admission.

There are anxieties that increased survival of low birth weight babies may bring an increased burden of morbidity and a high rate of demand for inpatient care.[14] This study may underestimate that problem because the offspring population were born between 1965 and 1971, and since then the chances of survival of low birth weight babies have continued to increase. For example, among those in the national population of birth weight 2000–2499 g, the risk of death in the perinatal period has fallen from 27·3 per thousand total births of that weight in 1986 to 24·1 in 1988:[30 31] but the proportion of babies weighing under 2500 g at birth still amounts to only 6·6% of the national population of all live births (4·3% at birth weights 2000–2499 g, and 2·2% at lower birth weights).[31] Nevertheless this study showed that at ages 1 to 5 years in the offspring population the relatively small proportion of low birth weight offspring babies consumed a high proportion of all hospital inpatient days.

Although a reduction in the time children spend in hospital has been found in this study, it is less likely that a comparable reduction would be found in demand for community care. General practitioner consultations, for instance, rose from 3773·9 per thousand children aged 0 to 4 years in 1971–72 to 4914·9 per thousand in 1981–82.[32 33] In most respects increases in admissions to hospital for any reason, and any extra burden of morbidity, handicap, and disability which may be brought by the increased survival of those of low birth weight,[11 34] must be borne not only by hospitals but also by families, by general practitioners, and by community health and welfare services.

Table III Ranking of conditions that required the most days of hospital admission in the study population and their offspring (aged 1–5 years), and the mean (SE) number of days of admission for each group of conditions

	Total cohort (admitted 1947–51)		*Firstborn cohort members* (admitted 1947–51)*		*Offspring (admitted 1966–76)*	
Highest percentage of days of admission	Infections 36·4 days	(43·2%) (4·2)	Infections 46·70 days	(53·8%) (14·76)	Respiratory 5·0 days	(19·8%) (0·4)
2nd highest	Respiratory 6·4 days	(13·7%) (0·4)	Musculoskeletal† 114·75 days	(14·7%) (87·12)	Injury 7·0 days	(15·5%) (2·0)
3rd highest	Congenital 39·7 days	(7·1%) (17·4)	Respiratory 4·99 days	(11·2%) (0·66)	Genitourinary 4·2 days	(10·6%) (0·9)
4th highest	Eye and ear 15·3 days	(6·8%) (2·0)	Eye and ear 14·55 days	(4·9%) (4·10)	Ill defined 6·2 days	(9·0%) (1·0)
5th highest	Digestive 12·4 days	(6·6%) (1·0)	Injury 6·86 days	(4·8%) (1·20)	Congenital 7·6 days	(7·4%) (1·3)
6th highest	Injury 13·0 days	(6·5%) (1·8)	Digestive 10·08 days	(4·6%) (1·20)	Digestive 4·1 days	(7·1%) (0·5)
7th highest	Genitourinary 17·4 days	(3·6%) (5·5)	Ill defined 6·25 days	(2·1%) (2·13)	Musculoskeletal 16·9 days	(5·0%) (9·0)
Total days for all causes including those not shown here (100%)	17 503		3117		2407	

*Born to mothers aged 19–25 years. †Including one admission lasting 774 days.

Table IV Comparison of hospital infant and early childhood admission (1–5 years) of the total cohort and firstborn cohort members (born 1946) and their firstborn offspring of the cohort (born 1965–71)

	Total cohort (n=5021)	*Firstborn cohort (n=844)*	*Offspring (n=2204)*
Mean (SE) number of days in hospital per person admitted	22·5 (2·2)	23·6 (7·7)	7·4 (0·6)
Mean (SE) number of days per admission	15·8 (1·0)	14·4 (3·4)	5·3 (0·4)

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