

Changes in children's hospital use

Cathy Connors and Wayne J. Millar

Abstract

Objectives

This article examines changes in hospital separations of children aged 1 to 14 between 1986/87 and 1996/97. It focuses on four common causes of childhood hospitalization: asthma, chronic disease of tonsils and adenoids, fractures, and acute appendicitis.

Data sources

Hospital separation data are from the Hospital Morbidity File, from Statistics Canada for fiscal year 1986/87, and from the Canadian Institute for Health Information for fiscal year 1996/97.

Analytical techniques

Diagnoses were coded to the *International Classification of Diseases, Ninth Revision* and surgical procedures were coded to the *Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures*. Population estimates for 1986 and 1996 were used to calculate hospital separation rates and surgical rates.

Main results

In 1986/87, there were 355,000 hospital separations of children aged 1 to 14; by 1996/97, the number of separations had fallen to just over 206,000. The hospital separation rate was 37.0 per 1,000 children in 1996/97, down from 69.7 ten years earlier. The average length of stay fell from 4.5 days to 3.8. The total annual number of days Canadian children stayed in hospital dropped from over 1.6 million to 788,700.

Keywords

hospital separation records, hospital utilization, length of stay, pediatric hospitalization, surgical procedures

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Since the mid-1980s, there have been major changes in the delivery of health care in Canada. While every province has its own strategy for health care reform, most have started with hospital downsizing.¹⁻³ Hospital mergers and closures^{4,5} have led to substantial reductions in the number of available beds.^{1,3,9} Many conditions that would have previously justified hospital admission may now be managed partly or entirely on an outpatient basis or at home.¹⁰ As a result, admission criteria have become more rigorous, thereby limiting inpatient services to the most seriously ill.³ There has been a well-documented shift from inpatient to outpatient treatments,^{4,8,9} most notably for surgical cases.^{1,3,6,11-13} At the same time, the use of alternative care settings, such as community health care centres and home care programs, has increased.^{7,14}

Recent trends in the hospitalization of children likely reflect not only the availability of hospital beds, but many other factors, such as the provision of ambulatory care services, improvements in medical technology, differences in the medical management of childhood illnesses, as well as changes in the incidence or prevalence of disease or changes in the natural history or severity of disease.

This article examines changes that have occurred in inpatient hospital use among children aged 1 to 14. Hospital records for 1986/87 and 1996/97 were used to compare hospital separation rates and average length of stay in the 10 provinces (see *Methods* and *Definitions*). The focus is on four common causes of childhood hospitalization: asthma, chronic disease of tonsils and adenoids, fractures, and acute appendicitis.

Provincial differences in hospital separation rates and average length of stay may be the result of many factors; for example, changes in the prevalence of childhood diseases, different start dates and approaches to restructuring, new or varying philosophies regarding the treatment of children, or the availability of clinical guidelines. However, it is beyond the scope of this study to explore or explain the reasons underlying observed differences between the provinces.

Methods

Data source

The data in this article are from the Hospital Morbidity File, from Statistics Canada for fiscal year 1986/87, and from the Canadian Institute for Health Information for fiscal year 1996/97. The information in this database comes from the admission/separation form completed by Canadian hospitals at the end of each patient's stay, when the patient is separated as a discharge or a death.

The File contains data on all inpatient cases that were separated from general and allied special hospitals (acute care, convalescent and chronic care hospitals) during the year. It includes information on patients treated in children's hospitals and in psychiatric units of general and allied special hospitals, but excludes outpatients and patients treated in psychiatric hospitals.

This article uses the hospital records for patients aged 1 to 14. Records for children younger than age 1 were excluded because of the unique conditions surrounding the hospitalization of this age group.

Adjusted population estimates for 1986 and 1996 are from Statistics Canada's Demography Division.¹⁵

Analytical techniques

Descriptive analyses present rates and percentages. Hospital separation rates were calculated by dividing the number of separations by the adjusted population estimate and multiplying by 1,000. Average length of stay was calculated by dividing the number of hospital days by the number of separations. Medical and surgical separations were analyzed separately (see *Definitions*).

Limitations

The Hospital Morbidity File for 1986/87 represented 93% of operating hospitals, or 1,134 out of 1,218.¹⁶ Reporting hospitals accounted

for more than 99% of all approved beds in Canada that year.¹⁶ By the mid-1990s, the response rate was somewhat lower: over 80% of operating hospitals, which covered 90% of hospital beds.¹⁷

The information in this article is not entirely representative of the Canadian population: the Northwest and Yukon Territories were excluded because 1986/87 data were not available. However, the number of childhood hospital separations in the Territories is quite small and is not expected to substantially affect the results.

Since a patient may be admitted to and discharged from a hospital more than once in a given year, the data reflect the characteristics of cases, not individuals. It was not possible to determine the rate of hospital re-admission for this analysis.

During each hospital stay, a patient may receive more than one diagnosis or may undergo more than one surgical procedure. For this analysis, only the most serious diagnosis or procedure was considered. This could under-represent the frequency of less serious conditions or procedures.

Hospital records are based on fiscal years, but the population estimates used to calculate separation rates refer to a specific point in time during the calendar year. However, since the rate of population change in a single year is very small, any effect should be minimal and should not affect the validity of the results.

Causality cannot be determined from this type of analysis. The data analyzed here cannot be used to determine whether children have a greater or reduced health risk because of the changes in the delivery of hospital services. Many procedures that formerly required hospital admission are now performed on an outpatient basis. A more comprehensive picture of children's health care utilization would include data about outpatient services. Such information is not available in sufficient detail to permit analysis by age or by reason for treatment.

Hospitalization rate halved

In 1986/87, there were 355,000 hospital separations of Canadian children aged 1 to 14. By 1996/97, despite a 10% increase in the child population, the number of separations for this age group had fallen to just over 206,000 (data not shown). The hospitalization rate was almost halved, falling from 69.7 to 37.0 separations per 1,000 children (Table 1). Both medical and surgical hospitalization rates (see *Definitions*) decreased for children of all ages (Chart 1).

Children admitted to hospital in 1996/97 stayed, on average, about one-half day less than did those admitted in 1986/87 (3.8 versus 4.5 days). However, while the average length of stay for medical reasons fell by over one day, the average stay for surgical procedures actually increased slightly, by 0.2 days. This slight increase at the national level was largely the consequence of a substantial rise in the average length of surgical stays in Québec.

As a result of the declining hospitalization rate, the total number of days Canadian children spent

Table 1
Hospital separations, children aged 1 to 14, by province, 1986/87 and 1996/97

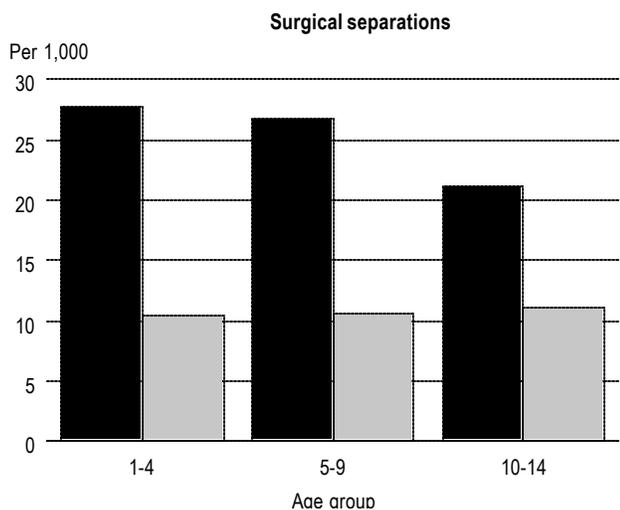
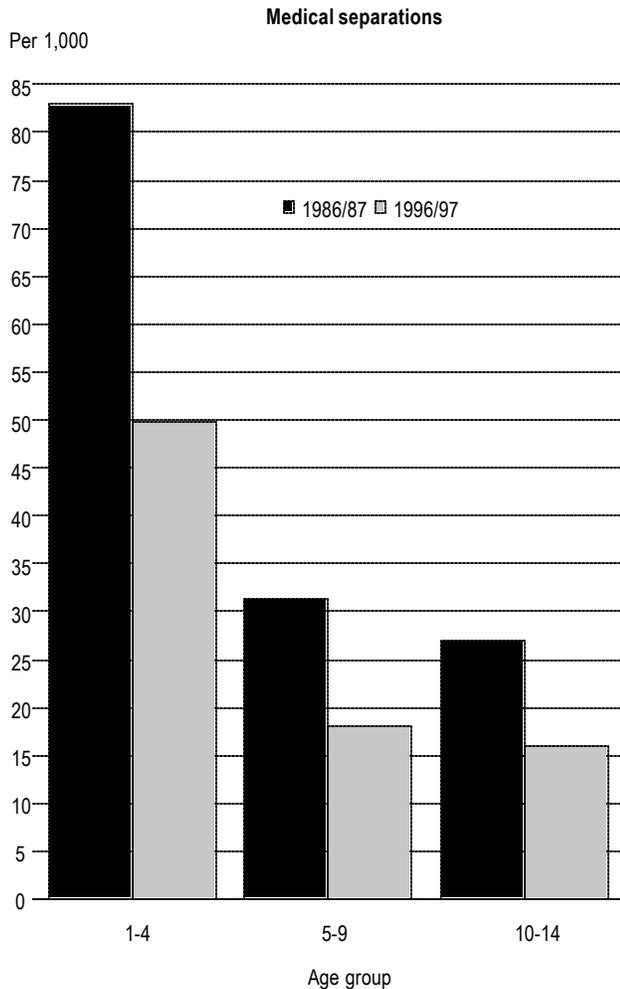
	Hospitalization rate (per 1,000)			Average length of stay (days)			Total number of days (^{'000})		
	1986/87	1996/97	% change [†]	1986/87	1996/97	Change [‡]	1986/87	1996/97	% change [‡]
Total									
Canada	69.7	37.0	-46.9	4.5	3.8	-0.7	1,591.9	788.7	-50.5
Newfoundland	79.8	50.6	-36.6	5.0	3.9	-1.1	55.7	20.8	-62.7
Prince Edward Island	100.2	54.2	-45.9	3.6	2.9	-0.8	10.0	4.3	-57.2
Nova Scotia	78.6	40.9	-48.0	4.9	4.3	-0.5	67.4	30.2	-55.3
New Brunswick	91.1	68.1	-25.2	4.3	3.0	-1.4	60.0	27.7	-53.9
Québec	48.2	36.3	-24.6	5.1	4.7	-0.4	315.4	221.6	-29.7
Ontario	70.8	32.0	-54.8	4.2	3.5	-0.7	526.1	232.5	-55.8
Manitoba	68.0	38.2	-43.8	4.5	4.1	-0.4	68.0	36.3	-46.7
Saskatchewan	121.5	62.3	-48.7	4.3	3.4	-1.0	120.8	45.7	-62.2
Alberta	90.2	37.7	-58.3	4.3	3.6	-0.7	206.0	79.4	-61.5
British Columbia	62.4	34.6	-44.6	4.6	3.7	-0.9	162.4	90.4	-44.3
Medical									
Canada	44.6	26.3	-41.2	4.7	3.6	-1.1	1,070.9	530.5	-50.5
Newfoundland	53.0	32.5	-38.6	4.9	4.3	-0.6	36.1	14.5	-59.8
Prince Edward Island	74.6	41.3	-44.7	3.7	3.1	-0.7	7.7	3.5	-54.7
Nova Scotia	54.1	25.6	-52.6	4.7	3.7	-1.0	45.1	16.1	-64.2
New Brunswick	66.0	49.9	-24.4	4.5	3.2	-1.4	45.6	21.5	-52.9
Québec	30.7	27.9	-8.9	5.1	3.9	-1.2	200.1	142.0	-29.0
Ontario	43.1	21.8	-49.4	4.5	3.3	-1.2	345.8	151.9	-56.1
Manitoba	45.4	27.1	-40.4	4.7	4.1	-0.6	47.6	25.7	-45.9
Saskatchewan	88.5	47.3	-46.5	4.6	3.4	-1.2	94.0	35.6	-62.1
Alberta	57.1	26.3	-54.0	4.6	3.6	-1.0	139.6	55.4	-60.3
British Columbia	38.5	23.7	-38.5	5.0	3.9	-1.2	109.3	64.3	-41.2
Surgical									
Canada	25.1	10.7	-57.2	4.1	4.3	0.2	521.0	258.2	-50.4
Newfoundland	26.8	18.1	-32.6	5.3	3.3	-1.9	19.6	6.3	-68.0
Prince Edward Island	25.7	13.0	-49.5	3.4	2.3	-1.1	2.4	0.8	-65.4
Nova Scotia	24.5	15.2	-37.8	5.2	5.4	0.2	22.3	14.0	-37.3
New Brunswick	25.1	18.3	-27.2	3.8	2.5	-1.3	14.4	6.2	-57.0
Québec	17.5	8.4	-52.0	5.2	7.3	2.1	115.3	79.6	-30.9
Ontario	27.6	10.2	-63.2	3.7	3.8	0.1	180.3	80.7	-55.3
Manitoba	22.6	11.1	-50.8	4.1	4.1	0.1	20.4	10.5	-48.3
Saskatchewan	33.0	15.0	-54.5	3.5	3.1	-0.5	26.8	10.0	-62.5
Alberta	33.1	11.4	-65.6	3.8	3.6	-0.2	66.5	24.0	-63.9
British Columbia	23.9	10.9	-54.5	3.9	3.4	-0.5	53.0	26.1	-50.8

Data source: Hospital Morbidity File, 1986/87 and 1996/97

[†] Based on unrounded rates. All differences between 1986/87 and 1996/97 are statistically significant ($p < 0.05$).

[‡] Based on unrounded numbers.

Chart 1
Hospitalization rate, by type of separation and age group, Canada excluding territories, 1986/87 and 1996/97



Data source: Hospital Morbidity File, 1986/87 and 1996/97

in hospital dropped sharply, from more than 1.6 million in 1986/97 to 788,700 in 1996/97. In both years, medical admissions represented just under two-thirds of these days.

Provincial declines

The child hospitalization rate fell in all provinces. However, the extent of the decline varied, from 25% in Québec and New Brunswick to 58% in Alberta. The drop in medical separation rates ranged from 9% in Québec to 54% in Alberta. The drop in surgical separation rates ranged from 27% in New Brunswick to 66% in Alberta.

By 1996/97, New Brunswick had the highest overall child hospitalization rate (68.1 separations per 1,000 children), followed by Saskatchewan (62.3). Ontario (32.0) and British Columbia (34.6) had the lowest.

It appears that hospitalization rates, both medical and surgical, are moving towards a common lower level. In 1996/97, rates for medical separations ranged from 21.8 per 1,000 children in Ontario to 49.9 in New Brunswick. For surgical separations, the range was from 8.4 per 1,000 children in Québec to 18.3 in New Brunswick.

The average length of stay in each province also tended to follow the national downturn. In 1996/97, all provinces had shortened stays for medical separations. But while some provinces had shorter average stays for surgical reasons, in others, the average actually rose. Most of these increases were slight (0.1 to 0.2 days), although in Québec, the average increased by 2.1 days.

By 1996/97, provincial differences in the average length of stay for medical reasons were relatively small. The average ranged from 3.1 days in Prince Edward Island to just over 4 days in Newfoundland and Manitoba. For surgical separations, average length of stay was comparatively short in Prince Edward Island and New Brunswick (2.3 and 2.5 days respectively), but much longer in Nova Scotia and Québec (5.4 and 7.3 days). The short stays in Prince Edward Island and New Brunswick may be the result of transferring some surgical cases to medical centres in Nova Scotia. The long average stay in Québec, where the surgical separation rate is very

low, may reflect a trend toward admitting only the most serious cases for surgery, while using outpatient surgical services for the less serious cases.

The top 10

The conditions that put children in hospital have changed very little over the past decade. In 1986/87, chronic disease of tonsils and adenoids had been the overall leading cause, followed by asthma (Table 2, Appendix Table A). Ten years later, the order was reversed, with asthma ranking first, and tonsils and adenoids second. In both years, fractures was third. For medical cases, asthma held first place in both years. Among surgical separations, operations on tonsils and adenoids, reduction of fracture and dislocation, and operations on appendix

ranked first, second and third, respectively, in both years.

Asthma leading cause

In 1996/97, asthma accounted for 20,128 hospital separations of children aged 1 to 14, down from 28,888 a decade earlier (data not shown). Thus, despite the increasing prevalence of childhood asthma,¹⁸ the hospitalization rate for this condition fell from 5.7 to 3.6 separations per 1,000 children (Table 3). Even so, by 1996/97, asthma had overtaken chronic disease of tonsils and adenoids as the overall leading cause of childhood hospitalization and remained the leading cause of medical separations. Over the decade, the average length of stay for asthma dropped from 3.6 to 2.3

Table 2

Hospital separations, by type, 10 leading causes, children aged 1 to 14, Canada excluding territories, 1986/87 and 1996/97

1986/87	Rank	1996/97
Total (ICD-9 code)		
Chronic disease of tonsils and adenoids (474)	1	Asthma (493)
Asthma (493)	2	Chronic disease of tonsils and adenoids (474)
Fractures (800-829)	3	Fractures (800-829)
Other noninfective gastroenteritis and colitis (558)	4	Other noninfective gastroenteritis and colitis (558)
General symptoms (780)	5	General symptoms (780)
Acute laryngitis and tracheitis (464)	6	Pneumonia, organism unspecified (486)
Pneumonia, organism unspecified (486)	7	Acute appendicitis (540)
Other symptoms involving abdomen and pelvis (789)	8	Acute bronchitis and bronchiolitis (466)
Acute bronchitis and bronchiolitis (466)	9	Acute laryngitis and tracheitis (464)
Acute upper respiratory infections of multiple or unspecified site (465)	10	Intestinal infections due to other organisms (008)
Medical (ICD-9 code)		
Asthma (493)	1	Asthma (493)
Other noninfective gastroenteritis and colitis (558)	2	Other noninfective gastroenteritis and colitis (558)
General symptoms (780)	3	General symptoms (780)
Acute laryngitis and tracheitis (464)	4	Pneumonia, organism unspecified (486)
Pneumonia, organism unspecified (486)	5	Acute bronchitis and bronchiolitis (466)
Other symptoms involving abdomen and pelvis (789)	6	Acute laryngitis and tracheitis (464)
Acute bronchitis and bronchiolitis (466)	7	Intestinal infections due to other organisms (008)
Acute upper respiratory infections of multiple or unspecified sites (465)	8	Other symptoms involving abdomen or pelvis (789)
Fractures (800-829)	9	Fractures (800-829)
Intracranial injury of other and unspecified nature (854)	10	Disorders of fluid, electrolyte and acid-base balance (276)
Surgical (CCP code)		
Operations on tonsils and adenoids (40)	1	Operations on tonsils and adenoids (40)
Reduction of fracture and dislocation (91)	2	Reduction of fracture and dislocation (91)
Operations on appendix (59)	3	Operations on appendix (59)
Other operations on middle and inner ear (32)	4	Operations on skin and subcutaneous tissue (98)
Operations on skin and subcutaneous tissue (98)	5	Operations on spinal cord and spinal canal structures (16)
Repair of hernia (65)	6	Operations on muscles, tendons, fascia, and bursa, except hand (95)
Operations on penis (76)	7	Incision, excision, and division of other bones (89)
Operations on testes (74)	8	Repair of hernia (65)
Operations on spinal cord and spinal canal structures (16)	9	Operations on testes (74)
Removal and restoration of teeth (35)	10	Other operations on middle and inner ear (32)

Data source: Hospital Morbidity File, 1986/87 and 1996/97

days. The declines in the number of hospital separations and in length of stay could be attributable to a combination of improved treatment

of childhood asthma with medications and greater use of ambulatory care services.¹⁸ The declining hospitalization rates and shorter stays resulted in a

Table 3
Hospital separations for four common causes, children aged 1 to 14, by province, 1986/87 and 1996/97

Cause (ICD-9 code)	Hospitalization rate (per 1,000)			Average length of stay (days)			Total number of days (⁰⁰⁰)		
	1986/87	1996/97	% change [†]	1986/87	1996/97	Change [‡]	1986/87	1996/97	% change [‡]
Asthma (493)									
Canada	5.7	3.6	-36.4	3.6	2.3	-1.3	105.1	47.2	-55.1
Newfoundland	4.7	3.5	-26.9	3.8	2.5	-1.3	2.5	0.9	-64.0
Prince Edward Island	9.6	9.2	-4.7	4.0	3.2	-0.8	1.1	0.8	-23.5
Nova Scotia	6.9	4.8	-30.4	4.0	2.8	-1.2	4.9	2.3	-53.5
New Brunswick	6.4	5.4	-14.7	4.7	2.9	-1.8	4.6	2.2	-52.1
Québec	5.4	4.2	-21.6	3.4	2.3	-1.1	23.2	12.5	-46.4
Ontario	6.3	3.3	-47.8	3.7	2.2	-1.5	41.6	15.4	-63.0
Manitoba	3.9	3.0	-22.3	3.0	2.6	-0.4	2.6	1.8	-29.7
Saskatchewan	6.3	4.8	-22.7	3.9	2.8	-1.1	5.7	3.0	-47.2
Alberta	6.2	3.4	-45.6	3.8	2.3	-1.5	12.4	4.6	-63.2
British Columbia	3.7	2.5	-30.8	3.2	2.2	-1.0	6.5	3.9	-41.1
Chronic disease of tonsils and adenoids (474)									
Canada	8.5	2.3	-73.2	1.7	1.1	-0.6	75.1	14.5	-80.7
Newfoundland	7.0	8.5	20.6	2.8	1.1	-1.7	2.8	1.0	-64.6
Prince Edward Island	10.9	6.7	-38.7	2.8	1.3	-1.5	0.8	0.2	-72.5
Nova Scotia	5.9	4.5	-24.3	1.7	1.4	-0.4	1.8	1.0	-41.8
New Brunswick	9.3	8.5	-8.9	2.0	1.1	-0.9	2.8	1.2	-56.1
Québec	3.8	0.4	-88.4	1.4	1.5	0.1	6.8	0.9	-87.2
Ontario	11.5	2.0	-82.5	1.6	1.1	-0.5	32.7	4.7	-85.7
Manitoba	8.0	2.7	-66.6	2.0	1.2	-0.8	3.5	0.7	-79.3
Saskatchewan	11.6	4.7	-59.6	2.1	1.1	-0.9	5.6	1.2	-79.1
Alberta	10.3	2.6	-75.2	1.9	1.1	-0.8	10.6	1.7	-84.3
British Columbia	7.7	2.5	-67.7	1.8	1.1	-0.7	7.7	1.9	-75.4
Fractures (800-829)									
Canada	3.4	2.1	-36.4	5.7	3.7	-2.0	98.5	44.1	-55.2
Newfoundland	4.3	2.6	-39.9	6.2	4.3	-1.9	3.7	1.2	-68.7
Prince Edward Island	2.5	2.1	-14.3	4.2	3.6	-0.6	0.3	0.2	-27.1
Nova Scotia	2.7	1.9	-29.5	5.7	4.0	-1.7	2.8	1.3	-52.0
New Brunswick	3.5	2.8	-20.0	5.7	3.5	-2.2	3.1	1.4	-56.2
Québec	2.2	1.8	-17.8	6.4	4.8	-1.5	18.3	11.6	-36.7
Ontario	3.1	1.8	-41.0	5.3	3.4	-1.9	29.1	13.1	-55.0
Manitoba	4.0	2.5	-37.7	12.4	4.8	-7.6	10.9	2.7	-75.2
Saskatchewan	4.9	3.3	-31.7	5.0	3.6	-1.5	5.6	2.6	-54.2
Alberta	4.8	2.3	-52.5	5.1	3.2	-1.9	13.0	4.3	-67.2
British Columbia	4.6	2.9	-36.6	4.5	2.8	-1.7	11.8	5.9	-50.2
Acute appendicitis (540)									
Canada	1.3	1.0	-22.7	4.9	3.7	-1.2	31.5	20.0	-36.5
Newfoundland	2.2	1.1	-48.6	4.6	3.8	-0.8	1.4	0.4	-68.6
Prince Edward Island	1.6	0.7	-55.7	5.0	3.2	-1.8	0.2	0.1	-71.8
Nova Scotia	1.6	1.1	-34.7	4.6	4.0	-0.6	1.3	0.7	-45.5
New Brunswick	1.5	1.0	-32.8	5.1	3.7	-1.4	1.2	0.5	-56.5
Québec	1.1	1.2	2.6	5.0	3.8	-1.2	7.2	5.7	-20.0
Ontario	1.1	0.8	-30.2	5.0	3.6	-1.4	10.1	5.9	-41.1
Manitoba	1.3	1.1	-19.4	5.1	4.3	-0.7	1.5	1.1	-28.5
Saskatchewan	1.4	1.0	-22.5	5.1	3.9	-1.3	1.6	0.9	-44.7
Alberta	1.4	1.1	-24.0	5.0	3.4	-1.6	3.7	2.1	-42.3
British Columbia	1.4	1.0	-24.6	4.5	3.5	-0.9	3.4	2.6	-25.2

Data source: Hospital Morbidity File, 1986/87 and 1996/97

† Based on unrounded rates. All differences between 1986/87 and 1996/97 are statistically significant ($p < 0.05$).

‡ Based on unrounded numbers.

55% decrease in the total number of days children spent in hospital for asthma treatment between 1986/87 and 1996/97.

Child hospitalization rates for asthma fell in all provinces. However, the percentage decline ranged from a minimal 5% in Prince Edward Island to 48% in Ontario.

Provincial hospitalization rates reflected the regional patterns of asthma prevalence noted in an earlier study.¹⁸ Prince Edward Island had the highest rates in both 1986/87 and 1996/97, while British Columbia had the lowest. In 1996/97, Prince Edward Island's rate was 9.2 per 1,000 children, more than three times the rate in British Columbia (2.5). If the unusually high rate in Prince Edward Island were excluded, provincial rates would have been more similar in 1996/97 than they had been 10 years earlier.

The average length of stay for asthma also declined in all provinces. As well, in 1996/97, the range in average stays for asthma was narrower than in 1986/87. In 1996/97, Prince Edward Island had the longest average stay (3.2 days); the shortest stays were in Ontario and British Columbia (2.2 days).

Sharp drop for tonsils and adenoids

Chronic disease of tonsils and adenoids (medical and surgical combined) had been the leading overall cause of hospitalization of children in 1986/87. However, in the next decade, the number of separations for this condition fell dramatically, from 43,213 to 12,680 (data not shown).

In fact, of the 10 leading causes of child hospitalization, chronic disease of tonsils and adenoids showed the largest decrease in rates over the decade. The national rate fell from 8.5 to 2.3 separations per 1,000 children. The main reason for this decline seems to be a shift from inpatient to day surgery procedures.^{12,13} For instance, it is estimated that in Ontario over half of all operations on tonsils and adenoids are now performed on an outpatient basis.¹³ Improvements in anaesthetics for children may contribute to even more acceptance of such procedures.¹³ And for those children who were admitted to hospital for tonsils and adenoids, the average length of stay fell from 1.7 to 1.1 days.

Definitions

Hospital refers to general and allied special hospitals, including acute care, convalescent, and chronic care hospitals. It includes patients treated in children's hospitals and in psychiatric units of general and allied special hospitals, but excludes outpatients and patients treated in psychiatric hospitals.

Separation refers to the discharge or death of an inpatient. *Medical separations* are those that did not involve a surgical procedure during the hospital stay. *Surgical separations* represent information on patients who underwent a surgical procedure during a hospital stay.

The medical diagnoses used in the tabulations were based on the most serious condition that caused the hospital stay, or the condition that required the greatest amount of medical resources. The medical conditions used for this article are coded to the three-digit level of the *International Classification of Diseases, Ninth Revision (ICD-9)*:¹⁹ Intestinal infections due to other organisms (008), Disorders of fluid, electrolyte and acid-base balance (276), Acute laryngitis and tracheitis (464), Acute upper respiratory infections of multiple or unspecified site (465), Acute bronchitis and bronchiolitis (466), Chronic disease of tonsils and adenoids (474), Pneumonia, organism unspecified (486), Asthma (493), Acute appendicitis (540), Other noninfective gastroenteritis and colitis (558), General symptoms (780), Other symptoms involving abdomen and pelvis (789), Fractures (800-829), and Intracranial injury of other and unspecified nature (854).

The surgical procedures in the tabulations were based on the most serious procedure. Those used for this analysis were coded to the two-digit level of the *Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures (CCP)*:²⁰ Operations on spinal cord and spinal canal structures (16), Other operations on middle and inner ear (32), Removal and restoration of teeth (35), Operations on tonsils and adenoids (40), Operations on appendix (59), Repair of hernia (65), Operations on testes (74), Operations on penis (76), Incision, excision, and division of other bones (89), Reduction of fracture and dislocation (91), Operations on muscles, tendons, fascia, and bursa, except hand (95), and Operations on skin and subcutaneous tissue (98).

Hospital records that did not have a CCP code of 14 or over were considered to be medical; those with a CCP code of 14 or over were considered to be surgical.

For the analysis of leading causes, conditions were considered regardless of whether a surgical procedure was performed, thereby combining medical and surgical separations.

The sharp drops in the hospitalization rate and length of stay resulted in an 81% decline in the number of days children spent in hospital because of tonsils and adenoids between 1986/87 and 1996/97.

Hospitalization rates for tonsils and adenoids decreased in all provinces except Newfoundland, where the rate rose from 7.0 to 8.5 separations per 1,000 children. By 1996/97, Newfoundland and New Brunswick had the highest rates (8.5 per 1,000 children). Québec had the lowest, recording only 0.4 separations per 1,000 children that year. Not only did hospitalization rates show substantial differences between provinces, but such differences increased slightly during the 10-year period.

Between 1986/87 and 1996/97, the average length of hospital stay for tonsils and adenoids fell in all provinces except Québec, where there was virtually no change. Provincial differences in average stays narrowed during this period so that by 1996/97, there was little difference between the provinces. That year, Québec had the longest average stay, at 1.5 days. In Newfoundland, New Brunswick, Ontario, Saskatchewan, Alberta and British Columbia, the average was 1.1 days.

Hospitalization rates down for fractures

In 1996/97, almost 12,000 separations of children aged 1 to 14 were attributable to fractures (medical and surgical combined), down considerably from 17,170 in 1986/87 (data not shown). While fractures were the third leading cause of child hospitalization in both years, there was a substantial reduction in the hospitalization rate during the period, from 3.4 to 2.1 separations per 1,000 children. As well, the average length of stay fell from 5.7 to 3.7 days.

The reduction in the hospitalization rate and length of stay may reflect a trend toward treating less serious fractures on an outpatient basis. However, there may also be a drop in the incidence of fractures among children, attributable to greater use of and improvements in the design of safety equipment for sports and recreational activities.²¹⁻²³ Motor vehicle accidents tend to result in more

serious fractures, so an additional factor in lower hospitalization rates may be fewer motor vehicle injuries. Between 1988 and 1992, motor vehicle injuries among children declined 25%.²⁴

The decline in the hospitalization rate, together with the drop in the average length of stay, produced a 55% decrease in the total number of days that children spent in hospital for fractures.

Hospitalization rates were down in all provinces, with declines ranging from 14% in Prince Edward Island to 53% in Alberta. In 1996/97, Saskatchewan had the highest rate (3.3 separations per 1,000 children); Québec and Ontario, the lowest (1.8).

While the average length of stay for fractures decreased in all provinces, the drop was particularly pronounced in Manitoba (7.6 days). Even so, Manitoba still tied with Québec for the longest average stay in 1996/97. Children in these two provinces averaged 4.8 days per visit for fractures. The shortest average stay was 2.8 days in British Columbia.

Acute appendicitis now in top 10

Acute appendicitis (medical and surgical combined) was not among the 10 leading causes of child hospitalization in 1986/87, but by 1996/97, it ranked seventh. Nonetheless, in 1996/97, there were fewer separations of children for acute appendicitis (5,450) than there had been in 1986/87 (6,431) (data not shown). The hospitalization rate fell slightly over the decade, from 1.3 to 1.0 separations per 1,000 children, and the average length of stay dropped from 4.9 to 3.7 days.

Some researchers have attributed the lower hospitalization rate to a decline in the incidence of appendicitis as a result of changes in dietary habits, with the young preferentially affected.²⁵ However, it has also been argued that the decline may reflect an increase in surgical conservatism.²⁵ That is, the severity of appendicitis is variable, and some cases resolve spontaneously without rupture. Improved diagnostic techniques may also have contributed to lower hospitalization rates.

The drop of more than one day in average length of stay and the decline in the hospitalization rate

meant that the total number of days children spent in hospital for acute appendicitis fell by 37% between 1986/87 and 1996/97.

The hospitalization rate decreased in all provinces except Québec, where there was a small increase. Consequently, by 1996/97, Québec's rate was the highest (1.2 separations per 1,000 children). The lowest rates were in Prince Edward Island (0.7) and Ontario (0.8).

The average length of stay for acute appendicitis also fell in all provinces over the 10-year period. By 1996/97, Manitoba had the longest average stay (4.3 days), and Alberta (3.4) and Prince Edward Island (3.2), the shortest.

Concluding remarks

Between 1986/87 and 1996/97, all provinces experienced a sharp drop in child hospitalization rates and a trend toward shorter stays overall and for the four causes examined in this article: asthma, tonsils and adenoids, fractures, and acute appendicitis. These declines may reflect the growing tendency to hospitalize only the most serious cases.

While there has been a narrowing of provincial differences in patterns of hospital use, variations persist. These variations may partly reflect the pace of health care reform, which began at different times and proceeded at a different rate in each province.

Provincial variations may also result from the extent to which ambulatory care and day surgery are used. The hospital bed supply and the availability of alternative care may differ greatly from province to province. As well, there may be provincial differences in hospital re-admission rates, which cannot be determined with the data used in this analysis.

To get a complete picture of hospital use, it would be necessary to look at changes in the use of outpatient services. An earlier study of all age groups found that between 1986/87 and 1993/94, total inpatient days decreased by 17%, but total outpatient hospital visits increased by 15%.⁹ A Winnipeg study found that when inpatients and outpatients were considered together, hospitals in that city treated just as many residents in 1997/98 as they had before downsizing.⁶

The decline in inpatient hospital use does not necessarily indicate lower pediatric health care costs. Nonetheless, between 1991/92 and 1994/95, annual operating expenses for Canadian hospitals showed an average decline of 2.4%.⁹

However, greater use of outpatient services may actually increase costs for individuals. For example, the cost of prescription medications, which would be borne by the hospital if the child were admitted, is passed on to the family. Since lower income households are less likely to be covered by prescription drug insurance,²⁶ and members of such households use proportionally more hospital services,^{1,3,6,11,27} the shift toward outpatient care may have a greater economic impact on such households.

As well, families increasingly face the necessity of caring for their sick children at home and so may need to make costly alternative care arrangements. This can be particularly difficult for dual-earner or lone-parent families.

It may, however, be in a child's best interest to be admitted to hospital only when absolutely necessary, to reduce trauma and family disruption. Additional health risks, such as infection, may also be reduced if a child is cared for at home.

Hospital statistics are only part of the total health care picture. More information on related areas, such as the use of day surgery and ambulatory care, could place hospital utilization patterns in sharper focus. ●

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Appendix

Table A

Hospital separations for 10 leading causes, children aged 1 to 14, Canada excluding territories, 1986/87 and 1996/97

Leading causes in 1996/97	Hospitalization rate (per 1,000)			Average length of stay (days)			Total number of days (⁰⁰⁰)		
	1986/87	1996/97	% change [†]	1986/87	1996/97	Change [‡]	1986/87	1996/97	% change [‡]
Total (ICD-9 code)	69.7	37.0	-46.9	4.5	3.8	-0.7	1,591.9	788.7	-50.5
Asthma (493)	5.7	3.6	-36.4	3.6	2.3	-1.3	105.1	47.2	-55.1
Chronic disease of tonsils and adenoids (474)	8.5	2.3	-73.2	1.7	1.1	-0.6	75.1	14.5	-80.7
Fractures (800-829)	3.4	2.1	-36.4	5.7	3.7	-2.0	98.5	44.1	-55.2
Other noninfective gastroenteritis and colitis (558)	2.6	1.7	-37.4	3.3	2.1	-1.2	43.9	19.0	-56.7
General symptoms (780)	2.5	1.5	-42.0	3.2	2.2	-1.0	40.4	17.4	-56.9
Pneumonia, organism unspecified (486)	1.7	1.3	-20.6	5.0	3.4	-1.7	43.0	25.1	-41.7
Acute appendicitis (540)	1.3	1.0	-22.7	4.9	3.7	-1.2	31.5	20.0	-36.5
Acute bronchitis and bronchiolitis (466)	1.5	0.8	-44.1	4.2	2.8	-1.4	31.7	13.0	-58.9
Acute laryngitis and tracheitis (464)	1.9	0.8	-57.4	2.5	1.5	-1.0	24.1	6.9	-71.4
Intestinal infections due to other organisms (008)	0.8	0.8	-7.6	3.2	2.4	-0.8	13.1	10.0	-24.2
Total medical (ICD-9 code)	44.6	26.3	-41.2	4.7	3.6	-1.1	1,070.9	530.5	-50.5
Asthma (493)	5.7	3.6	-36.3	3.6	2.3	-1.3	104.4	47.0	-55.0
Other noninfective gastroenteritis and colitis (558)	2.6	1.6	-37.2	3.2	2.0	-1.2	42.6	18.5	-56.6
General symptoms (780)	2.4	1.4	-41.6	3.1	2.1	-1.0	37.1	16.1	-56.6
Pneumonia, organism unspecified (486)	1.7	1.3	-20.4	5.0	3.3	-1.7	41.7	24.2	-41.9
Acute bronchitis and bronchiolitis (466)	1.5	0.8	-44.1	4.2	2.8	-1.4	31.5	12.9	-59.0
Acute laryngitis and tracheitis (464)	1.9	0.8	-57.3	2.5	1.5	-1.0	23.9	6.8	-71.4
Intestinal infections due to other organisms (008)	0.8	0.7	-7.6	3.1	2.3	-0.8	12.8	9.5	-26.0
Other symptoms involving abdomen and pelvis (789)	1.5	0.6	-58.4	2.5	1.9	-0.6	19.0	6.7	-64.9
Fractures (800-829)	1.0	0.5	-51.3	8.1	6.1	-2.1	40.4	16.1	-60.1
Disorders of fluid, electrolyte and acid-base balance (276)	0.1	0.5	558.7	5.1	2.2	-2.8	1.8	5.8	218.3
Total surgical (CCP code)	25.1	10.7	-57.2	4.1	4.3	0.2	521.0	258.2	-50.4
Operations on tonsils and adenoids (40)	8.8	2.5	-71.9	1.8	1.4	-0.4	82.1	19.9	-75.8
Reduction of fracture and dislocation (91)	2.3	1.6	-29.1	4.5	2.8	-1.7	53.0	25.3	-52.4
Operations on appendix (59)	1.5	1.1	-27.3	4.9	3.7	-1.2	37.1	22.1	-40.4
Operations on skin and subcutaneous tissue (98)	1.1	0.5	-52.0	6.5	8.1	1.7	35.3	23.5	-33.5
Operations on spinal cord and spinal canal structures (16)	0.5	0.3	-37.8	5.8	5.5	-0.3	15.4	9.9	-35.3
Operations on muscles, tendons, fascia, and bursa, except hand (95)	0.5	0.3	-48.4	5.7	3.5	-2.2	14.9	4.9	-66.8
Incision, excision, and division of other bones (89)	0.4	0.3	-42.7	6.5	4.4	-2.2	14.6	6.1	-58.1
Repair of hernia (65)	1.0	0.2	-80.7	2.9	4.3	1.4	14.9	4.7	-68.5
Operations on testes (74)	0.6	0.2	-68.2	2.8	1.3	-1.5	8.7	1.4	-84.0
Other operations on middle and inner ear (32)	1.2	0.2	-84.6	2.1	2.4	0.2	13.0	2.4	-81.5

Data source: Hospital Morbidity File, 1986/87 and 1996/97

[†] Based on unrounded rates. All differences between 1986/87 and 1996/97 are statistically significant ($p < 0.05$).

[‡] Based on unrounded numbers.