

The evolution of freestanding children's hospitals in Canada

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OBJECTIVE: The purpose of the present article is to examine the evolution of freestanding children's hospitals in Canada over the past century. The results include documentation of the number of freestanding children's hospitals in Canada that have since closed, merged with other institutions or remained freestanding. Similar data are presented for the United States (US). Also included is an analysis of factors in the internal and external environment that contributed to the changing structure of children's hospitals.

METHODS: Sources of information included a review of the literature, publicly available data and statistics on children's hospitals in Canada and the US.

RESULTS: Nine of the 16 children's hospitals in Canada were freestanding at one time. Today, only two remain freestanding. Three formerly freestanding children's hospitals have merged with maternal health facilities and four formerly freestanding children's hospitals have merged with adult institutions. Similar trends are seen in the US.

CONCLUSIONS: The structure of children's hospitals in North America has changed significantly over the past century. This can be attributed to a number of factors, including the evolution of the health status of children due to medical advances, as well as external forces such as demographics and the rising cost of health care. The impact on the health of children and the mission of children's hospitals in terms of patient care, teaching and research remains to be seen.

Key Words: *Cost of health care; Freestanding children's hospitals; Health status of children; Hospital mergers; Structure of children's hospitals*

The structure of children's hospitals in North America has changed significantly over the past century. For example, only two of the 16 children's hospitals in Canada remain freestanding; the remainder have merged with adult institutions or maternal health facilities. This restructuring can be attributed to a number of factors, including an evolution in the health status of children due to medical advances, as well as external forces such as demographics and the rising cost of health care. The impact on the health of children and the mission of children's hospitals in terms of patient care, teaching and research remains to be seen.

HISTORY OF CHILDREN'S HOSPITALS

Founded in 1852, the first children's hospital in the English-speaking world was The Great Ormond Street

L'évolution des hôpitaux pédiatriques autonomes au Canada

OBJECTIF : Le présent article vise à examiner l'évolution des hôpitaux pédiatriques autonomes au Canada depuis un siècle. Les résultats incluent de la documentation sur le nombre d'hôpitaux pédiatriques autonomes au Canada qui ont fermé depuis, qui ont fusionné avec d'autres établissements ou qui sont demeurés autonomes. Des données similaires sont présentées pour les États-Unis. On trouve également une analyse des facteurs des milieux internes et externes qui contribuent à la structure évolutive des hôpitaux pédiatriques.

MÉTHODOLOGIE : Les sources d'information comprennent une analyse bibliographique, les données publiquement disponibles et des statistiques sur les hôpitaux pédiatriques au Canada et aux États-Unis.

RÉSULTATS : Neuf des 16 hôpitaux pédiatriques du Canada ont déjà été autonomes. Seulement deux le sont encore. Trois anciens hôpitaux pédiatriques autonomes ont fusionné avec des établissements de santé maternelle et quatre, avec des établissements pour adultes. On constate une tendance semblable aux États-Unis.

CONCLUSIONS : La structure des hôpitaux pédiatriques en Amérique du Nord s'est considérablement modifiée depuis un siècle. On peut attribuer ce phénomène à plusieurs facteurs, y compris l'évolution de l'état de santé des enfants en raison des progrès médicaux, ainsi qu'à des forces externes comme la démographie et le coût croissant des soins de santé. Il reste à évaluer les répercussions de cette situation sur la santé des enfants et sur la mission des hôpitaux pédiatriques en matière de soins aux patients, d'enseignement et de recherche.

Hospital for Sick Children, located on 49 Great Ormond Street, London, United Kingdom (1). The first children's hospital in the United States (US) was The Children's Hospital of Philadelphia (Philadelphia, Pennsylvania), founded in 1855 (2), while The Hospital for Sick Children in Toronto, Ontario, opened in 1875 and was the first children's hospital in Canada (3). These hospitals were followed by the opening of a number of children's hospitals in the US and Canada between the end of the 19th century and the beginning of the 20th century.

CHILDREN'S HOSPITALS IN CANADA TODAY

According to the Canadian Paediatric Society (4), there are 16 children's hospitals in Canada. The majority of these are teaching hospitals with paediatric residency programs.

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Of the 16 Canadian children's hospitals, two are freestanding (defined here as largely geographically, financially, clinically and administratively independent), three consist of merged services for children and women, and the remainder are paediatric programs within larger medical centres, some of which are located in separate paediatric facilities.

EVOLUTION OF THE HEALTH OF CHILDREN

Since the inception of the first freestanding children's hospitals in the late 19th century, there have been significant changes in the health status of children. For example, the infant mortality rate in Canada fell from 134 per 1000 in 1901 to 5.5 per 1000 in 1997 (5). This decline in the infant mortality rate represents the most dramatic mortality rate reduction of the 20th century.

In the early 1900s, a significant proportion of total deaths were among children, often caused by infectious diseases. For example, in 1900, 30.4% of all deaths occurred among children younger than five years of age; in 1997, that percentage was only 1.4%. The control of infectious diseases has contributed to the sharp drop in infant and child mortality rates, and to an increase in life expectancy of 29.2 years (6).

In contrast, unintentional injury was the leading cause of death for children and youth in Canada at the close of the 20th century. Injuries accounted for more child deaths than all diseases combined. In 1997, 963 Canadians younger than 19 years of age died from unintentional injuries. Although deaths from external causes and disease have declined over the past three decades, the child mortality rate attributed to suicide has increased 2.5 times, from three deaths per million in 1971 to eight deaths per million in 1996 (5).

Improvements in medical care was the main force for the decline in infant mortality rates during the second half of the 20th century. The discovery and widespread use of antimicrobial agents, the development of fluid and electrolyte replacement therapy, and safe blood transfusions contributed to the decline in infant mortality rate (7). Recent advances in the field of perinatal medicine have significantly increased the survival rate of premature infants. For example, according to one study, the survival rate of extremely low birth weight (500 g to 800 g) neonates increased from 20% to 59% between 1979 and 1994 (8). Furthermore, due to advances in clinical medicine, there are a number of conditions (eg, congenital heart defects, cystic fibrosis and leukemia) that were once fatal but are now treatable with survival into adulthood (9-12).

In addition to advances in the treatment of disease, another area of paediatric medicine that has had an impact on mortality and morbidity rates over the past century is the prevention of disease. The most striking example is childhood vaccinations. Dramatic declines in child morbidity rates have been reported for nine vaccine-preventable diseases (13). The development and release of new vaccines in the next decade is likely to continue to impact paediatric morbidity and mortality rates.

IMPACT ON THE PROVISION OF CARE

The evolution in the health of children over the past century has had a significant impact on how health care is provided. For example, these factors have contributed to a shift from inpatient to ambulatory care and a change in the composition of hospitalized patients. In addition, there has been a blurring of the boundaries between the care of children and adults, a shift in resources and attention from treatment to prevention, and a redefinition of health and well being. These changes have significantly impacted children's hospitals and are likely to continue to do so in the 21st century.

Medical advances have played a significant role in decreasing hospital admissions and increasing outpatient services. For example, in Canada in 1986/1987, there were 355,000 hospital separations (discharges or deaths) of children between one and 14 years of age. By 1996/1997, this number had fallen to just over 206,000, despite a 10% increase in the child population. This represents a decrease in the hospitalization rate of almost 50%, from 69.7 to 37.0 separations per 1000 children. During the same time period, length of stay in hospitals decreased on average by half a day (14).

The decrease in inpatient hospital admissions was accompanied by a shift from inpatient to ambulatory care. For example, total outpatient hospital visits increased by 15% between 1986/1987 and 1993/1994. This was partly due to medical and surgical advances that led to improvements in the treatment of prevalent childhood diseases, such as asthma, and ambulatory surgery for common procedures, such as the removal of adenoids and tonsils (14).

Medical advances, combined with the shift toward outpatient care, have also resulted in a change in the composition of patients cared for by children's hospitals. The number of paediatric patients with moderate to severe chronic medical conditions that require ongoing care has increased over the past two decades.

The health care needs of children with chronic conditions are particularly complex and expensive. Children with chronic conditions require more health services, use more compensatory devices and prescription medications, and consume a wide array of nonmedical and community services, including occupational and physical therapy, home health and respite care (15).

Medical advances in recent decades have also resulted in a blurring of boundaries between the care of children and adults. Perhaps the most striking example of this is in the field of perinatology, in which the health of the mother and her child are inextricably linked. However, despite this link, the care of the mother and her infant is often provided at separate institutions. Studies have shown that the outcome is better for preterm infants born at a tertiary care centre who do not have to be transferred to another institution. Even after adjusting for perinatal risk factors and admission illness severity, premature infants born outside of tertiary care centres have been found to be at increased risk of major morbidity and mortality (16).

A final example of this blurring of boundaries is the long-term survival of patients with once fatal childhood conditions. This raises important decisions to be made about who will provide medical care for these patients as they transition into adulthood. This transition is particularly challenging because physicians who specialize in treating adults will be expected to take over the care of patients with illnesses such as cystic fibrosis, certain malignancies and congenital heart disease, which were once essentially only seen in children.

A significant proportion of the improvement in mortality rates for children in the 20th century was attributable to medical advances in the diagnosis and treatment of disease, areas in which children's hospitals play an integral role. However, in the 21st century, further reductions in mortality rates are likely to come from the prevention rather than the treatment of disease. As discussed previously, unintentional injury ranks as the leading cause of death for children and youth in Canada. The likely resultant shift in resources and attention to prevention will have an impact on the role of children's hospitals.

EXTERNAL FORCES AFFECTING HEALTH CARE INSTITUTIONS

There are a number of factors affecting the health care industry that have an impact on all hospitals, including children's hospitals. Most significantly, the cost of health care has been rising steadily in most industrialized countries, regardless of the system of health care delivery.

In Canada, between 1997 and 2002, the combined public and private health care bill rose by 43%, an increase of \$34 billion (17). In Canada, in 2001, health care spending accounted for 9.3% of the gross domestic product (GDP). In comparison, Germany spent 10.6% of its GDP on health care, while France spent 9.5% (17). In the US, health care spending accounted for 14.1% of the GDP (18).

Hospitals account for the largest category of health care spending in Canada and the US. In the US, hospital spending rose 8.3% to US\$451 billion in 2001 (18). Canada spent \$35 billion on hospitals in 2002 (17). However, the proportion of spending allocated to hospitals has declined in both countries. In the US, hospitals' share of health spending declined from 36.7% in 1991 to 31.7% in 2001, and is expected to shrink to 27.9% by 2012 (18). In Canada, hospitals accounted for 45% of the total health care spending in 1975, compared with 31% in 2002 (17).

Another significant category of health care spending is retail drug sales. In Canada, \$18 billion, or 16% of total health expenditures, was spent on retail drug sales in 2002 (17). Another source of rising health care costs is the emergence of new technologies and the intensified use of old technologies, accounting for approximately 40% of the annual increase (19).

Demographic trends have increased the demands on the health care system and will continue to do so well into the next century. The health care cost per capita for persons 65 years of age or older in developed countries is three to

five times greater than the cost for persons younger than 65 years of age. In 1997, the US had the highest health care spending per person for individuals 65 years of age or older (US\$12,100), but other developed countries also spent substantial amounts per person for individuals 65 years of age or older, ranging from approximately US\$3,600 in the United Kingdom to approximately US\$6,800 in Canada (20).

The proportion of the population aged 65 years or older is expected to increase. In Canada, this proportion is expected to increase from 12.6% in 2000 to 21% in 2025. This is particularly significant given the fact that birth and fertility rates are expected to remain relatively constant. The Canadian birth rate was 14 per 1000 in the year 2000 and is expected to remain at 14 per 1000 by the year 2025, with a fertility rate of 2.1 in the year 2000 and 2.2 in the year 2025. The percentage of the population younger than 19 years of age will decrease from 28% to 26% in Canada over the same time period (21).

IMPACT ON HEALTH CARE INSTITUTIONS

The soaring cost of health care in North America has led to a focus on cost-cutting strategies. Because hospitals account for the largest area of health care spending in both Canada and the US, many of these strategies have a direct impact on hospitals.

Traditional cost-cutting measures, such as more effective management and efficient utilization of resources, were not enough to offset the financial losses experienced by hospitals in the late 1990s. A significant number of hospitals closed, and many of the remaining hospitals turned to strategies such as mergers with other health care institutions.

There were a number of reasons for the increase in mergers in the 1990s, but most were driven by market pressures. It was thought that mergers would provide opportunities for enhanced quality, image branding, enhanced critical mass, and would reduce costs through shared services and capital investments (22). However, many mergers failed to achieve their goals. For example, many of the integrated systems revealed huge negative margins in the first half of 1999, suggesting failure to achieve financial efficiency (23).

Although the funding and delivery of health care in Canada is fundamentally different from that in the US, hospitals in both countries are under similar pressures to cut costs due to a decrease in funding. In Canada, during the 1990s, there was an attempt on the part of the federal and provincial governments to control health care spending, with significant decreases in federal and financial tax transfers. In 1975, federal health care transfers represented just under 39% of the provincial and territorial health spending. Double digit growth in transfers occurred in the 1970s and 1980s. By the 1990s, transfer growth reduced sharply, and by 1995, the federal share of health care spending dropped to 33% (24).

With hospitals accounting for the largest category of health care spending, there was significant pressure on the regional and provincial health boards to decrease spending on hospitals. As a result, there was a trend in the 1990s toward hospital closures and mergers similar to that occurring

in the US. Between 1986/1987 and 1994/1995, the number of public hospitals decreased 14%, while the number of approved beds decreased by 11% (25). Overall, between 1995/1996 and 1999/2000, 275 hospitals in Canada closed, merged or changed to provide other types of care (17). Although the federal government reinvested in health care starting in the late 1990s, the portion allocated to hospitals has continued to decrease.

IMPACT ON CHILDREN'S HOSPITALS

The pressure for cost containment and increased competition for limited resources has had a significant impact on children's hospitals in North America. The funding crisis affecting many health care institutions has a particular impact on children's hospitals for a number of reasons. Children in Canada and the US make up a relatively small, nonvoting proportion of the total population. As discussed previously, children represent less than 30% of the total population in both countries, and this proportion is expected to decrease. As a result, the health care needs of children are not always given priority.

Furthermore, the majority of children's hospitals in the US and Canada, whether freestanding or part of larger academic medical centres, are teaching hospitals. Teaching hospitals have significantly higher operating expenses than community hospitals. For example, the cost of medical care in a teaching facility can be double that of a community hospital. A study by Lewin Group Inc (Virginia, USA) (26) showed that in 1999, Medicare inpatient cost per case was higher for academic health centre hospitals (US\$10,656) than for large urban nonteaching hospitals (US\$5,603).

RESPONSE OF CHILDREN'S HOSPITALS

Although much of the focus on hospital closures and mergers has been on adult care institutions or large medical centres, freestanding children's hospitals have also undergone significant restructuring. A survey of freestanding children's hospitals in the US indicated that the majority of the 29 respondents (86.2%) pursued at least one type of integration strategy between 1991 and 1996. These included formal business relationships with a network of paediatricians, as well as integration with an adult-focused health care delivery organization (27).

Research performed in 2002 by the National Association of Children's Hospitals (Virginia, USA) and other related institutions also indicated that a significant number of children's hospitals are forming service partnerships. In the study (17), 38 hospitals reported having over 100 partnerships. The most common types of partnerships reported were neonatal intensive care services within a general acute care hospital, outpatient clinics, emergency room and urgent care, and inpatient medical, surgical and ancillary services. Examples of less common partnerships included hospitalist services, rehabilitation services, ambulatory surgery centres and satellite children's hospitals on a partner's campus (28).

The organizational evolution that has taken place among Canada's children's hospitals is evidenced by an examination of the current structure of those institutions. Of the 16 children's hospitals identified by the Canadian Paediatric Society, two are freestanding (financially, administratively, geographically and clinically independent), while three children's hospitals (formerly freestanding) have merged with maternal health facilities, four children's hospitals (formerly freestanding) have merged with adult institutions, and the remainder are paediatric programs within larger medical centres.

The freestanding children's hospitals are The Hospital for Sick Children in Toronto, Ontario, and Children's Hospital of Eastern Ontario in Ottawa, Ontario, the latter being the last freestanding children's hospital built in Canada in 1974.

The formerly freestanding children's hospitals that merged with maternal health facilities are BC Children's Hospital (Vancouver, British Columbia), IWK Health Centre (Halifax, Nova Scotia) and Sainte-Justine UHC (Montreal, Quebec). Sainte-Justine UHC pioneered this concept in 1970. The IWK Hospital for Children merged with a maternal health facility in 1995. In 1997, BC Children's Hospital merged with BC Women's Hospital and Health Centre and the Sunny Hill Health Centre for Women to form Children's & Women's Health Centre of British Columbia.

The formerly freestanding children's hospitals that merged with adult institutions are The Montreal Children's Hospital (Montreal, Quebec), Winnipeg Children's Hospital (Winnipeg, Manitoba), Alberta Children's Hospital (Calgary, Alberta) and Janeway Children's Health and Rehabilitation Centre (St John's, Newfoundland). Although all four of these remain geographically independent, they are merged administratively, financially and clinically with the adult institutions to varying degrees. In 1970, the Winnipeg Children's Hospital merged with the Winnipeg General Hospital, the Women's Hospital and the Rehab/Respiratory Hospital to form the Winnipeg Health Sciences Centre. Since 1994, the Alberta Children's Hospital has been under a unified board (the Calgary Health Region) with three adult institutions. In 1995, the Dr Charles A Janeway Health Centre and Children's Rehabilitation Centre merged administratively with the Salvation Army Grace General Hospital, St Clare's Mercy Hospital and St John's General Hospital to form the Health Care Corporation of St John's. A new facility, Janeway Children's Health and Rehabilitation Centre and Maternal Health Centre, opened in 2001 to become part of the Health Care Corporation of St John's. The Montreal Children's Hospital merged with four adult institutions in 1997 – the Montreal General Hospital, the Royal Victoria Hospital, the Montreal Neurological Institute and the Montreal Chest Institute – to form the McGill University Health Centre (Montreal, Quebec).

CONCLUSION

The structure of children's hospitals in North America has changed significantly over the past 30 years. Nine of the 16 Canadian children's hospitals currently in existence were freestanding at one time. Today, only two remain as freestanding institutions. Three formerly freestanding children's hospitals have merged with maternal health facilities and four formerly freestanding children's hospitals have merged with adult institutions. Similar trends toward integration and service partnerships are seen in the US.

Given the diverse forces affecting children's hospitals and the changing health status and needs of children, freestanding children's hospitals may no longer be the optimal model for paediatric health care. There are multiple examples of both horizontal and vertical integration strategies being pursued by freestanding or once-freestanding children's hospitals in Canada and the US. Although there are theoretical advantages to horizontal mergers with adult hospitals, there are also significant risks, including the loss of many of the tangible and intangible benefits of freestanding children's hospitals.

One of the tangible benefits of freestanding children's hospitals is the fundraising capability of their foundations. This role is of such significance that some of the formerly freestanding children's hospitals in Canada have chosen to retain their own foundations. For example, the Janeway Children's Health and Rehabilitation Centre retained its own foundation rather than merging it with the adult hospitals in the Health Care Corporation of St John's. Another tangible benefit of freestanding children's hospitals is the focus on paediatric-centred research and dedicated research institutes. Similarly, freestanding children's hospitals create a critical mass of patients and play an important role in attracting and training medical professionals (29).

Many of the benefits of freestanding children's hospitals are less quantifiable and stem from the recognition that

providing care for a child differs from adult care in a number of ways. For example, hospitalized children younger than two years of age require nearly 40% more nursing care than the average patient (30). Children also require more health care resources in respiratory therapy, cardiac catheterization, physical and recreational therapy, and social work (31). The care of children also requires a substantial commitment to family-centred care in terms of time, resources and hospital policy. For example, most children's hospitals allow 24 h visitation for parents and provide sleeping space and other amenities.

The physiology of infants and children varies based on age and size. As a result, caring for children requires that physicians and nurses have specialized medical and surgical knowledge and skills. Other health care providers, including laboratory technicians, dietitians, physiotherapists and respiratory therapists, also require specialized knowledge and training. Finally, the architecture and layout of children's hospitals are designed to provide a safe and reassuring environment for paediatric patients. Many of the intangible benefits that result from focusing solely on the needs of paediatric patients will likely be lost in horizontal mergers with adult hospitals.

In addition, as evidenced by many of the mergers between adult institutions over the past 15 years, gains in operational efficiency and cost savings have been disappointing. Vertical integration strategies may provide the opportunity to capitalize on certain benefits of integration without losing the advantages of paediatric-focused care. Further research is needed on the impact of these integration strategies on the health care of children and the relative advantages and disadvantages of each strategy compared with the model of freestanding children's hospitals. The intangibles that differentiate children's hospitals from their adult care counterparts will be the most difficult variable to measure, but they may also represent the greatest potential loss.

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CPSP HIGHLIGHTS

Unravelling the risk factors for non-type 1 diabetes in children

A 14-year-old girl of South Asian descent presents to your office with a two-week history of vaginal itchiness and whitish discharge. She mentions that over the past month, she has been more fatigued, very thirsty, and urinating frequently, even at night. An examination of family history reveals that her maternal grandmother was diagnosed with type 2 diabetes mellitus and that her mother had gestational diabetes. Her height is 148 cm (third percentile) and her

weight is 65 kg (90th percentile), with a calculated body mass index of 29.5 (97th percentile) and predominantly more body fat distributed in the abdominal area. She has vulvar erythema and discharge consistent with vaginal candidiasis. A urine dipstick reveals glucosuria but no ketonuria. A random blood sugar test is performed, revealing a level of 15.6 mmol/L. You contact your local paediatric diabetes education centre for referral and further management.

LEARNING POINTS

- Diabetes mellitus (DM) in children has evolved from the most common diagnosis of type 1 DM to a more complex differential diagnosis comprising type 2 DM (T2DM), monogenic forms of diabetes and secondary diabetes, including medication-induced DM, classified together as 'non-type 1 diabetes mellitus' (NT1DM).
- The Canadian Paediatric Surveillance Program, in partnership with the National Research System – The College of Family Physicians of Canada, is currently conducting surveillance of NT1DM in children up to 17.9 years of age to determine the incidence of NT1DM and T2DM in this age group.
- Since the study began in April 2006, 42 new cases of NT1DM have been identified through the surveillance program, with nine of them being confirmed cases of T2DM.
- In childhood, the rapid rise in T2DM prevalence parallels the epidemic of obesity. This poses a significant health threat worldwide, as evidenced by some studies that have demonstrated the rapid development of diabetes-related microvascular and macrovascular complications in young adulthood.
- Early identification of those at risk, as well as initiation of lifestyle interventions, are essential in the prevention of childhood T2DM.
- Over the past decade, isolation of six causative gene mutations has increased recognition of the genetic forms of childhood DM. This important advance can help guide the therapeutic approach.
- Medication-induced DM during childhood has been observed due to the use of glucocorticoids, chemotherapeutic agents (eg, L-asparaginase) and immunosuppressants (eg, cyclosporine and tacrolimus).
- Acquiring epidemiological and demographic data on Canadian children affected with NT1DM, specifically obesity-related T2DM, is essential and would provide a foundation upon which specific paediatric health promotion and disease prevention programs can be established.
- More information on NT1DM can be found in the following reference: Porter JR, Barrett TG. Acquired non-type 1 diabetes in childhood: Subtypes, diagnosis, and management. *Arch Dis Child* 2004;89:1138-44.

The Canadian Paediatric Surveillance Program (CPSP) is a project of the Canadian Paediatric Society, which undertakes the surveillance of rare diseases and conditions in children. For more information, visit our Web site at <www.cps.ca/cpsp> or <www.cps.ca/pcsp>.