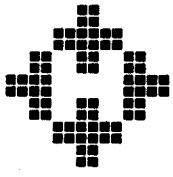
Patterns of Tonsillectomy in Manitoba 1989 - 1993

Analyses to support the Tonsillectomy Review Panel of the Clinical Guidelines and Analysis Program

January 1996



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This report represents one of the projects the Manitoba Centre for Health Policy and Analysis (MCHPE) has conducted under its contract with Manitoba Health. MCHPE would like to recognize the important contribution of the College of Physicians and Surgeons of Manitoba in initiating a program in which research about clinical practice patterns plays a fundamental role.

The Manitoba Centre for Health Policy and Evaluation

The Manitoba Centre for Health Policy and Evaluation (MCHPE) is a unit within the Department of Community Health Sciences, Faculty of Medicine, University of Manitoba. MCHPE is active in health services research, evaluation and policy analysis, concentrating on using the Manitoba health data base to describe and explain patterns of care and profiles of health and illness.

Manitoba has one of the most complete, well-organized and useful health data bases in North America. The data base provides a comprehensive, longitudinal, population-based administrative record of health care use in the province.

Members of MCHPE consult extensively with government officials, health care administrators, and clinicians to develop a research agenda that is topical and relevant. This strength, along with its rigorous academic standards and its exceptional data base, uniquely position MCHPE to contribute to improvements in the health policy process.

MCHPE undertakes several major research projects, such as this one, every year under contract to Manitoba Health. In addition, MCHPE researchers secure major funding through the competitive grants process. Widely published and internationally recognized, they collaborate with a number of highly respected scientists from Canada, the United States and Europe.

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EXECUTIVE SUMMARY

The Clinical Guidelines and Analysis Program (CGAP) is an educational program that examines patterns of practice with a view to improving the effectiveness and efficiency of medical care. Funded as a one year pilot program by the Manitoba Health Services Innovations Fund, CGAP involves a collaboration between the College of Physicians and Surgeons of Manitoba and the Manitoba Centre for Health Policy and Evaluation. The mandate of CGAP is to examine the effectiveness and efficiency of medical interventions, to develop clinical practice guidelines based on the best available evidence, to implement educational strategies that assist physicians in their practices, and to monitor the impact of such interventions.

Important components of CGAP involve analyzing Manitoba data to describe patterns of practice and reviewing the degree to which these patterns conform to evidence about optimal care. This document provides a report on analyses conducted to support the deliberations of the Tonsillectomy Review Panel, which included Dr. Lindsay DuVal, an otolaryngologist practising in Winnipeg, Dr. Robert Smith, a paediatrician practising in Selkirk and Dr. Don Klassen, a family practitioner practising in Winkler, as well as members of the CGAP program team comprising Dr. John Mansfield, Dr. Charlyn Black and Ms. Mary Thliveris.

The primary objective of the research was to provide information about patterns of tonsillectomy in Manitoba. Several types of analysis were produced, including general descriptive analyses, population-based analyses, provider-related analyses, and assessments of quality and efficiency. In addition to initial analyses, further refinement of the analyses was conducted to enhance guideline development. Finally, the work served to identify potential strategies for professional education, including groups to target.

Review of the evidence

The literature review conducted for this initiative concluded that tonsillectomy has long been one of the most common paediatric surgical procedures, but that rates of surgery have declined over time, likely related to changing understanding about indications for and benefits of the procedure. Recurrent throat infection has been, and continues to be, the predominant indication for tonsillectomy in children. Systematic review suggests that high quality scientific evidence of the effectiveness of tonsillectomy in reducing infection rates exists only for a small percentage of cases that meet very strict criteria. Furthermore, histories of recurrent throat infection that are not documented in the medical record do not constitute an adequate basis for subjecting children to tonsillectomy. Even for individuals who meet the strict criteria for which benefit has been demonstrated, the magnitude of the benefit conferred by tonsillectomy (in terms of reduced episodes of throat infection) appears to be small. Finally, there are no high quality scientific studies demonstrating benefit for less severely affected children, although this issue is currently under study.

While recurrent infection remains the predominant indication for surgery, obstruction has emerged as an increasingly important indication in recent years. There is no high quality evidence from randomised controlled studies of the benefits and risks of tonsillectomy in obstructive disease, and controversy exists about the role of the procedure for less than severe obstructive conditions.

In terms of adverse consequences, tonsillectomy itself is not an innocuous procedure. It carries with it well-defined morbidity related to the procedure itself and a risk of consequences that range from death, to non-fatal direct and indirect anaesthetic and surgical complications, to hypothetical interference with immunologic defence mechanisms. In order to determine whether a child should undergo tonsillectomy and/or adenoidectomy, the associated risks and benefits must be assessed. The

clinician who recommends one or both of these procedures must weigh the possibility of adverse consequences against potential benefits.

Patterns of tonsillectomy care in Manitoba

Over the five years of analysis, from 1989/90 to 1993/94, approximately 2000 tonsillectomy procedures were conducted annually on Manitoba residents. Most of these procedures were performed in larger hospitals, with surgery conducted by specialist ENT (ear, nose and throat) surgeons and anaesthesia provided by specialist anaesthetists. However, almost one-quarter of the procedures were provided by non-specialist surgeons and anaesthetists, and approximately six percent took place in intermediate and small rural hospitals.

Analyses by patient characteristics identified very different patterns of care for the sexes and for aboriginal populations in comparison to others. In comparison to males, females receive 39 percent more tonsillectomies, despite having lower rates of surgery in early childhood. Most of the difference between the sexes is related to markedly higher rates of surgery for females in the adolescent period. Treaty Indians generally have lower rates of tonsillectomy in comparison to others and are less likely to receive surgery at younger ages, despite having higher rates of early childhood morbidity. There was little evidence in the literature to explain these differences in patterns of tonsillectomy delivered to Manitoba residents.

In contrast to expectations, rates of surgery were 20 percent higher for residents living outside of Winnipeg, in comparison to residents living in the city. This finding was unexpected because Winnipeg residents presumably have easier access to ENT surgeons. Among Manitoba Health regions, the residents of 'highest rate region' had tonsillectomy rates that were 78 percent higher than Winnipeg, which was the lowest

rate region. Across 21 hospital service areas (geographic regions where a single hospital provides the majority of tonsillectomy services), rates of surgery were over seven times higher in the area with the highest level of surgery, in comparison to the area with the lowest level. There is no evidence that population characteristics and morbidity rates are responsible for these differences. While it was not possible to examine what proportion of cases meet current indications for tonsillectomy, it is likely that differences in clinical judgement about the balance of benefits and risks conferred by tonsillectomy made by physicians working in various areas contribute to much of the variation exhibited.

In addition to the potential issues of quality raised by variation in rates across regions and differential patterns of use by females and native children, several other quality of care issues were identified in the analyses and reviewed by the panel. The first of these relates to caseload volume. It was noted that a relatively large percentage of facilities and physicians perform small numbers of procedures on an annual basis. In turn, they are responsible for a very small percentage of the total procedures performed. While the number of procedures done in such circumstances has declined over time, a significant number of physicians and facilities continue to do a very small number of procedures on an annual basis. The Tonsillectomy Review Panel felt that quality of care may be a concern when physicians and/or institutions perform very few procedures and that it is important that a guideline stress that a sufficient number of procedures be performed to ensure provider and institutional competence.

Other quality of care issues that were highlighted in the analyses included the performance of surgery on very young children and patterns of early discharge associated with postoperative care. Since children less than three years of age represent a very high risk group for postoperative complications, performance of tonsillectomy procedures in settings where there may be both limited facilities for intensive monitoring and limited expertise in managing emergencies among this age

group raised concerns among members of the Review Panel. The study also found an unusual pattern of high use of 'zero day' postoperative stays by small rural hospitals. This pattern, while efficient, may actually be less than optimal from a quality of care perspective because of the risk of postoperative haemorrhage. The area of postoperative management in rural settings was identified as an area that requires careful consideration in order to minimize risk. Attempts to achieve efficiencies must clearly be balanced against appropriate concern for reducing potential risk related to complications of surgery.

In spite of these concerns, recent changes in patterns of management of tonsillectomy have led to marked improvements in efficient use of hospital days. Teaching and urban community hospitals now rarely admit patients prior to surgery. Increased efficiencies could be achieved if other groups of hospitals performing tonsillectomy procedures were to adopt similar approaches.

The role of evidence and data in overseeing medical care

This report represents a very detailed analysis of tonsillectomy patterns in Manitoba. Hopefully, it provides insight into the role that data analysis and feedback can play in informing the profession to improve the 'oversight' of medical care. The analyses conducted for this report were undertaken to support the deliberations of the Tonsillectomy Review Panel, which ultimately produced a clinical practice guideline that has been distributed to all Manitoba practitioners (see Appendix 1).

While interest in clinical practice guidelines has never been greater, review of the literature suggests that in addition to dissemination of information, more creative and complex approaches will be required to influence physician behaviour. Data analyses

conducted as part of the CGAP process provide useful information and tools for the development and implementation of such approaches.

As an example, the research identified several important topics that were subsequently addressed in the guideline. Moreover, the analyses provided information about which groups of physicians (and institutions) would be likely to benefit from educational intervention. This targeting of educational initiatives is especially important when more intensive strategies to influence physician behaviour are used. Most importantly, the research provides important tools that can be used as part of the educational process, similar to the approach used by the Maine Medical Assessment Foundation, a voluntary research and educational foundation that is supported by the Maine Medical Association. This Foundation has found a process of review of population-based rates and feedback of information to local groups of physicians to be a remarkably powerful tool in modifying behaviour. Feedback of rates of surgery for hospital service areas to local physicians therefore represents an approach that would likely enhance the effectiveness of CGAP. Finally, data analysis provides a tool that permits a guidelines program to monitor its own effectiveness over time. While development of the initial strategies for data analysis are fairly laborious, examining the same patterns in subsequent years is relatively simple.

The Clinical Guidelines and Analysis Program was developed to review and synthesize evidence based on scientific criteria, develop guidelines for practice based on an understanding of that evidence, review actual patterns of practice against what has been learned, and monitor change in response to guideline dissemination and data feedback strategies. It is clear that data analysis plays a large and important role in this set of activities. Moreover, the linkage between guideline and analysis activities is likely to support a very comprehensive approach to continuing medical education.

The American College of Physicians has recently proposed a new model for overseeing the delivery of medical care (1994). Components of this model include an integrated approach to reviewing utilization and quality, the use of science-based, explicit review criteria, and reliance on understanding patterns of care in lieu of case-by-case review. Manitoba's Clinical Guidelines and Analysis Program incorporates many of these strategies. In so doing, it hopes to foster an evidence-based approach to overseeing medical care.

INTRODUCTION

The Clinical Guidelines and Analysis Program

The Clinical Guidelines and Analysis Program (CGAP) is an educational program aimed at reviewing patterns of practice with a view to improving the effectiveness and efficiency of medical care. Funded as a one year pilot program by the Manitoba Health Services Innovations Fund, CGAP is a collaboration between the College of Physicians and Surgeons of Manitoba and the Manitoba Centre for Health Policy and Evaluation. The mandate of CGAP is to examine the effectiveness and efficiency of medical interventions, to develop clinical practice guidelines based on the best available evidence, to implement educational strategies that assist physicians in their practices, and to monitor the impact of such interventions. The program involves identification of initiatives for study, review of available evidence, analysis of data about Manitoba patterns of practice, development of practice-based clinical practice guidelines, active dissemination of educational materials in conjunction with other educational activities, and finally, monitoring of impact.

The process of guideline development relies on assembling evidence from the literature about best practice, and conducting research about current Manitoba practice. This information is reviewed by a panel of practising physicians to produce a "made in Manitoba" clinical practice guideline.

An important part of CGAP involves the analysis of Manitoba data to describe patterns of practice and to review, where possible, the degree to which these patterns conform to evidence about optimal care. The analysis can also serve to identify institutions and providers that might benefit from education, as well as groups of patients for whom care might be optimized. Finally, analysis after the introduction of

educational strategies (such as guideline dissemination and focus groups with feedback of information about local practice) can serve to assess the impact of educational interventions at achieving change.

This document is the report of analyses conducted to support the deliberations of the Tonsillectomy Review Panel. This panel was convened to review the evidence pertaining to tonsillectomy, consider patterns of practice in Manitoba, and develop a clinical practice guideline for Manitoba practitioners. The Tonsillectomy Review Panel included Dr. Lindsay DuVal, an otolaryngologist practising in Winnipeg, Dr. Robert Smith, a paediatrician practising in Selkirk and Dr. Don Klassen, a family practitioner practising in Winkler, as well as members of the CGAP program team comprising Dr. John Mansfield, Dr. Charlyn Black and Ms. Mary Thliveris.

Why tonsillectomy?

Tonsillectomy was identified as a possible topic for review and analysis with the release of a draft document entitled "Manitoba's Child Health Strategy" in June 1994 (Child Health Strategy Committee).[1] This document identified chronic disease of the tonsils, usually requiring tonsillectomy, as the leading cause of hospitalization for Manitoba children 0 to 19 years of age. In addition, it suggested that aboriginal children in both Winnipeg and rural regions had a much lower rate of hospitalization for tonsillectomy and adenoidectomy when compared to non-aboriginal populations. The report pointed out that it was not clear whether differences for aboriginals reflected a difference in disease incidence, a problem with access to service, or alternatively, whether the differential represents an excessive rate of hospitalization in

[1] The document was subsequently released with the title "The Health of Manitoba's Children" in March 1995.

the non-aboriginal population. This report, combined with information from the Central Standards Committee of the College of Physicians and Surgeons — that serious sequelae had occurred in relation to a tonsillectomy procedure conducted in May of 1994 — suggested that issues relating to quality of care in the area of tonsillectomy existed and should be addressed.

The issue met several other additional criteria that made it a useful initiative for the pilot project of CGAP. Preliminary analyses indicated that there was significant variation in rates of tonsillectomy across geographic areas of the province. In addition, there was a reasonably large base of published research pertaining to tonsillectomy that could be used in production of a guideline. Furthermore, other jurisdictions had also done work on the subject of tonsillectomies, demonstrating that it was a feasible topic to address. For example, in Saskatchewan, an initiative on tonsillectomy had a major impact on practice patterns, being credited with reducing tonsillectomy rates by 35 percent (Rafuse 1994; Health Services Utilization and Research Committee 1994). Finally, tonsillectomy is an issue that can be studied using routinely collected administrative data from Manitoba Health, and researchers from the Centre had previous experience studying this procedure (Roos, Henteleff & Roos 1977; Roos, Roos & Henteleff 1978; Roos LL 1979; Roos NP 1979; Henteleff, Roos & Roos 1981).

OBJECTIVES OF THE STUDY

The primary objective of this research was to provide information about the patterns of tonsillectomy in Manitoba in order to support the deliberations of the Tonsillectomy Review Panel. Several types of analysis were produced, including general descriptive analyses, population-based analyses, provider-related analyses, and assessment of quality and efficiency. In addition to initial analyses, further refinement of the analyses was conducted to enhance guideline development. Finally, the work served to identify potential strategies for professional education, including groups to target.

LITERATURE REVIEW

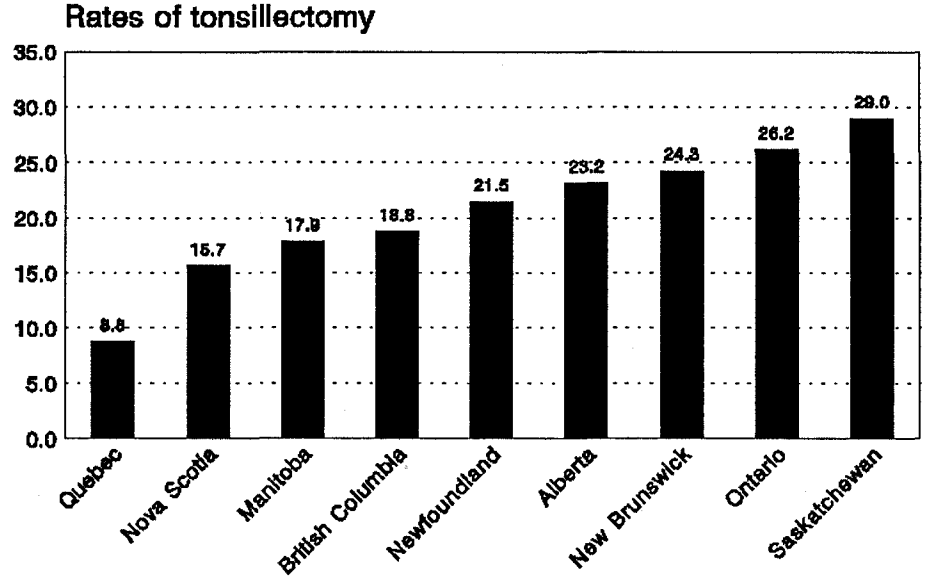
Background

Tonsillectomy and adenoidectomy (T & A) has long been the most common major paediatric surgical procedure performed in Canada and the United States (Bluestone 1992; Paradise 1990; MacDonald et al. 1992). Despite a steady decline in recent years and controversy regarding indications, efficacy and risks, the rate of tonsillectomies in Canada has historically been and still is very high when compared to other developed countries (MacPherson 1989). Furthermore, the rate has been highly variable between and within jurisdictions (MacDonald et al. 1992; Wright 1990; Maber et al. 1992). Comparisons of tonsillectomy rates across provinces show a two- or three- fold variation (HMRI 1991; Gentleman et al. 1994). The reasons for regional variation remain difficult to explain. Controversies about the benefits and risks of surgical intervention; disparities in recommendations made by authorities; differences in physicians' training, experience, personal attitudes and values; as well as parental expectations and demand, have all been cited as factors that may contribute to this phenomenon (MacDonald et al. 1992; Paradise et al. 1984; Paradise et al. 1978).

Several provinces have initiated studies of tonsillectomy practice. Saskatchewan, with the highest rate (Figure 1), has developed guidelines that have led to a 35 percent reduction in surgeries performed (Rafuse 1994; Health Services Utilization and Research Commission 1994). Ontario has initiated a review of patterns of tonsillectomy (A. Basinski, personal communication 1994), modeled after other analyses conducted for the ICES Practice Atlas (1994). Even in Quebec, the province with the lowest rate of tonsillectomy, the Technology Assessment Council (Conseil d'évaluation des technologies de la santé du Québec) has recently conducted a review

Figure 1: Provincial rates of tonsillectomy

Rates per 10,000 population, April 1988 - March 1990



Source: Health Reports, 1994, Volume 6, No.4, Statistics Canada, Cat. No. 82-003.

of tonsillectomy patterns (1995). While Manitoba has typically had a rate of tonsillectomy that is intermediate to low, concerns about quality of care and unusual patterns of surgery among aboriginal children suggested tonsillectomy as an important area for study.

Indications for tonsillectomy

The issue of appropriate indications for tonsillectomy has long been one of the most controversial areas of medical care. Paradise (1990) has suggested that controversy around indications for the procedure is related to "the lack, until recently, of any

convincing evidence that tonsillectomy and adenoidectomy, in the conditions for which they are undertaken, are superior in efficacy to conservative management."

Although tonsillectomy is currently the most common major paediatric operation performed, its use has steadily declined during the past 20 years. This decrease has been attributed to many factors, the most important being challenges to assumptions about the indications for surgery (Bluestone 1992). However, evidence for the effectiveness of tonsillectomy remains controversial and only a few randomized trials have been conducted to study its impact.

Most indications for tonsil surgery are based on two categories of problems: *infection* that is recurrent or chronic, and *obstruction*. Wide differences of opinion have prevailed concerning how extensive, severe, and long-standing these conditions should be in order to justify surgery. Opinions have also differed as to whether, under various clinical circumstances, surgery should consist of tonsillectomy only, adenoidectomy only, or a combination of the two procedures.

Evidence relating to indications for tonsillectomy was reviewed using a classification system developed by the Canadian Task Force on the Periodic Health Exam (1980) to assess research quality. This classification system has been widely adopted for reviewing the quality of evidence in other areas. Briefly, it assigns the highest ranking to evidence obtained from at least one properly randomized controlled trial. Evidence obtained from other types of research is ranked at lower levels: evidence obtained from well-designed controlled trials without randomization is ranked next; this is followed by evidence obtained from well designed cohort or case-control analytic studies, preferably from more than one centre or research group; a still lower ranking is given to evidence obtained from comparisons between times or places with

or without the intervention.[2] The lowest ranking is given to information which is based on descriptive studies, clinical experience, opinions of respected authorities or reports of expert committees.

Evidence relating to recurrent infection as an indication for tonsillectomy

Recurrent throat infection has been the predominant indication for tonsillectomy, but controversies exist about the severity of symptoms that warrant surgical intervention and the magnitude of the benefit conferred by the procedure.

Evidence of the efficacy of tonsillectomy for severely affected children is supported by high quality evidence in the form of a single randomized controlled trial (Paradise et al. 1984). The Children's Hospital of Pittsburgh Study was designed to avoid the limitations of earlier studies. By employing stringent surgical criteria, it focused on children who were severely affected and who therefore stood the best chance of showing meaningful improvement in response to an efficacious procedure. It demonstrated that, using various measures, the incidence of throat infection during the first two years of followup was significantly lower in the surgical group in comparison to the non-surgical control group. On average, mean rates of infection were 1.85 episodes per subject lower in the first year and 1.05 episodes lower in the second year. Third year differences were not significant. On the other hand, the followup illness rates among subjects in the control group were not consistently high: only about 26% of subjects who did not undergo surgery experienced more than one moderate or severe episode of throat infection in the first year of followup. This dropped to 24% in year two and to 5% in year three. Of subjects treated with surgery, 14% had surgery-related complications, all of which were readily managed or self-limited. The authors concluded that, for children meeting the trial's stringent

[2] Dramatic results from uncontrolled experiments such as the results of treatment with penicillin in the 1940s could also be included in this category.

eligibility criteria, the results provided support for the election of tonsillectomy but they also provided support for non-surgical management (Paradise 1990).

All children admitted to the Children's Hospital of Pittsburgh Study had to meet criteria relating to frequency, severity, appropriateness of therapy, and documentation of episodes in clinical records.[3] An aspect of the trial that is not well recognized is just how stringent these criteria were. In fact, the investigators had considerable difficulties in finding sufficient numbers of eligible subjects for study, despite intensive efforts over an 11 year period. They suggested that children with experiences as extreme as those of their trial subjects are exceptional (Paradise et al. 1984). Accordingly, they concluded that many children who undergo tonsillectomy have throat infection experiences that are less severe than that for which there is evidence of benefit.

A related finding that emerged from the Pittsburgh study was that only a small percentage of children appear to have episodes of throat infection with clinical features and patterns conforming to those described in their presenting histories. Many of the children referred to the study as potential candidates for the tonsillectomy trial had histories of recurrent throat infection that appeared to meet all of the entry criteria — except for documentation in the clinical record. These

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[3] The criteria for entry into the study included the following:

1. At least three episodes in each of three years or five episodes in each of two years or seven episodes in one year
2. Each episode must have been characterized by one or more of the following:
   a. oral temperature 101°F (38.3°C) or higher
   b. enlarged (>2 cm) or tender anterior cervical lymph nodes
   c. tonsillar exudate
   d. positive culture for Group A beta-haemolytic *Streptococcus*
3. Apparently adequate antibiotic therapy must have been administered for proven or suspected streptococcal episodes
4. Each episode must have been confirmed by examination, and its qualifying features described in a clinical record at the time of occurrence

children were admitted to the study to be followed prospectively; if at least two observed episodes of throat infection then developed with patterns of frequency and clinical features that matched or exceeded those described in their presenting histories, the children became eligible for the trial. A large majority of children failed to develop frequent or severe episodes of throat infection (Paradise et al. 1978). From this experience, the authors concluded that histories of recurrent throat infection that are undocumented in clinical records do not validly forecast subsequent experience and hence do not constitute an adequate basis for subjecting children to tonsillectomy. They suggested that if a practice of watchful waiting were generally adhered to, many children would be spared surgery because they remain essentially and demonstrably well.

Another issue around which there is controversy relates to the magnitude of the benefit to be derived from the procedure. In the Children's Hospital of Pittsburgh Study, mean episodes of throat infection in the surgically treated group were 1.85 and 1.05 episodes per subject lower than for the non-surgical control group in the first and second years following surgery. Roos, Roos and Henteleff (1978) used a case comparison study to assess the impact of tonsillectomy on subsequent patterns of use of physician services in Manitoba. When the data were restricted to respiratory diagnoses, the findings suggested that on average, tonsillectomy reduced utilization by 0.5 to 1.5 episodes of illness per patient per year in the two years following surgery. These patterns were more pronounced among individuals having several physician visits for tonsillitis in the preoperative year. However, when visits for all diagnoses were considered, the changes in utilization were much smaller: visits for conditions other than respiratory took up much of the "savings" produced by tonsil surgery. Overall, for severely affected children, the benefit produced by tonsillectomy appears to be a reduction of 2.9 episodes of throat infection per subject over the two years after surgery. The benefit is likely to be smaller among less severely affected children.

Finally, Paradise has stressed that the findings of the Pittsburgh study "cannot properly be extrapolated to other less severely affected children" (1992). Another clinical trial has been initiated to examine the efficacy of tonsillectomy in these children (Paradise 1990). Its findings should provide useful guidance in developing criteria to use in deciding between surgical and non-surgical management. Until these results are available, however, there is no evidence to suggest that surgical management confers any benefit over conservative management for children who have recurrent tonsillitis that does not meet the criteria used in the original study.

In summary, systematic review of the evidence for benefit produced by tonsillectomy in the treatment of recurrent sore throat suggests that high quality evidence exists only for a small percentage of cases that meet very strict criteria. Furthermore, histories of recurrent throat infection do not constitute an adequate basis for subjecting children to tonsillectomy. Even for individuals who meet the strict eligibility criteria of the randomised study, the magnitude of the benefit conferred by tonsillectomy appears to be small. Finally, there is no evidence of benefit for less severely affected children, although this issue is currently under study.

Since the publication of these results, there has been some evidence that infection is playing a diminished role as an indication for surgery. Rosenfeld and Green (1990), in a review of cases at the Mount Sinai Medical Centre, found that infection was the major indication for surgery in 100% of cases in 1978, but only 81% of cases in 1986.

Evidence relating to obstruction as an indication for tonsillectomy

Although recurrent infection has been, and remains the predominant indication for surgery in children, among otolaryngologists, obstruction has emerged as an increasingly important indication for surgery (Potsic et al. 1986; Rosenfeld and Green 1990). Based on case reports, severe obstruction associated with cor pulmonale and

pulmonary hypertension has become accepted as a definite indication for adenotonsillectomy. Less severe obstructive symptoms are increasingly being recommended as an indication for tonsillectomy (Mauer et al. 1983) on the basis of relatively weak evidence derived from case series or case-control studies. There is no high quality evidence from randomised controlled studies of the benefits and risks of tonsillectomy in obstructive disease and controversy exists about the role of the procedure for less severe obstructive conditions.

Paradise (1990) suggests that operation is clearly indicated in those unusual circumstances in which massive hypertrophy of tonsils results in unquestioned dysphagia, extreme discomfort in breathing, or, even more extremely, alveolar hypoventilation or cor pulmonale. On the other hand, even in children with symptoms or signs of appreciable obstruction, surgery should not be resorted to automatically. He suggests that "seemingly dramatic manifestations, even when longstanding, may sometimes be due to edema accompanying relatively inapparent infection, rather than to fixed structural changes. Such obstructive symptoms may sometimes lessen considerably when vigorous antimicrobial treatment is used. Accordingly, a trial of an appropriate antimicrobial agent is often advisable before deciding finally whether surgery is mandatory or even reasonably indicated."

Other indications for tonsillectomy

In a 1990 review article, Paradise suggests that certain other non-urgent conditions also seem to be reasonable indications for tonsillectomy, even though their response to surgery has not been tested in controlled trials. These conditions include peritonsillar abscess and chronic (as distinct from recurrent acute) tonsillitis when conservative measures have proven ineffective.

Definite versus elective indications for tonsillectomy

Approaches to tonsillectomy have become more conservative over the past 25 years and the awareness that there are definite, as opposed to elective, indications for tonsillectomy has increased over the past two decades. Definite indications for tonsillectomy are relatively infrequent and include suspected malignancy and obstructive tonsils and/or adenoids causing severe airway obstruction (Paradise 1990).

Since most tonsillectomies and adenoidectomies are recommended on an elective basis, it is important that patients and providers be aware of the reasonable indications for surgical intervention. At the present time, elective tonsillectomy may be indicated for frequently recurrent throat infection that meets strict criteria documented in the study conducted by Paradise and coinvestigators (1984), chronic tonsillitis, peritonsillar abscess, and obstructive tonsils (Bluestone 1992; Paradise 1990). Among the above, only recurrent throat infections have been studied in clinical trials. Decisions about recommending surgery for these conditions should be individualised and take into consideration the potential adverse consequences of surgery as well as individual circumstances in relation to various quality of life considerations. The fact that a child indeed meets the criteria should not necessarily lead to a decision in favour of surgery (Paradise 1990).

Evidence relating to adenoidectomy

Adenoidectomy and tonsillectomy should be regarded as two separate procedures, each with its own indications (Bicknell 1994). To date, there is no convincing evidence to support routine adenoidectomy with elective or urgent tonsillectomy. Specific indications exist for each procedure. In general, tonsillectomy alone is indicated for children meeting criteria for recurrent infection, while the combined procedure (T&A) is indicated for children undergoing surgery on the basis of obstructive conditions.

Risks associated with tonsillectomy

General risks

The possible adverse consequences of tonsillectomy range from death, to non-fatal direct and indirect anaesthetic and surgical complications, to hypothetical interference with immunologic defense mechanisms (Paradise 1990). In order to determine whether a child should undergo tonsillectomy and/or adenoidectomy, the associated risks and benefits must be assessed. The clinician who recommends one or both of these procedures must weigh the possibility of adverse consequences.

Mortality

Deaths due to tonsil and adenoid surgery are generally caused by bleeding and complications of anaesthesia and medications (Rasmussen 1987). When fatal bleeding occurs, it usually takes place within the first 24 hours postoperatively. Secondary aspiration of blood to the lungs during anaesthesia or recovery, leading to cardiac arrest, is the major cause of death as a result of tonsil or adenoid surgery. With the exception of a probably irreducible minimum of deaths related to anaesthesia, death as a result of tonsil or adenoid surgery should be entirely preventable under present-day circumstances of care (Paradise 1990).

Determining whether deaths are due to adenoidectomy or tonsillectomy is difficult, since many operations involve combined procedures. Surveys from 1922 to 1979 have described fatality rates from 1 in 1000 operations to 0 out of more than 170,000 operations (Rasmussen 1987). Nationwide fatality rates in the United States between 1965 and 1975 have been reported as approximately 1 in 16,000 procedures. However, these rates are based on operative and anaesthetic techniques that are no longer in clinical use. They are therefore likely to yield excessive estimates of current mortality rates since operative mortality has declined over the years.

Accurate statistics regarding current mortality and morbidity risks in large patient populations are not available.

In an effort to determine the number of fatalities that occurred across Canada over the past ten years, the CGAP program contacted provincial and territorial coroners. Provincial coroners from British Columbia, Alberta, Saskatchewan and Quebec reported a combined total of 7 deaths in children that were related to tonsillectomy over this period. Information was not available for Manitoba.

Haemorrhage

Haemorrhage is the most frequent complication of tonsillectomy. Bleeding in connection with tonsillectomy can be classified as operative bleeding, early postoperative bleeding (within 24 hours), and late postoperative bleeding (Rasmussen 1987). Alternatively, it is classified as primary (within 24 hours), or secondary (after the first 24 hours). The last category usually occurs from the fifth to the tenth postoperative day, although delayed bleeding has been described up to 21 days postoperatively.

Comparisons of frequency of haemorrhage among different series are problematic due to varying definitions. Reported frequency of serious postoperative bleeding has ranged from 0 to 10 percent. Tan and colleagues (1993) found that the triad of recent upper airway infection, knife dissection technique and increased intraoperative bleeding was found to be associated with early postoperative haemorrhage. The risk of haemorrhage can be minimized by avoiding surgery during or immediately following episodes of infection, by careful attention to surgical technique and by avoiding aspirin in the two weeks prior to surgery as well as for relief of postoperative pain. Furthermore, in Manitoba, taking a detailed patient and family history is very important because the province has a relatively large population of patients with von Willebrand's disease (L. DuVal, personal communication 1995).

The successful treatment of bleeding or pulmonary aspiration after tonsillectomy or T&A depends on several prerequisites. The use of general anaesthesia with endotracheal intubation, active medical surveillance in the postoperative period, immediate availability of properly trained personnel and equipment for resuscitation, laboratory facilities for blood cell counts and determination of coagulation factors are essential (Paradise 1990).

Other consequences

Adverse events associated with general anaesthesia are more common in children than in adults (Cohen, Cameron and Duncan 1990). Using data from a paediatric followup program from 1982 to 1987, they found a risk of an adverse event in 35% of paediatric cases when all events (both major and minor) were considered. This compared to a rate of 17% for adults. In children over 5 years of age, postoperative nausea and vomiting was very frequent, with about one-third of children experiencing this problem.

Postoperative pain is common after tonsillectomy, with the perception of postoperative pain increasing with age (Rasmussen 1987). Tonsillectomy causes a significant, although slight and transient reduction of immunoglobulins (Jeschke and Stroeder 1980). Careless or complicated operations may lead to damage causing hypernasal speech, pharyngeal stenosis and lesions to the tongue, teeth and nerves (Rasmussen 1987).

Risks related to changing indications for the procedure

Tonsillectomy for obstructive conditions is generally performed at an earlier age than tonsillectomy for recurrent infection. Furthermore, earlier intervention in the process of obstructive disease is being advocated by some (Potsic 1986). As the mean age for surgery has dropped and the percentage of patients with obstructive conditions has

risen in recent years (Rosenfeld and Green 1990), recent studies have highlighted the special problems of these cases.

Children with obstructive sleep apnoea have been found to be at increased risk for respiratory compromise following adenotonsillectomy (McColley et al. 1992; Rothschild, Catalano and Biller 1994). McColley and colleagues found that 23% of patients with obstructive sleep apnoea had severe postoperative respiratory compromise requiring intervention. Young age and severe preoperative upper airway obstruction significantly increased this risk. They recommended in-hospital postoperative monitoring for children undergoing adenotonsillectomy for obstructive sleep apnoea.

Risks in young children

Several recent studies have found that among very young children (under 3 years of age), the most common indication for surgery is upper airway obstruction with apnoea (Berkowitz and Zalzal 1990; Rothschild et al. 1994; Tom et al. 1992). These findings differ from earlier studies, in which the primary indication for surgery in very young children was recurrent tonsillitis.

Patients younger than 3 years of age have been found to be at higher risk of postoperative complications after tonsillectomy (Carithers, Gebhart and Williams 1987). The combination of a small patient, dehydration after preoperative fasting, operative blood loss, and delayed oral rehydration all contribute to perioperative discomfort and potential morbidity. Among young children, the most frequent postoperative problem is delay in adequate oral hydration; airway problems are less common, although obviously of greater concern (Rothschild et al. 1994). McColley et al. (1992) found that, among children receiving surgery for obstructive tonsillar conditions, those of very young age (less than 3 years) were at significantly increased risk of respiratory compromise. Wiatrak et al. (1991) also noted the higher incidence

of airway complications in this group and recommended that they be observed in a unit capable of providing continuous pulse oximetry monitoring and emergent resuscitation.

Day surgery and attendant risks

Financial and utilization concerns have focused on reducing hospitalization costs for many procedures. Based on a low rate of complications for most patients, the literature suggests that outpatient tonsillectomy in children is a safe and cost-effective procedure in selected children (Shott, Myer and Cotton 1987; Maniglia, Kushner and Cozzi 1989; Riding et al. 1991). Moreover, ambulatory surgery has been found to minimize the psychological sequelae associated with an overnight hospital stay and is favoured by most parents and children (Maniglia, Kushner and Cozzi 1989).

Many studies have concluded that post-surgical haemorrhage is the major short term complication and concern associated with outpatient surgery (Truy et al. 1994). Yardley (1992) found that all cases of early postoperative haemorrhage arising in a series of 3,488 procedures occurred within the first eight hours after surgery, and suggested that outpatients be monitored for at least an eight hour postoperative period before discharge.

Other research has suggested that certain high risk groups should not be candidates for outpatient tonsillectomy (Truy et al. 1994; Rothschild, Catalano and Biller 1994). Rothschild and colleagues identified two such groups: patients 3 years of age and younger, who seem to be at increased risk for delayed adequate oral intake; and patients with obstructive sleep apnoea, who are at risk for airway difficulties. They suggest that the problems encountered by the latter group mandate close overnight observation, preferably in an intensive care unit setting with continuous pulse oximetry. Truy and colleagues found that children with concomitant medical problems or with a poor social environment had to be managed as inpatients. Even

for older patients, delayed fluid intake can be a problem, with 12.5% requiring more than 30 hours of intravenous support (Rothschild, Catalano and Biller 1994). Many of the studies that support the safety of ambulatory tonsillectomy assess patients as high-risk and admit on the basis of postoperative behaviour. Rothschild and colleagues stress that it should remain the surgeon's prerogative to admit an outpatient from the recovery room without penalty because the benefits of admission justify the costs in high risk subgroups.

Conclusion

Despite a recent decline, the rate of tonsillectomies and adenoidectomies in Canada remains persistently higher than in other developed countries and regional variation has been shown to occur both between and within provinces. Although physician training and values as well as parental demands and expectations will influence decision-making, the indications, efficacy and risks associated with tonsillectomy and adenoidectomy should be the primary factors in determining which patients will likely benefit from tonsillectomy and/or adenoidectomy.

METHODS

Data

Data for the project were derived from the health insurance data collected by Manitoba Health and made available to the Manitoba Centre for Health Policy and Evaluation. Four data files were used, including a patient registry file, a physician registry file, hospital discharge abstracts and physician claims. The quality and utility of these data for health services research have been well documented (Roos et al. 1982; Roos, Sharpe and Wajda 1989). Because tonsillectomy is a fully insured service and physicians must submit claims to be reimbursed for services provided, the data are believed to be complete, except in the case of anaesthesia services, for which some physicians are paid out of hospital budgets instead of billing fee for service.

Hospital discharge abstracts, submitted to Manitoba Health for fiscal years 1989/90 to 1993/94, by hospitals both in and out of province, were used. From these files, all records containing a procedure code for tonsillectomy, conducted on either an inpatient or as an outpatient basis, were chosen for the study. This identified records with the following codes: tonsillectomy without adenoidectomy (ICD-9 CM procedure code 28.2) or tonsillectomy with adenoidectomy (ICD-9 CM procedure code 28.3).

Physician claims submitted to Manitoba Health for the years 1990/91 to 1993/94 were analyzed. Claims data for the year 1989/90 were not able to be formatted for some of the analyses and were therefore omitted. The tariffs used to identify tonsillectomies in the medical claims data included: tonsillectomy with or without adenoidectomy or uvulectomy for a child under 13 years (Tariff number 2992) and tonsillectomy with or without adenoidectomy or uvulectomy for an adult (2993).

General approach

General descriptive analyses were conducted to review the number and type of tonsillectomy procedures performed on Manitoba residents, as well as to examine changes over the five years of observation. In general, hospital discharge abstracts were used to describe overall patterns of care as well as to document delivery of procedures according to type of hospital. Physician claims were used to analyze patterns of care according to physician characteristics such as specialty training and practice location.

In addition to descriptive analyses which review the number and types of cases and changes over time, the analyses conducted fall into one of two general approaches. The first of these, a *population-based approach*, is based on calculating annual rates of surgery by dividing the number of surgeries by a relevant denominator population. For this type of analysis, all surgical procedures are attributed to the population under consideration, regardless of where the surgery takes place. Population-based analyses were conducted to compare rates of surgery for different geographic areas as well for different groups defined by population characteristics such as age, sex and income.

The second general type of analysis relies on a *provider-based approach*, in which patterns of tonsillectomy delivered by different categories of hospitals and physicians are described. Provider-based analyses were conducted to determine the numbers and types of physicians and institutions involved in providing tonsillectomy, as well as the numbers and types of procedures performed by providers, according to characteristics such as caseload volume.

Population-based analyses

Population-based rates were developed to permit comparisons between groups having different characteristics. Rates of surgery were compared for age and sex groups, for different socio-economic groups (for residents of Winnipeg only), and for Indians in comparison to other provincial residents. In addition, population-based rates of tonsillectomy were calculated to permit comparisons across geographic areas. This involved calculating rates for the province as a whole, for Winnipeg and non-Winnipeg areas, for Manitoba Health regions, and for hospital service areas.

In some cases, age- and sex-specific population-based rates were used, while in others, summary rates were calculated. Where summary rates were used, two different versions were developed: one for children (i.e. the population less than 15 years of age), and another for the entire population at risk of receiving tonsillectomy (i.e. less than 40 years of age).

Because many comparisons of summary rates involve groups with different age and sex structures (which might affect rates of tonsillectomy), rates were age- and sex-adjusted to make these comparisons more valid. Rates were adjusted using a direct method of standardization to the 1993/94 Manitoba population. Rates have been expressed as the number of procedures per 10,000 population per year.

Comparisons of rates of surgery by gender were performed by one year age breaks. To ensure stability of these rates, data were combined over the five years. In addition, summary age-adjusted rates were developed for males and females, in which rates were adjusted to the 1993/94 population of males and females combined.

Rates by socio-economic status (Winnipeg residents only) were also calculated. The measure of socio-economic status chosen was Census Canada's (1986) Average

Annual Household income, which was grouped into Urban Income Quintile levels. Patients were assigned an Urban Income Quintile value according to their postal code.

Rates were developed as well for individuals holding treaty status under the Federal Indian Act. These individuals were identified in the dataset because the municipal code denoting their place of residence begins with an 'A'. For comparative purposes, rates for non-treaty residents were also calculated.

Municipal codes for patient residence were used to develop rates for geographical areas (i.e. Winnipeg, non-Winnipeg, and eight Manitoba Health regions). Twenty-one hospital service areas were defined by uniquely assigning municipalities and local government districts to hospitals that performed tonsillectomy procedures. This was done by determining which hospital provided the largest percentage of procedures to a given area. To ensure that these patterns were up to date, the most recent three years of data (1991/92 to 1993/94) were used. The hospital service area for a given hospital therefore comprised all areas which received most of their tonsillectomy procedures at the identified facility. Rates of procedures were calculated for residents of these areas. Seven of the 28 hospitals did not provide a majority of services to any area and correspondingly, did not have a defined service area.

Provider-related analyses

Hospitals were grouped into the following five categories according to location and function: teaching, urban community, major rural, intermediate rural and small rural. These categories were developed for an earlier report in consultation with Manitoba Health (Black, Roos and Burchill 1995). Patterns of care delivered by these different hospital types were analyzed to provide information relevant to assessing quality (i.e. analyses by age of patient, patterns of postoperative care) as well as efficiency (i.e.

analyses of total length of stay and patterns of preoperative care). Hospitals were also categorized according to annual number of tonsillectomy cases performed (caseload). Number of hospitals and total number of procedures performed were analyzed by caseload group.

Physicians were categorized by practice location and specialty training. Those performing surgery were classified as otolaryngologists, general surgeons, urban general/family practitioners, and rural general/family practitioners, while those delivering anaesthetics were grouped as specialist anaesthetists, urban non-specialists and rural GP anaesthetists. Physicians were also categorized according to the annual number of tonsillectomy, surgical and anaesthetic procedures they performed. Number of physicians and total number of procedures were analyzed by caseload group.

RESULTS

General patterns of tonsillectomy

Over the past 5 years, approximately 2000 cases of tonsillectomy were performed on Manitoba residents per annum (Table 1). The majority of tonsillectomy procedures were performed on children; in 1993/94, patients under the age of 15 years comprised 61.0% of all cases performed on Manitoba residents. The greatest number of procedures were performed on those 5 to 9 years of age (29.7% of cases) (Figure 2). This was followed by tonsillectomies on children from 10 to 14 years of age (16.8% of cases) and then by those on children 3 and 4 years of age (12.5% of cases). A very small percentage of procedures (2.0%) were performed on children less than 3 years of age.

A surprising number and percentage of procedures were performed on older children and adults. Tonsillectomies for individuals 15 to 24 years old represented 28.3% of cases while those for persons 25 years of age and older represented 10.8% of cases.

With a few exceptions, these patterns have been relatively stable over time. Over the past five years, there has been a tendency for both the number and percent of procedures performed on 5 to 9 year olds to decline — from 691 cases in 1989/90 to 608 cases in 1993/94, a decrease of 12.0%. Over the same period, tonsillectomies among 15 to 24 year olds increased by 27.8% (from 452 to 578 cases) and cases among 25 to 39 year olds increased by 25.9% (from 154 to 194 cases). Thus, cases on older children and adults constitute a larger percentage of cases over time.

Table 1
Number of tonsillectomy procedures by age and year

Procedures performed on Manitoba residents, 1989/90 - 1993/94

		Number (%) of tonsillectomy procedures				
Age		**1989/90**	**1990/91**	**1991/92**	**1992/93**	**1993/94**
0-2	No. (%)	44 (2.2)	32 (1.6)	33 (1.6)	51 (2.4)	41 (2.0)
3-4	No. (%)	272 (13.8)	275 (14.1)	237 (11.3)	275 (12.9)	256 (12.5)
5-9	No. (%)	691 (35.0)	656 (33.5)	725 (34.5)	664 (31.1)	608 (29.7)
10-14	No. (%)	334 (16.9)	344 (17.6)	356 (16.9)	362 (17.0)	343 (16.8)
15-24	No. (%)	452 (22.9)	438 (22.4)	544 (25.9)	574 (26.9)	578 (28.3)
25-39	No. (%)	154 (7.8)	183 (9.4)	179 (8.5)	178 (8.3)	194 (9.5)
40+	No. (%)	28 (1.4)	27 (1.4)	29 (1.4)	28 (1.3)	26 (1.3)
All cases	No. (%)	1975 (100.0)	1955 (100.0)	2103 (100.0)	2132 (100.0)	2046 (100.0)

Figure 2: Tonsillectomy procedures by age

Procedures performed on Manitoba residents, 1993/94

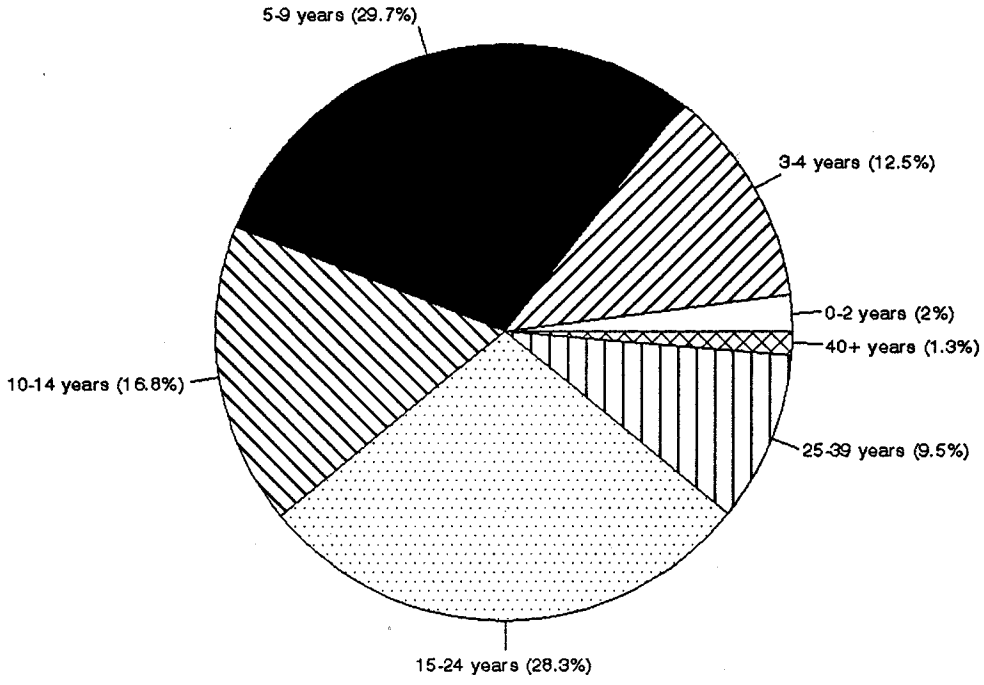
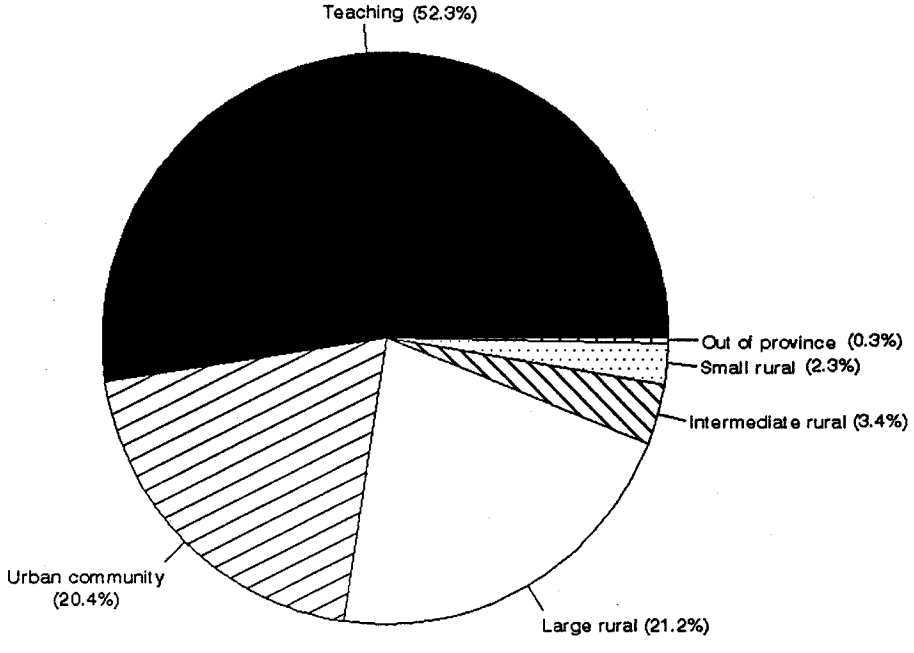


Figure 3: Tonsillectomy procedures: Where were they performed?

Procedures performed on Manitoba residents, 1993/94



Patterns of provision of care

Where were tonsillectomy procedures performed?

In 1993/94, 72.7% of procedures performed on Manitoba residents took place in urban hospitals and 26.9% in rural hospitals (Figure 3). A majority of procedures (52.3%) were performed in teaching hospitals, likely reflecting activity at the Children's Hospital. Most of the procedures performed in rural hospitals took place in larger rural hospitals that function as regional centres for surgical activity.[4]

There has been a recent change in patterns of care delivered by urban hospitals (Table 2). Between 1992/93 and 1993/94, tonsillectomies performed in urban community hospitals dropped by 210 cases, while tonsillectomies performed in teaching hospitals increased by 118 cases; there were corresponding changes in the percentage of cases performed. This shift of cases was related to a change in clinical policy regarding the provision of anaesthetic care for children. Late in 1992, provisions were implemented for all paediatric cases in Winnipeg to be conducted at the Children's Hospital.

Who delivered the care?

In terms of who performs the surgery, the majority of tonsillectomy procedures received by Manitoba residents are done by otolaryngologists: 67.3% in 1993/94 (Figure 4). General and family practitioners based in rural settings are the next largest group of providers (19.6% of cases), followed by general surgeons (10.6% of cases) and urban based general/family practitioners (2.5% of cases). These patterns have remained stable over time (Table 3).

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[4] Large rural hospitals include Bethesda (Steinbach), Dauphin, Flin Flon, Morden, Portage, Swan River, The Pas, Thompson, Selkirk, and Winkler. The hospital categories used in this report were developed for earlier work on hospital utilization performed by the Manitoba Centre for Health Policy and Evaluation. A complete listing of which hospitals fall into various categories can be found in the document Utilization of Hospital Resources. Volume I, Key Findings (Black, Roos and Burchill, 1993).

Table 2
Tonsillectomy procedures:
Where were they performed?

Procedures performed on Manitoba residents, 1989/90 - 1993/94

		Number (%) of tonsillectomy procedures				
Hospital type		**1989/90**	**1990/91**	**1991/92**	**1992/93**	**1993/94**
Teaching	No. (%)	897 (45.4)	827 (42.3)	881 (41.9)	952 (44.7)	1070 (52.3)
Urban community	No. (%)	576 (29.2)	576 (29.5)	687 (32.7)	628 (29.5)	418 (20.4)
Large rural	No. (%)	361 (18.3)	445 (22.8)	408 (19.4)	420 (19.7)	434 (21.2)
Intermediate rural	No. (%)	75 (3.8)	46 (2.4)	62 (2.9)	75 (3.5)	70 (3.4)
Small rural	No. (%)	60 (3.0)	44 (2.3)	44 (2.1)	49 (2.3)	48 (2.3)
Out of province	No. (%)	6 (0.3)	17 (0.9)	21 (1.0)	8 (0.4)	6 (0.3)
All cases	No. (%)	1975 (100.0)	1955 (100.0)	2103 (100.0)	2132 (100.0)	2046 (100.0)

Table 3
Tonsillectomy procedures:
Who performed the surgery?

Procedures performed on Manitoba residents by Manitoba physicians, 1989/90 - 1993/94

		Number (%) of tonsillectomy procedures				
Type of physician		**1989/90**	**1990/91**	**1991/92**	**1992/93**	**1993/94**
Otolaryngologists	No. (%)	1311 (66.9)	1293 (66.3)	1469 (70.8)	1495 (70.0)	1370 (67.3)
General surgeons	No. (%)	213 (10.9)	201 (10.3)	167 (8.0)	167 (7.8)	215 (10.6)
Urban general/ family practitioners	No. (%)	71 (3.6)	66 (3.4)	60 (2.9)	66 (3.1)	51 (2.5)
Rural general/ family practitioners	No. (%)	364 (18.6)	391 (20.0)	380 (18.3)	407 (19.1)	398 (19.6)
Others	No. (%)	1 (<0.1)	- -	- -	- -	- -
All groups	No. (%)	1960 (100.0)	1951 (100.0)	2076 (100.0)	2135 (100.0)	2034 (100.0)

Figure 4: Tonsillectomy procedures: Who performed the surgery?

Procedures performed on Manitoba residents by Manitoba physicians, 1993/94

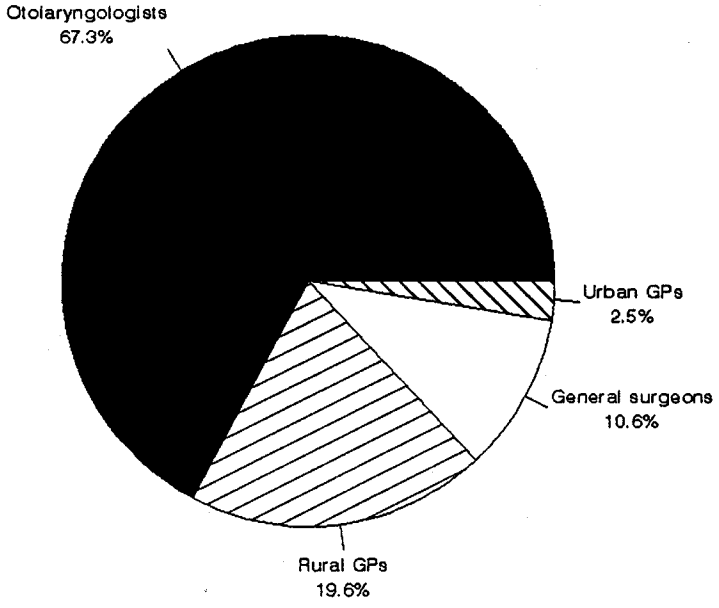
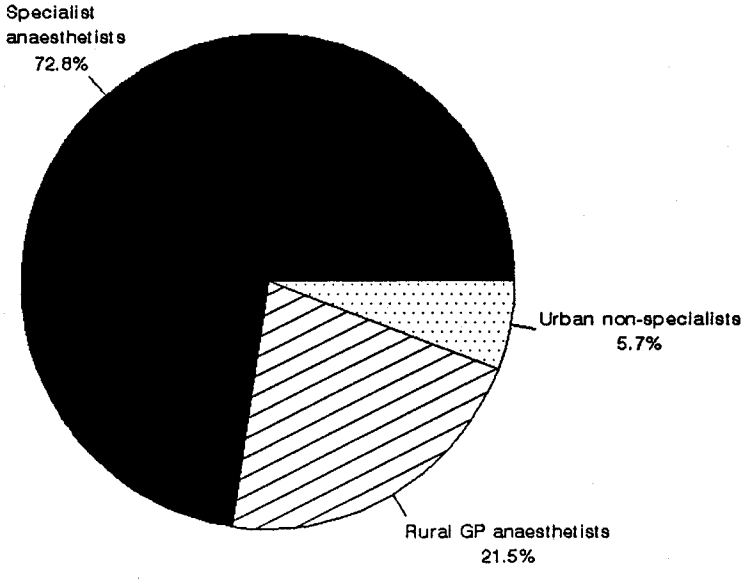


Figure 5: Tonsillectomy procedures: Who administered the anaesthesia?

Procedures performed on Manitoba residents by Manitoba physicians, 1993/94



Patterns of delivery of anaesthetic care for tonsillectomy parallel those for provision of surgical care (Figure 5). The greatest percentage of cases receive anaesthesia from specialist anaesthetists (72.8%). GP anaesthetists[5] provide the next largest percentage of cases (21.5%). A relatively small percent of cases (5.7%) are provided by non-specialist anaesthetists based in urban settings. Over time, these patterns have remained relatively stable, except that in 1993/94, the percentage of cases provided by urban non-specialist anaesthetists declined, with a corresponding increase in percent and number of cases performed by specialist anaesthetists (Table 4). This shift was likely related to the change in policy for performing children's surgery in Winnipeg hospitals.

Population-based analyses

In order to understand which characteristics of people, if any, are associated with the likelihood of receiving a tonsillectomy procedure, we calculated rates of tonsillectomy procedures for persons falling into different age, sex, background, and residence categories.

Age and sex

The likelihood of receiving a tonsillectomy varies by age and sex (Figure 6). For males, there is an increased likelihood of tonsillectomy surgery at young ages. Age-specific rates increase until the age of 6 years, after which the rate of surgery declines. For females, there is a very different pattern by age. As was the case with young males, age-specific rates of surgery rise sharply up to the age of 6 years, but for females the rate of surgery at these early ages is much lower than for males.

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[5] These are general and family practitioners who have received special training in anaesthesia and are approved by the College of Physicians and Surgeons to provide anaesthetic care to a determined level of complexity (ASA I-III), with some pediatric restriction.

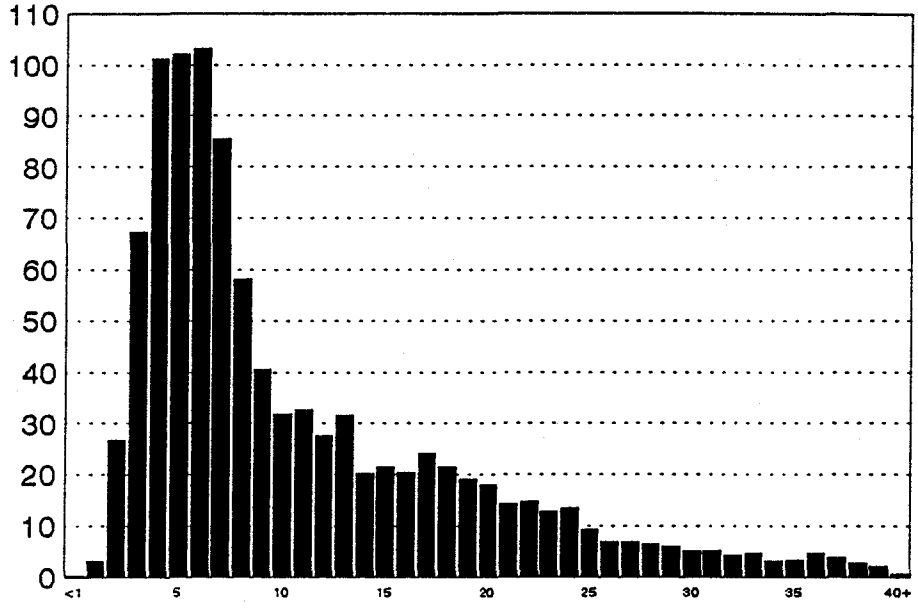
Table 4
Tonsillectomy procedures:
Who administered the anaesthesia?

Anaesthesia performed on Manitoba residents by Manitoba physicians, 1989/90 - 1993/94

		Number (%) of tonsillectomy procedures				
Type of physician		**1989/90**	**1990/91**	**1991/92**	**1992/93**	**1993/94**
Specialist anaesthetists	No. (%)	1241 (69.2)	1048 (62.7)	1079 (62.0)	1164 (64.7)	1270 (72.8)
Urban non-specialists	No. (%)	185 (10.3)	250 (15.0)	280 (16.1)	267(14.8)	99 (5.7)
Rural GP anaesthetists	No. (%)	368 (20.5)	373 (22.3)	380 (21.9)	369 (20.5)	374 (21.5)
All groups	No. (%)	1794 (100.0)	1671 (100.0)	1739 (100.0)	1800 (100.0)	1743 (100.0)

Figure 6: Age specific rates of tonsillectomy by sex
Five year average, 1989/90 - 1993/94

Males



Females

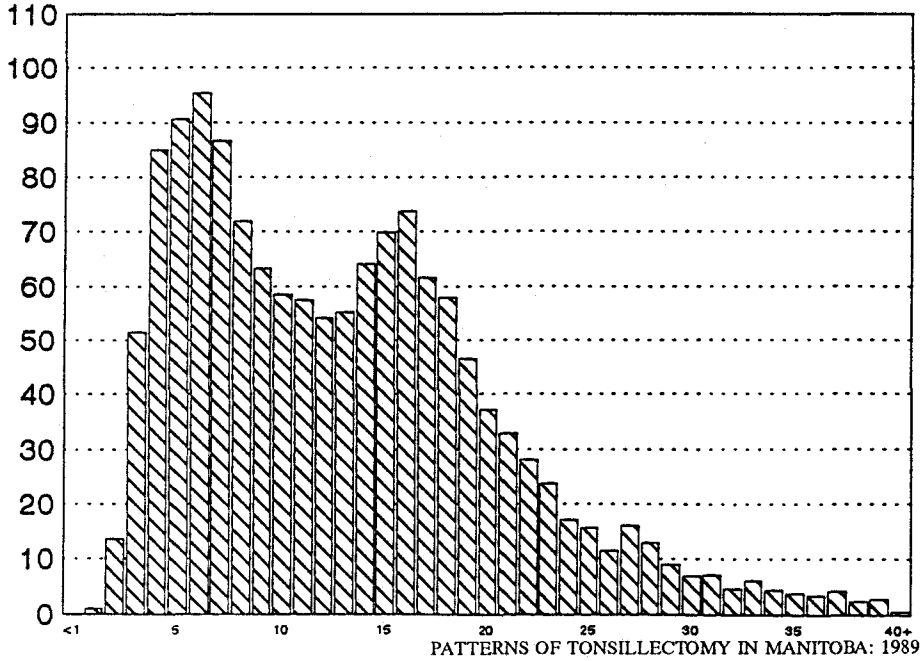
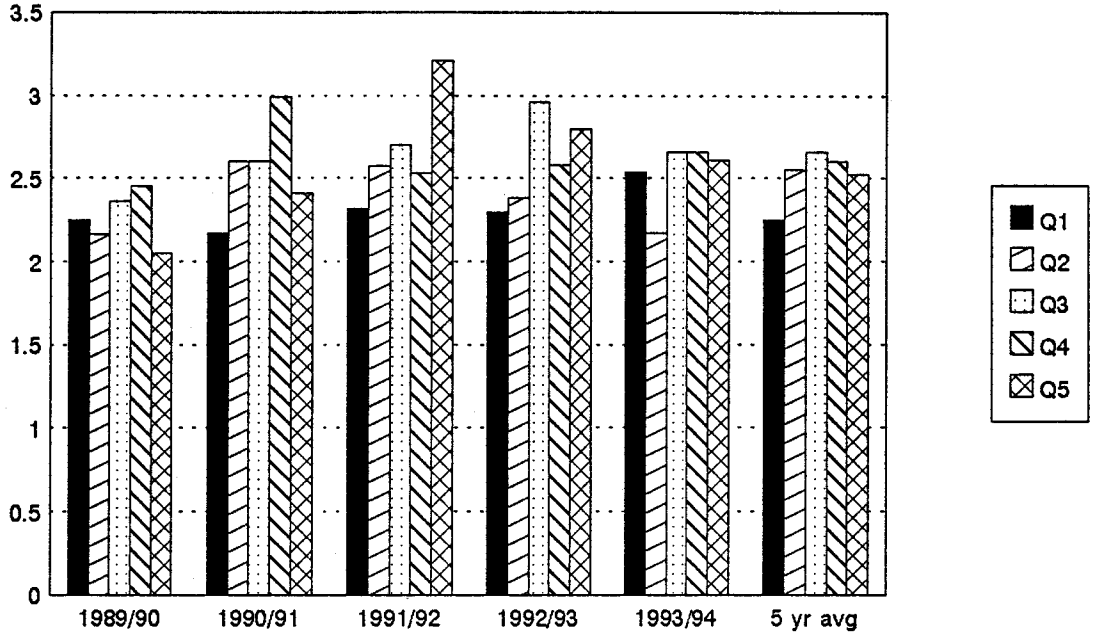


Figure 7: Rates of tonsillectomy by income quintiles for urban residents
Adjusted rates, 1989/90 - 1993/94



For example, at age one year, males are more than three times as likely to receive surgery as females and at two years of age are twice as likely. After the age of 6 years, rates of surgery for females decline, but not as rapidly as for males. During adolescence, rates for females rise dramatically: at age 16, females are over 3 times more likely than males to have a tonsillectomy. In general, rates for males are higher than for females up to and including age 6. Between ages 7 and 30, the differential is reversed, and after age 30 rates for the two sexes are approximately equal. Overall, when age standardized rates for the two sexes are compared, females receive 39% more tonsillectomies than males, with most of the difference related to markedly higher levels of surgery in the adolescent period.

Socio-economic status

To examine the impact of socio-economic status on the likelihood of having a tonsillectomy, we examined age- and sex- standardized rates of surgery for Winnipeg

residents by income level (Figure 7). Using census data, the Winnipeg population was divided into fifths (quintiles) according to family income level. There was no consistent pattern across the income quintiles in any of the years studied, suggesting that income level is not associated with rates of tonsillectomy.

Treaty Indians in comparison to others

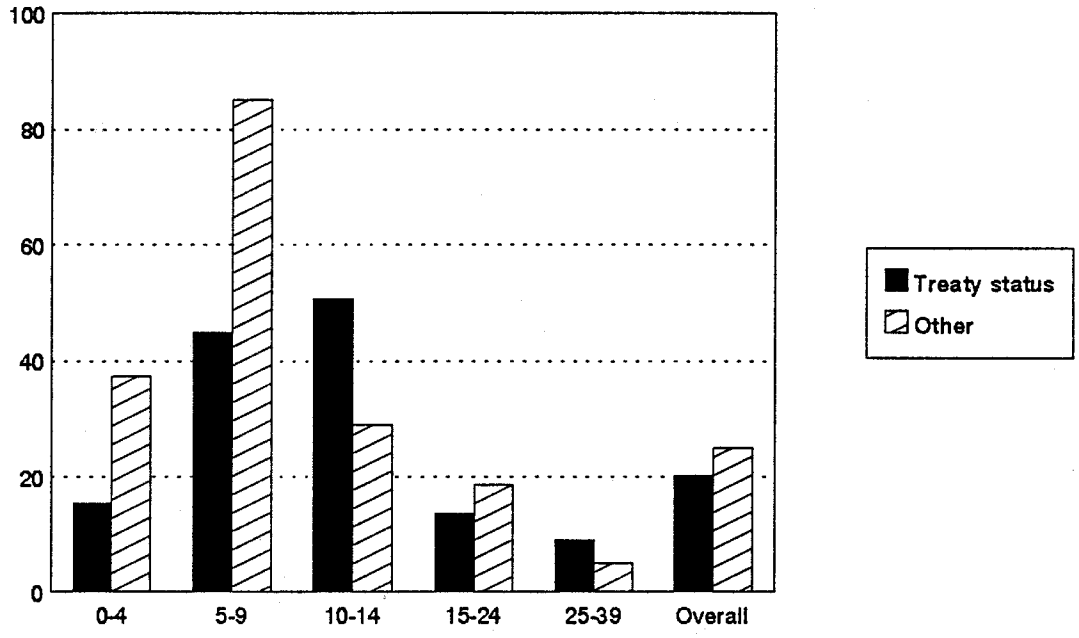
Consistent with the Report of the Child Health Strategy Committee (1995), our data show that young treaty Indians are less likely to receive tonsillectomy than other children (Figure 8). This pattern was most pronounced for children less than 5 years of age — non-Indian males and non-Indian females were 2.4 and 3.8 times more likely, respectively, to have their tonsils removed than treaty Indians of this age. The pattern was maintained for children ages 5 to 9 years of age, although the differential was not as large as for young children. Between ages 10 and 14 years, the pattern reversed, with treaty Indians more likely to receive surgery. After age 15 years, the patterns diverged for the sexes. For males 15 years and older, rates for Indians are roughly equivalent to those of non-Indian residents. In contrast, rates for non-treaty females age 15 to 24 years are almost twice as high as those for Indian females. This differential reversed for persons aged 25 to 39 years of age. Overall, non-treaty residents were 22% more likely than Indians to receive tonsillectomy surgery. They were also more likely to receive surgery at younger ages.

Rural versus urban residence

Important patterns emerged when rates of surgery were compared by patients' residence. Surprisingly, rates of surgery for rural residents were consistently higher than rates for urban residents. This differential was consistent over the five years of study and was present in both comparisons of rates for children and the entire 'at risk' population (i.e. those 0 to 39 years of age) (Figure 9).

Figure 8: Rates of tonsillectomy by treaty status and age
Five year average, 1989/90 - 1993/94

Males



Females

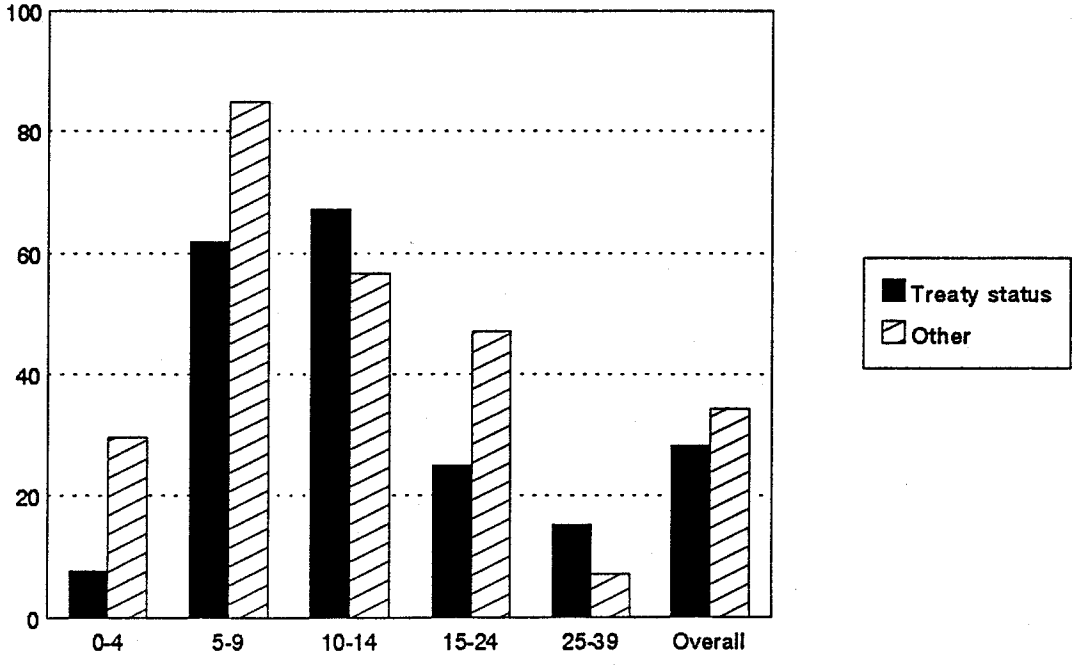
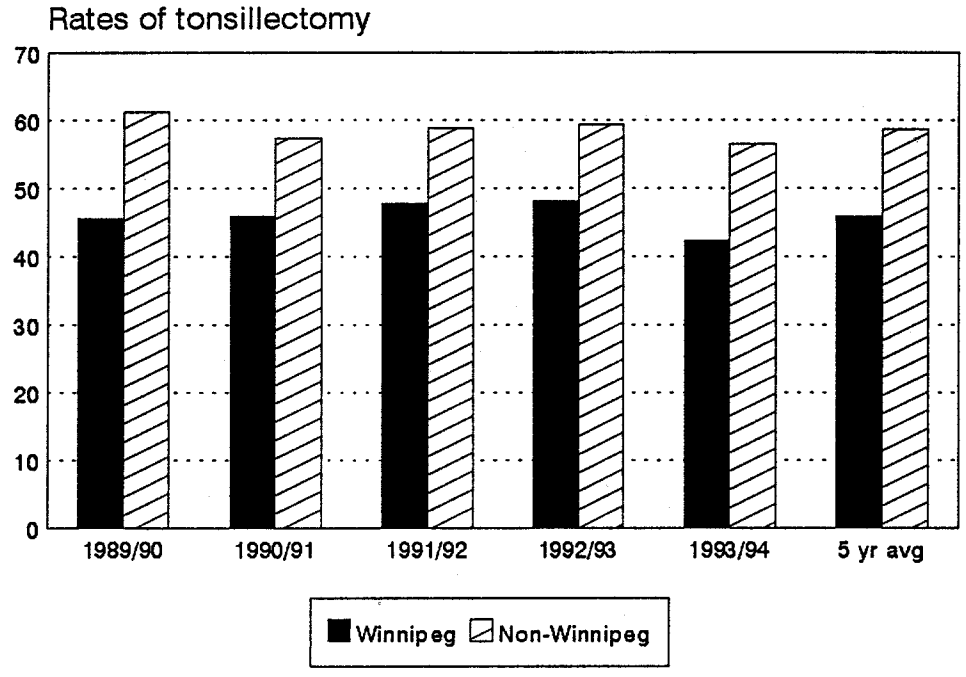
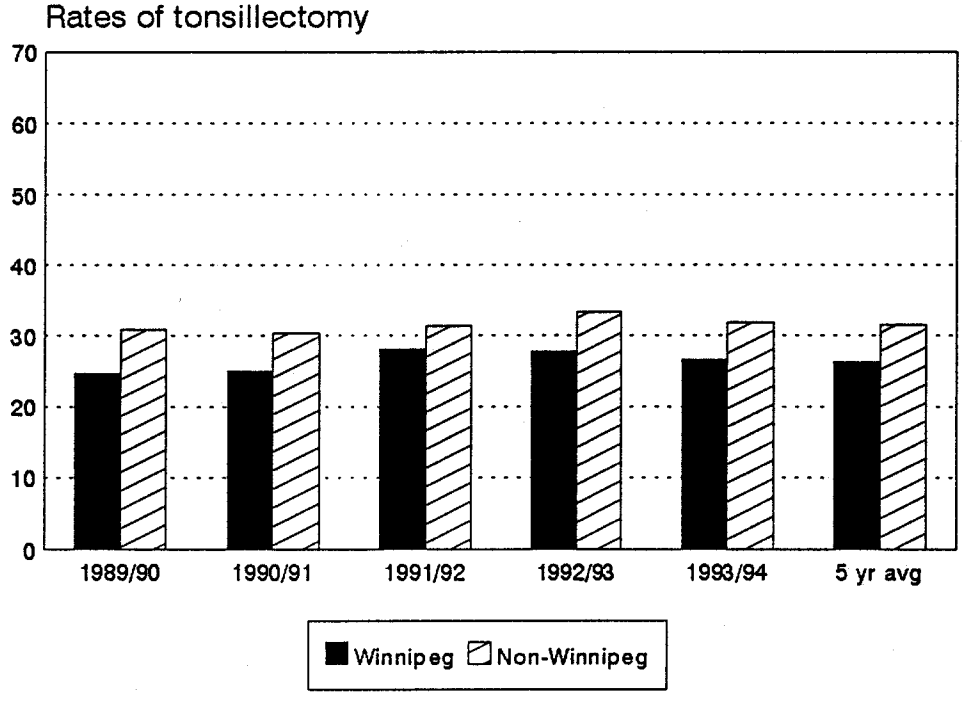


Figure 9: Winnipeg vs. non-Winnipeg rates of tonsillectomy Adjusted rates, 1989/90 - 1993/94

Age 0-14 years



Age 0-39 years



The differential was greater for children. Overall, children were 28% more likely to have their tonsils removed if they lived in a rural location than if they lived in Winnipeg. Rates of surgery for the population 0 to 39 years of age were lower (almost one-half) than for those 0 to 14 years of age, among whom the majority of surgery is concentrated. For this group, the difference in rates between non-Winnipeg and Winnipeg populations was slightly lower. Nonetheless, rural residents were still 20% more likely to have a tonsillectomy than were residents living in Winnipeg, who presumably have easier access to otolaryngologists.

Region of residence

Analysis of rates of surgery for the eight Manitoba Health regions demonstrated considerable variation. Again, variation was observed for both children (Table 5) and the entire population of persons at risk (i.e. those 0 to 39 years of age) (Table 6). Annual rates for the eight regions were somewhat variable over time, but in general patterns were stable. Rates calculated on the basis of a five year average were lowest for Winnipeg and Central region residents and highest for residents of the Westman and Norman regions (Figure 10). For both children and the general population, residence in the highest rate region was associated with a 78% higher level of tonsillectomy in comparison to residence in Winnipeg, the lowest rate region.

Hospital service area analyses

Assignment of small geographic areas to the hospital providing the majority of tonsillectomies to their residents led to the creation of 21 hospital service areas. Four of these were service areas for Winnipeg hospitals and the rest were areas where rural hospitals have the major influence on rates of surgery. Several unusual patterns emerged in the resultant map of hospital service areas (Figure 11). Several hospitals that perform tonsillectomy surgery did not have tonsillectomy service areas because they do not provide the majority of these procedures to nearby residents. In addition, hospital service areas were not neatly distributed in concentric areas around each hospital.

Table 5
Regional rates of tonsillectomy, Ages 0-14

Age- and sex-adjusted rates 1989/90 - 1993/94 and five year average

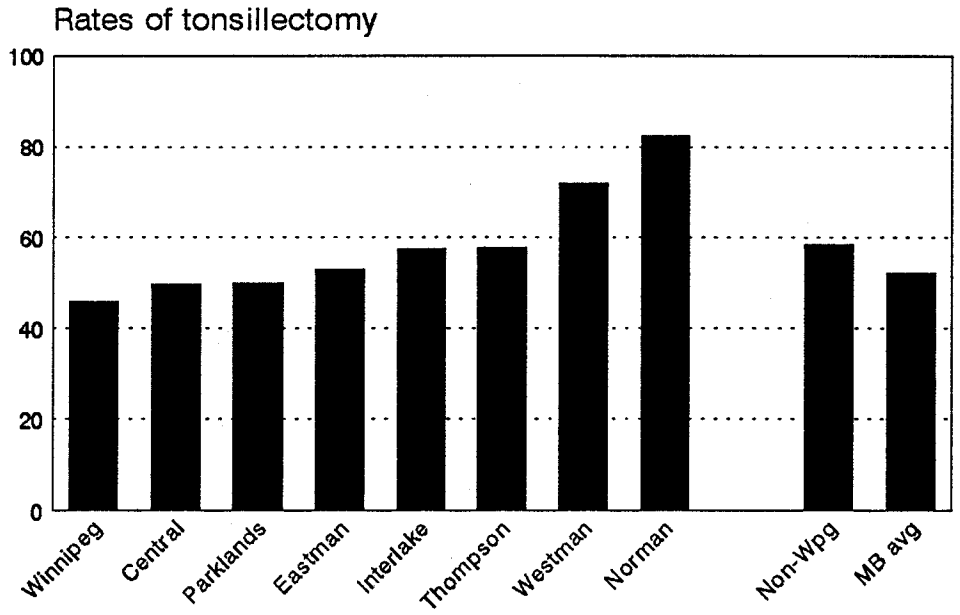
	Rate of tonsillectomy procedures (per 10,000 population)					
Regions	**1989/90**	**1990/91**	**1991/92**	**1992/93**	**1993/94**	**5 yr avg**
Winnipeg	45.6	46.0	47.9	48.1	42.4	46.0
Central	51.3	56.1	53.4	47.0	40.6	49.8
Parklands	42.2	66.8	45.7	35.5	60.9	50.1
Eastman	55.4	49.5	51.9	58.7	50.0	53.1
Interlake	60.0	52.6	57.4	64.7	53.2	57.5
Thompson	55.1	57.3	52.2	64.0	61.0	57.9
Westman	88.9	58.6	79.6	70.8	61.7	72.0
Norman	62.0	87.7	71.2	81.5	111.4	82.4
Non-Wpg	61.3	57.4	58.9	59.4	56.4	58.7
Manitoba	53.5	51.7	53.4	53.7	49.4	52.3
Ratio (Non-Wpg to Wpg rates)	1.35	1.25	1.23	1.24	1.33	1.28

Table 6
Regional rates of tonsillectomy, Ages 0-39

Age- and sex-adjusted rates 1989/90 - 1993/94 and five year average

	Rate of tonsillectomy procedures (per 10,000 population)					
Regions	**1989/90**	**1990/91**	**1991/92**	**1992/93**	**1993/94**	**5 yr avg**
Winnipeg	24.7	25.0	28.1	27.8	26.7	26.4
Central	24.7	28.8	28.5	29.0	23.3	26.8
Eastman	28.8	26.3	27.7	31.3	27.7	28.4
Parklands	29.6	35.4	31.2	21.2	36.4	30.8
Interlake	30.6	28.2	31.3	33.3	31.1	30.9
Thompson	26.3	32.3	30.0	37.5	32.9	31.8
Westman	41.3	30.2	36.6	38.4	34.0	36.1
Norman	35.1	48.0	41.5	47.2	63.8	46.9
Non-Wpg	30.9	30.4	31.4	33.3	31.9	31.6
Manitoba	27.8	27.6	30.0	30.4	29.3	29.0
Ratio (Non-Wpg to Wpg rates)	1.25	1.21	1.12	1.20	1.19	1.20

Figure 10: Regional rates of tonsillectomy
Adjusted rates, five year average 1989/90 - 1993/94
Age 0-14 years



Age 0-39 years

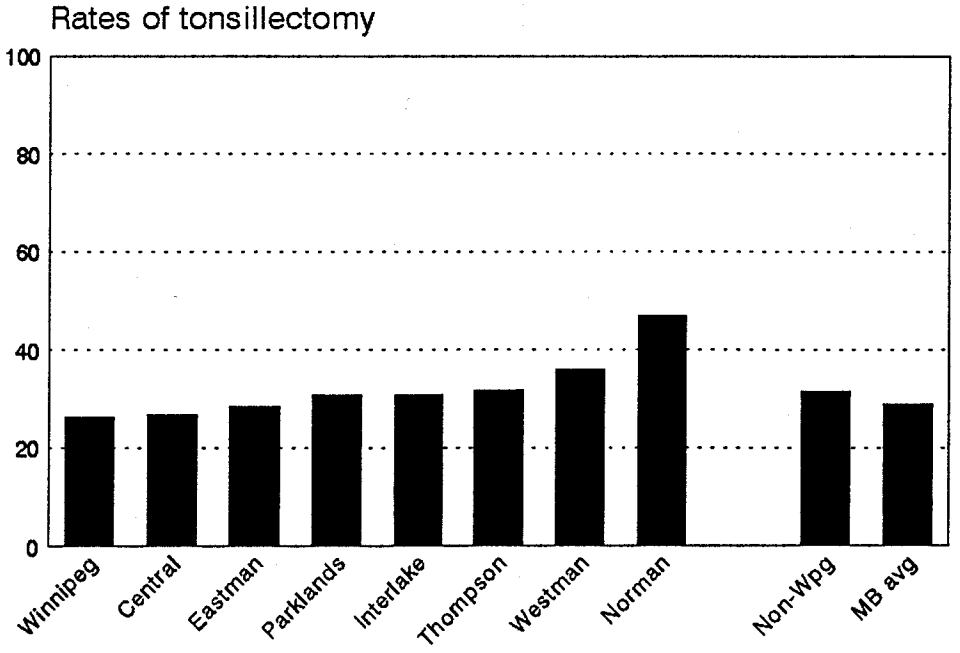
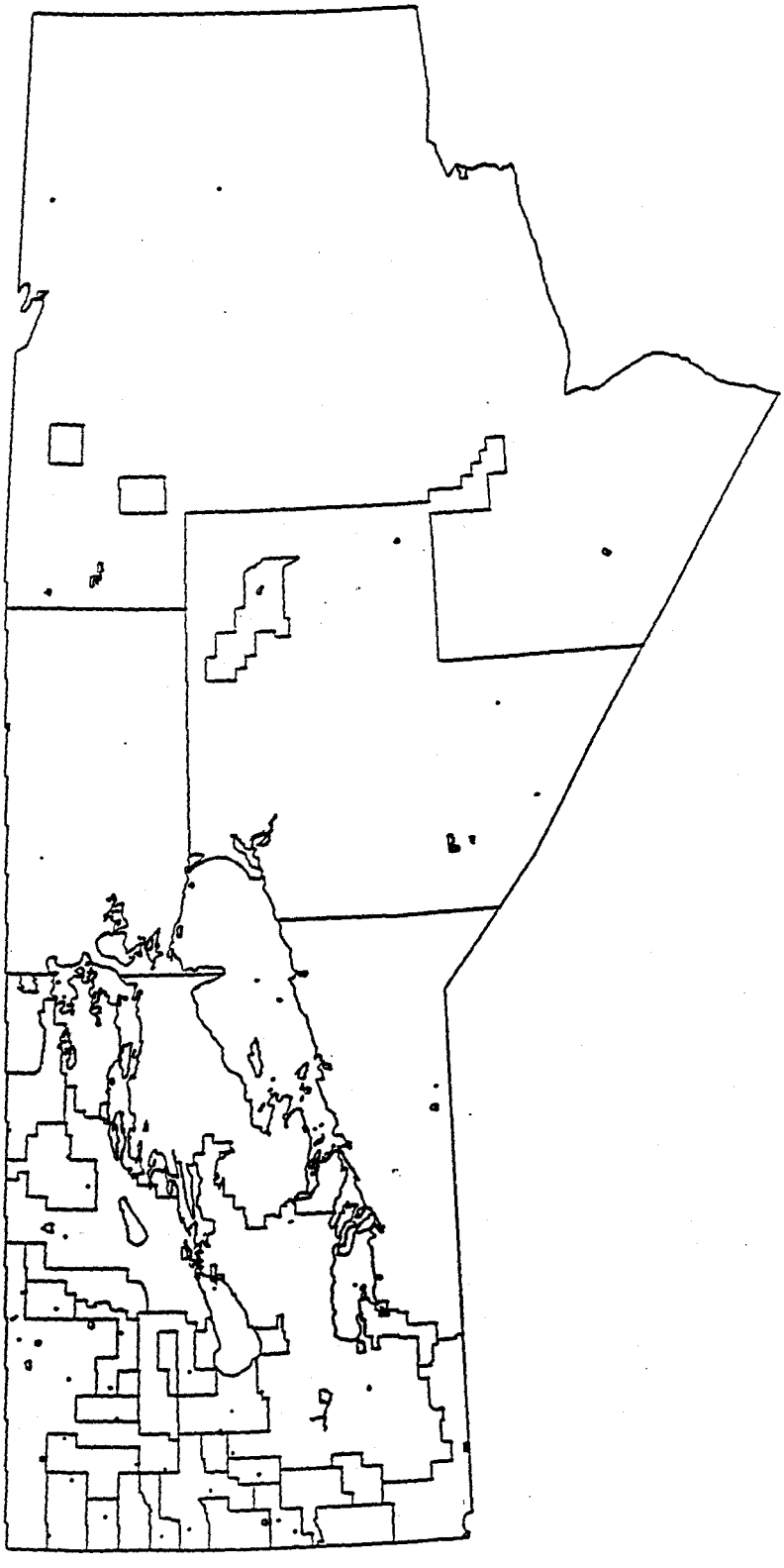


Figure 11: Map of hospital service areas



For example, while the service area for the Health Sciences Centre (which includes the Children's Hospital) was the largest, it was very dispersed and was frequently interrupted by other hospital service areas; the service area therefore comprises a large area and many smaller areas that all receive a majority of tonsillectomies from the Health Sciences Centre. Hospital service areas varied considerably in geographic area and population size. For 0 to 39 year olds, baseline populations ranged from 989 persons to 488,811 persons. Because some of the populations were very small, three years of data were used to calculate rates of surgery.

Rates of tonsillectomy surgery for hospital service areas showed even greater variation than regional comparisons (Figure 12). Rates of surgery were over seven times higher in the area with the highest level of surgery in comparison to the area with the lowest level. In general, rates for the four service areas in which the Winnipeg hospitals play a major role in influencing patterns of care were at the lower end of the scale. Only one rural hospital area had a rate of tonsillectomy that was lower than areas served by Winnipeg hospitals, indicating that access to surgery may be a problem for these residents. In contrast, many other areas appear to have much higher rates of surgery than either the rate for residents served by Winnipeg hospitals or the average rate for provincial residents.

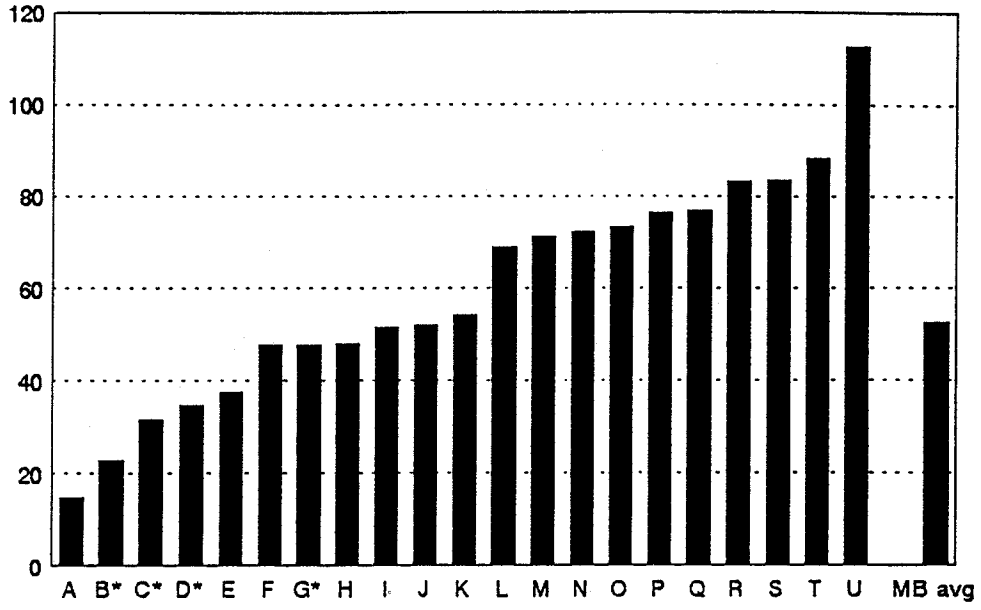
Quality of care

Caseload volume

Tonsillectomy caseload volumes varied considerably across providers. In 1993/94, 54.7% of providers doing tonsillectomies each performed fewer than 10 procedures per year. In aggregate, these physicians were responsible for only a small proportion of the total cases performed (6.3%) (Figure 13).

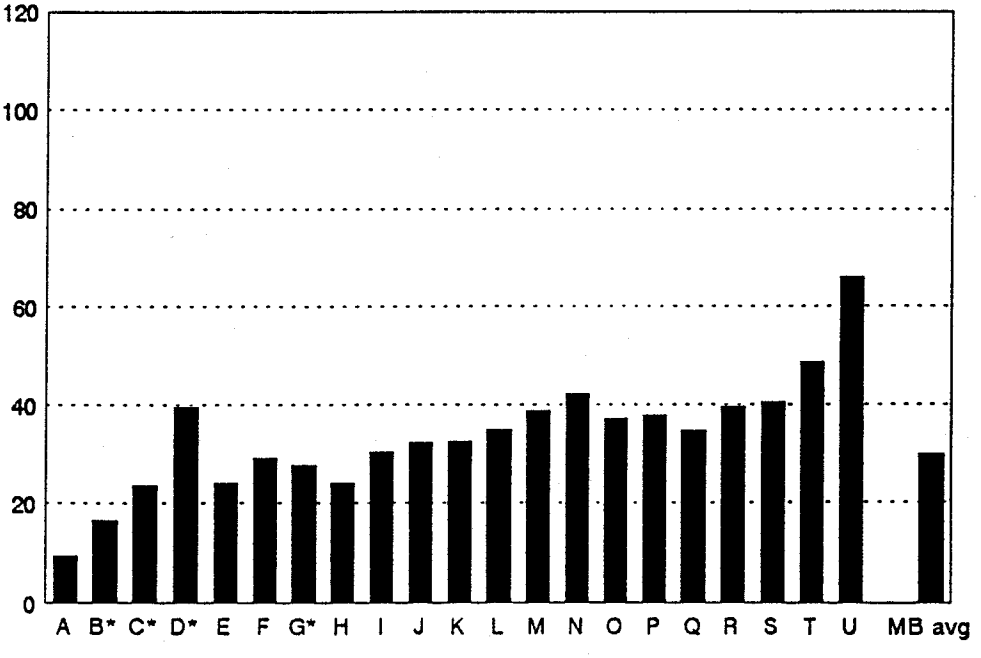
Figure 12: Hospital service area rates of tonsillectomy Adjusted rates, three year average 1991/92 - 1993/94

Age 0-14 years



*Asterisks represent Winnipeg hospital service areas

Age 0-39 years



*Asterisks represent Winnipeg hospital service areas

Figure 13: Physicians and cases by tonsillectomy caseload

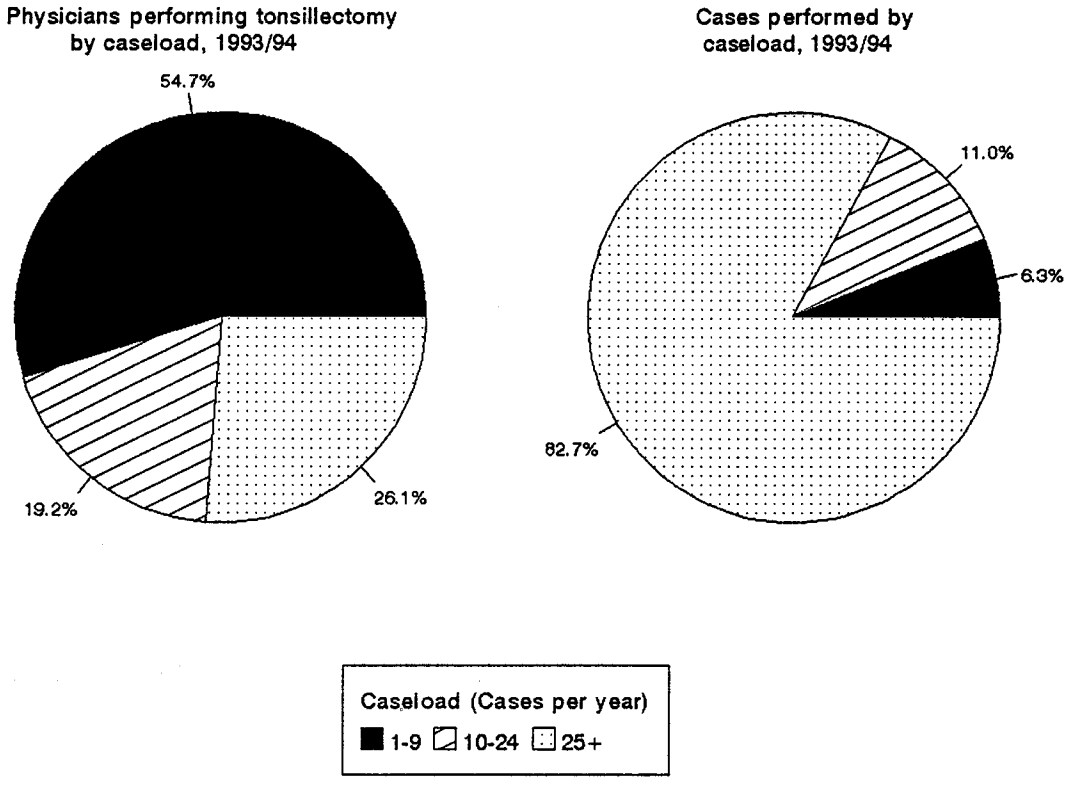
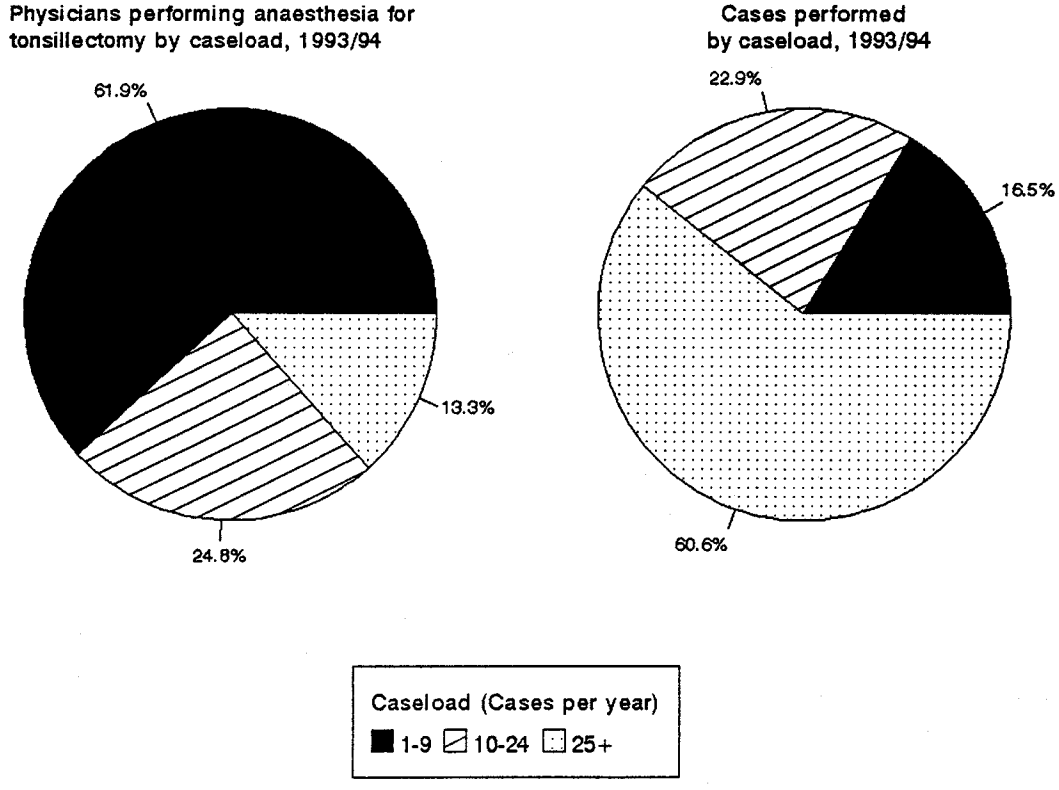


Figure 14: Anaesthetists and cases by tonsillectomy caseload



In contrast, a relatively small proportion (26.1%) of providers who annually performed 25 or more procedures was responsible for a large majority (82.7%) of the procedures performed. This overall pattern was stable over the four year period 1990/91 to 1993/94 (Table 7). However, over this four year period, the number of physicians performing tonsillar surgery decreased from 98 to 73, with most of the decline occurring among physicians who performed fewer than 5 procedures per year.

A similar pattern was found for anaesthetic care related to tonsillectomy (Figure 14) — 61.9% of physicians who provided anaesthesia for fewer than 10 tonsil cases per year were responsible for anaesthesia care for 16.5% of tonsillectomy cases. Again, a relatively small proportion of providers (13.3%) provided the anaesthesia for a majority of cases (60.6%). Overall, the number of physicians performing anaesthesia for tonsillectomy procedures has declined, with most of the decrease occurring among the group involved in fewer than 5 procedures per annum (Table 8).

Among hospitals, too, there was a significant percentage of low volume providers (Figure 15). Twelve hospitals (or 46.1% of those hospitals performing tonsillectomy) performed fewer than 25 cases per year and were responsible for only 6.4% of cases; five hospitals performed fewer than 10 cases per year, contributing less than 1 percent (0.7%) of cases. In contrast, 19.2% of hospitals performed over 70% of cases. As was the case with physicians, there was a decline in the number of facilities providing tonsillectomy over time, and most of the decrease occurred among low volume facilities (Table 9).

Performance of procedures on very young children

In 1993/94, most of the procedures performed on very young children (less than 3 years old) were performed at teaching hospitals (Table 10). However, a small number of these high risk procedures were conducted in other settings.

Table 7
Number of physicians performing tonsillectomy procedures by caseload

Procedures performed on Manitoba residents by Manitoba physicians, 1990/91 - 1993/94

Physician tonsillectomy caseload			Number (%) 1990/91	1991/92	1992/93	1993/94
1-4	Physicians	No. (%)	48 (49.0)	29 (35.8)	33 (41.8)	25 (34.2)
	Procedures	No. (%)	73 (3.7)	41 (2.0)	46 (2.2)	26 (1.3)
5-9	Physicians	No. (%)	17 (17.3)	18 (22.2)	13 (16.5)	15 (20.5)
	Procedures	No. (%)	114 (5.8)	113 (5.4)	89 (4.2)	101 (5.0)
10-24	Physicians	No. (%)	15 (15.3)	15 (18.5)	15 (19.0)	14 (19.2)
	Procedures	No. (%)	203 (10.4)	245 (11.8)	224 (10.5)	224 (11.0)
25-99	Physicians	No. (%)	10 (10.2)	11 (13.6)	7 (8.9)	11 (15.1)
	Procedures	No. (%)	497 (25.5)	488 (23.5)	295 (13.8)	522 (25.7)
100+	Physicians	No. (%)	8 (8.2)	8 (9.9)	11 (13.9)	8 (11.0)
	Procedures	No. (%)	1064 (54.5)	1190 (57.3)	1481 (69.4)	1161 (57.1)
All groups	Physicians	No. (%)	98 (100.0)	81 (100.0)	79 (100.0)	73 (100.0)
	Procedures	No. (%)	1951 (100.0)	2077 (100.0)	2135 (100.0)	2034 (100.0)

Source: Mar 22/95

Table 8
Number of physicians administering anaesthesia for tonsillectomy procedures by caseload

Procedures performed on Manitoba residents by Manitoba physicians, 1990/91 - 1993/94

			Number (%)			
Physician tonsillectomy caseload			**1990/91**	**1991/92**	**1992/93**	**1993/94**
1-4	Physicians	No. (%)	49 (38.9)	46 (37.8)	40 (32.8)	39 (34.5)
	Procedures	No. (%)	102 (6.1)	100 (5.8)	83 (4.7)	84 (4.8)
5-9	Physicians	No. (%)	27 (21.4)	31 (25.4)	38 (31.1)	31 (27.4)
	Procedures	No. (%)	178 (10.7)	218 (12.6)	249 (14.2)	203 (11.7)
10-14	Physicians	No. (%)	15 (11.9)	6 (4.9)	9 (7.4)	17 (15.0)
	Procedures	No. (%)	162 (9.7)	57 (3.3)	106 (6.1)	193 (11.1)
15-24	Physicians	No. (%)	20 (15.9)	18 (14.8)	18 (14.8)	11 (9.7)
	Procedures	No. (%)	353 (21.1)	320 (18.5)	308 (17.6)	204 (11.8)
25-49	Physicians	No. (%)	7 (5.6)	12 (9.8)	8 (6.6)	6 (5.3)
	Procedures	No. (%)	208 (12.5)	334 (19.3)	252 (14.4)	192 (11.1)
50+	Physicians	No. (%)	8 (6.3)	9 (7.4)	9 (7.4)	9 (8.0)
	Procedures	No. (%)	659 (39.7)	703 (40.6)	751 (42.9)	860 (49.5)
All groups	Physicians	No. (%)	126 (100.0)	122 (100.0)	122 (100.0)	113 (100.0)
	Procedures	No. (%)	1662 (100.0)	1732 (100.0)	1749 (100.0)	1736 (100.0)

Table 9
Number of hospitals performing tonsillectomy procedures by caseload

Procedures performed on Manitoba residents by Manitoba hospitals, 1989/90 - 1993/94

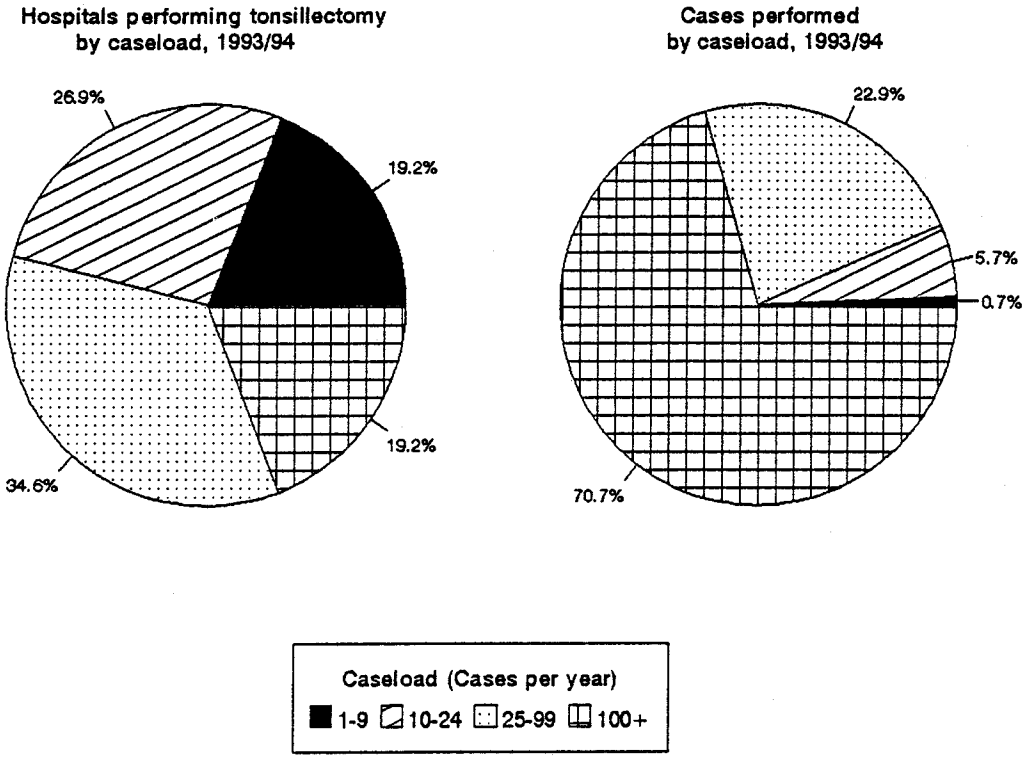
Hospital tonsillectomy caseload			Number (%) 1989/90	1990/91	1991/92	1992/93	1993/94
1-9	Hospitals	No. (%)	11 (33.3)	11 (33.3)	8 (26.7)	6 (21.4)	5 (19.2)
	Procedures	No. (%)	34 (1.7)	25 (1.3)	17 (0.8)	20 (0.9)	15 (0.7)
10-24	Hospitals	No. (%)	9 (27.3)	9 (27.3)	6 (20.0)	8 (26.8)	7 (26.9)
	Procedures	No. (%)	160 (8.1)	172 (8.9)	116 (5.6)	138 (6.5)	117 (5.7)
25-99	Hospitals	No. (%)	7 (21.2)	8 (24.2)	11 (36.7)	8 (28.6)	9 (34.6)
	Procedures	No. (%)	332 (16.9)	469 (24.2)	503 (24.2)	388 (18.3)	468 (22.9)
100+	Hospitals	No. (%)	6 (18.2)	5 (15.2)	5 (16.7)	6 (21.4)	5 (19.2)
	Procedures	No. (%)	1443 (73.3)	1272 (65.6)	1446 (69.5)	1578 (74.3)	1440 (70.6)
All groups	Hospitals	No. (%)	33 (100.0)	33 (100.0)	30 (100.0)	28 (100.0)	26 (100.0)
	Procedures	No. (%)	1969 (100.0)	1938 (100.0)	2082 (100.0)	2124 (100.0)	2040 (100.0)

Table 10
Number of tonsillectomy procedures by age and hospital type

Cases performed on Manitoba residents age 0-19 years, 1993/94

	Number of tonsillectomy procedures				
Age	**Teaching**	**Urban community**	**Large rural**	**Intermediate rural**	**Small rural**
0-2	30	<5	7	0	0
3-6	353	37	124	15	15
7-11	288	38	108	20	13
12-13	82	7	30	6	<5
14-16	106	63	51	13	5
17-19	74	80	43	10	6

Figure 15: Hospitals and cases by tonsillectomy caseload



Although in 1993/94, these cases occurred in urban community and large rural hospitals, the committee reviewed data suggesting that, in earlier years, small numbers of these cases were even conducted in intermediate and small rural facilities, which are less likely to have the facilities required for intensive monitoring of these children.

Postoperative management

Pressures to perform tonsillectomy procedures on a day surgery basis did not lead to appreciable change in postoperative management until 1993/94 (Figure 16). In that year, over 20 percent of cases had a zero day postoperative stay, reflecting a shift from previous years (Figure 16). Concurrent with this change was a decrease in the percentage of cases having a one day postoperative stay. To understand which hospitals were involved in implementing zero day postoperative care, patterns were examined by hospital type (Figure 17). In 1993/94, over 30 percent of cases at the teaching hospitals were being managed without admission after surgery.

Figure 16: Use of postoperative hospital days for tonsillectomy, 1989/90 - 1993/94

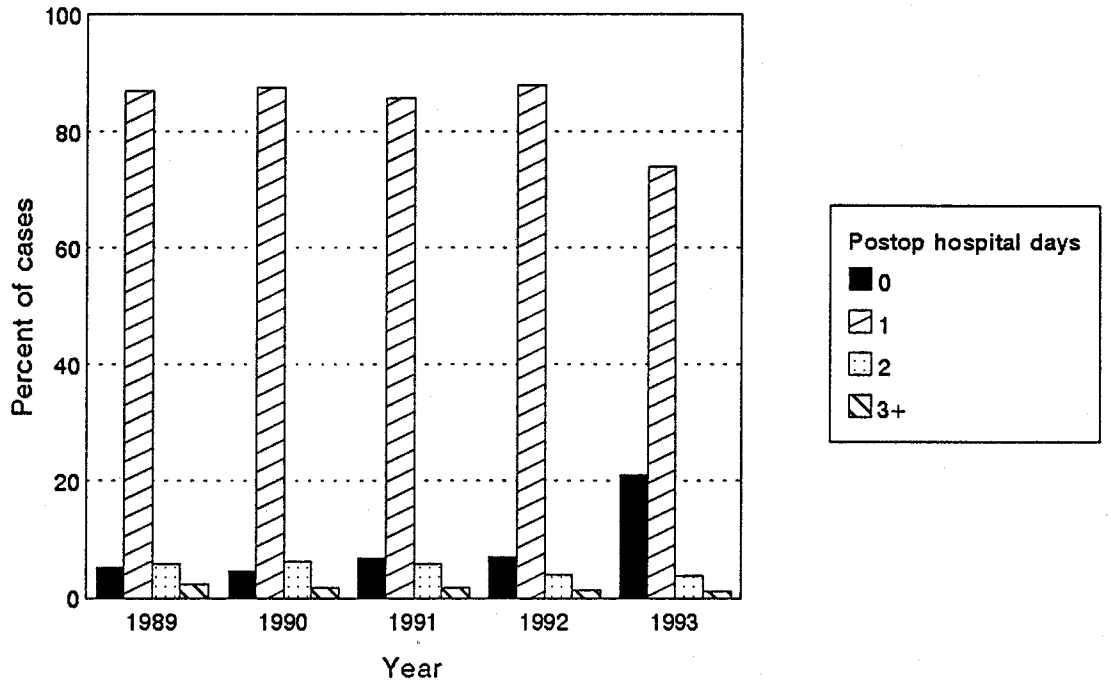
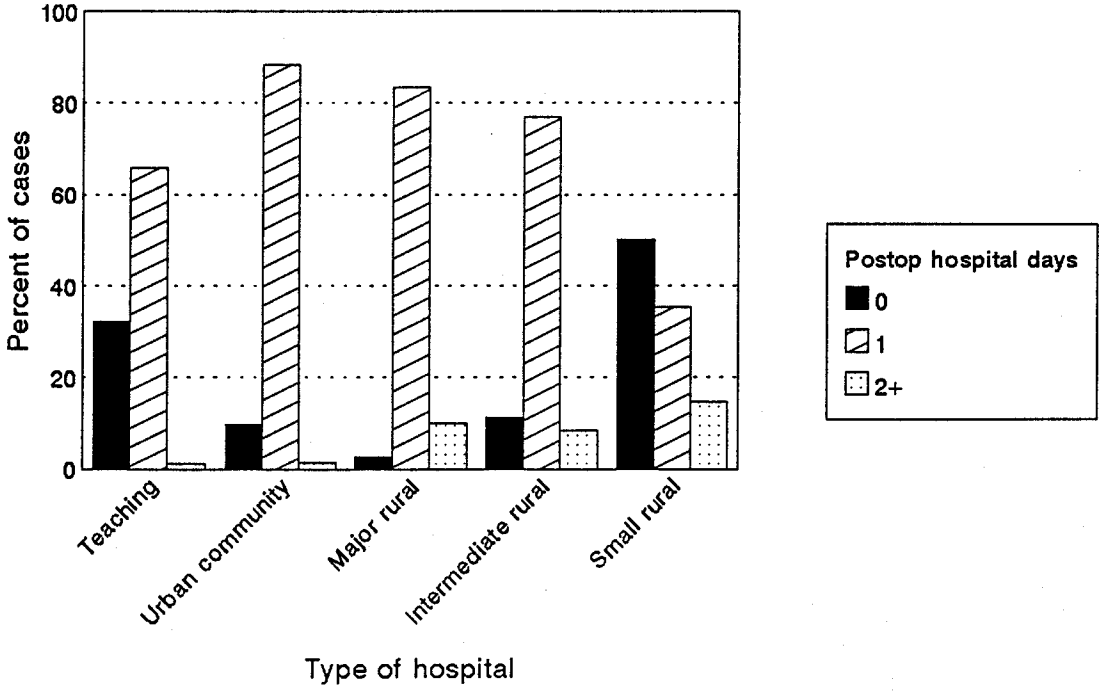


Figure 17: Use of postoperative hospital days by type of hospital, 1993/94



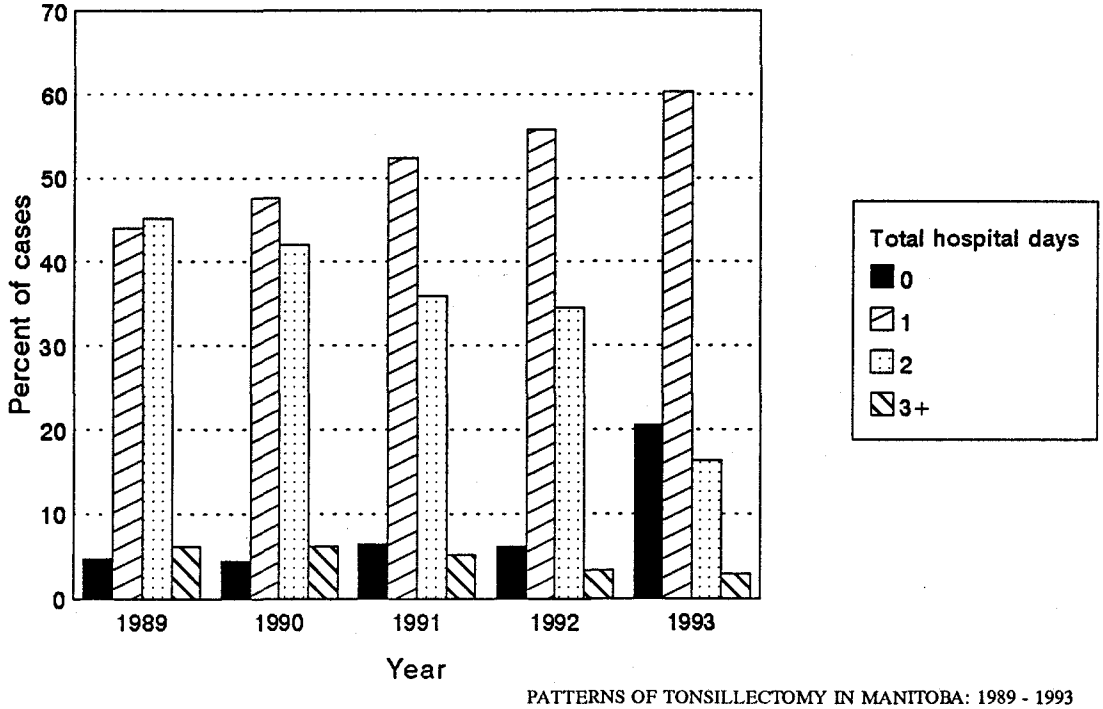
Very surprisingly, small rural hospitals had the highest percentage of tonsillectomies without an overnight postoperative stay; their percent of 'zero day' postoperative stays was higher than the percentage of 1 day stays. No data were available to determine whether patients with zero day postop stays are being adequately observed for early postoperative haemorrhage (i.e. at least eight hours postoperatively).

Efficiency issues

Total length of stay

Significant change has occurred in patterns of tonsillectomy care over the period from 1989/90 to 1993/94, resulting in increased efficiency in use of hospital days. Over this time, two and three day stays have been decreasing, while zero and one day stays have been increasing (Figure 18).

Figure 18: Total length of stay for tonsillectomy, 1989/90 - 1993/94



Preoperative care

Much of the change in length of stay for tonsillectomy is related to different patterns of admission prior to the procedure (Figure 19). Since 1989/90, when approximately equal numbers of cases were admitted zero and one day before surgery, there has been a dramatic shift: in 1993/94, over 80 percent of cases were not admitted prior to surgery (i.e. 0 day preoperative stay).

Over the years in the study, the teaching hospitals have had the highest percentage of surgeries that are not admitted prior to surgery; in 1993/94 the percentage of cases was almost 100 percent (Figure 20). Urban community hospitals started with approximately 25 percent of cases in 1989/90 and now treat over 90 percent of cases in this manner. Small rural hospitals started in 1989/90 with almost 40 percent of cases not admitted prior to surgery; this has increased to just over 60 percent in 1993/94. While major and intermediate rural hospitals have made recent changes, the percentage of cases admitted to hospital one day or more prior to surgery remains above 50 percent of cases. It is not clear why rural hospitals have been slower to adopt this aspect of outpatient surgery.

Postoperative care

As a component of reducing total length of stay and moving toward outpatient surgery, there has been cautious adoption of zero day postoperative stays by the teaching hospitals and more rapid adoption of such practices by small rural hospitals (Figures 16 and 17). Moreover, the percentage of two and three day postoperative stays, while always low, has decreased gradually over the five years of the study.

Figure 19: Use of preoperative hospital days for tonsillectomy, 1989/90 - 1993/94

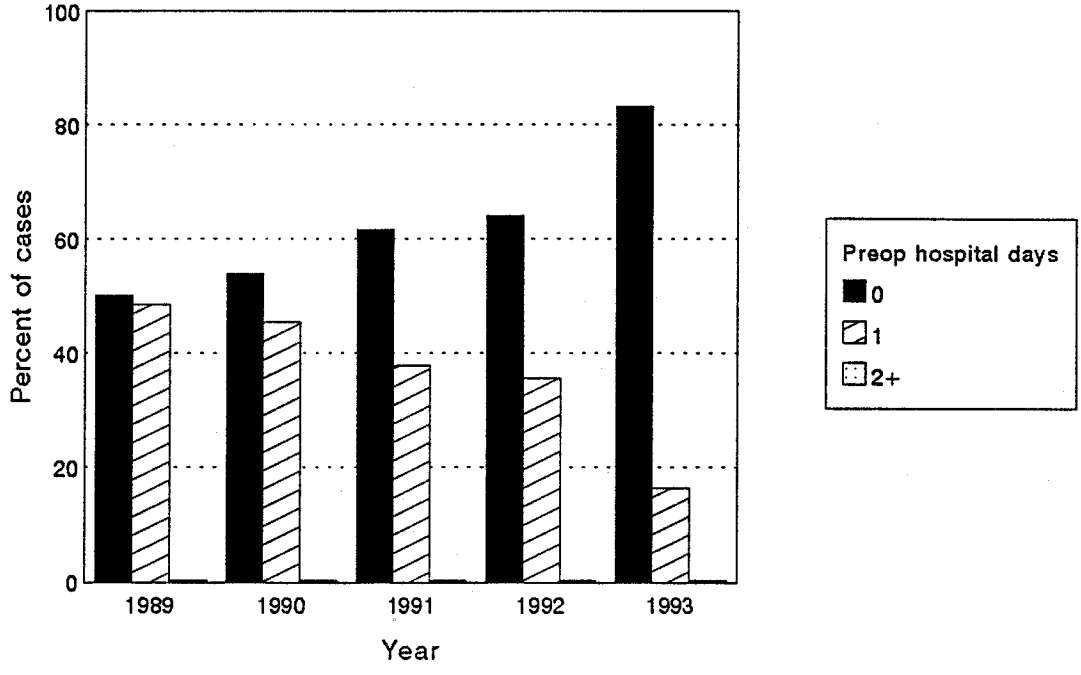
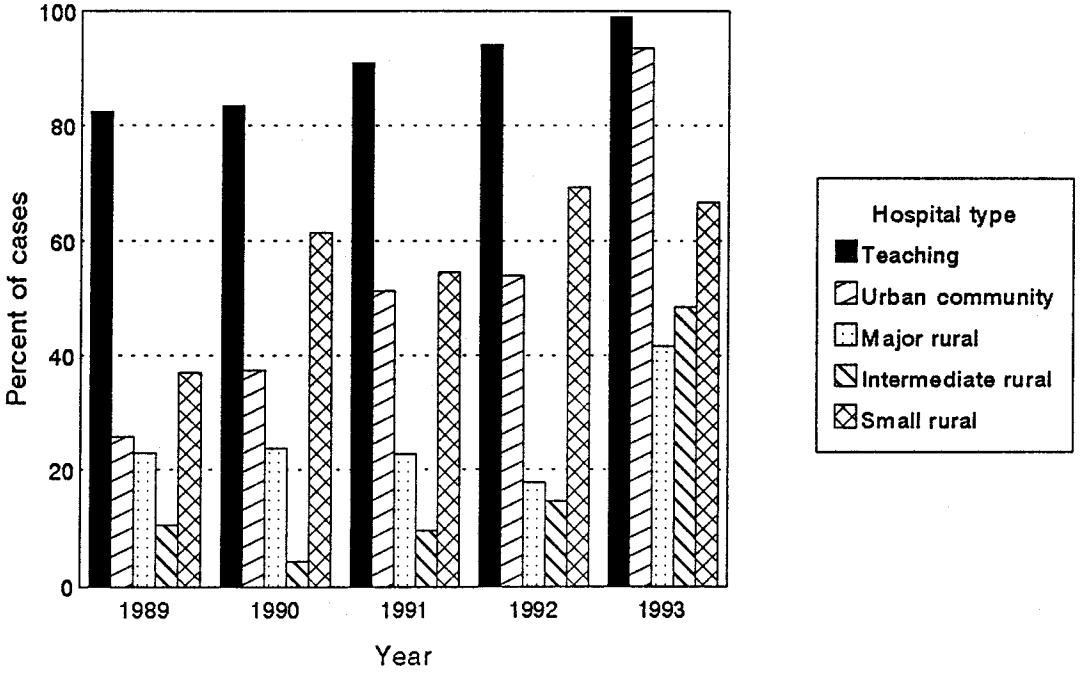


Figure 20: Percent of cases with 0 day preoperative stays by type of hospital, 1993/94



DISCUSSION

The epidemiology of tonsillectomy in Manitoba

The number of tonsillectomy procedures performed on Manitoba residents has remained relatively stable over the five years studied. In general, patterns of age distribution for tonsillectomy cases in Manitoba are similar to those reported in other settings. Paradise (1990), citing figures from the U.S. National Center for Health Statistics (1988), suggests that about two-thirds of all tonsillectomy and adenoidectomy cases are performed on children 15 years of age and younger. Of interest in the Manitoba data is a five year trend toward an increased number and proportion of procedures among persons 15 years and older. This trend has been noted in other settings, where it has been interpreted as a consequence of increasingly conservative thresholds for tonsillectomy in antecedent years (Bicknell 1994). However, there has been little systematic research to study this issue.

In examining who gets surgery, age is clearly an important factor, but sex also influences surgical rates. Paradise (1990), citing U.S. data (National Center for Health Statistics 1988), has previously reported that the rate of tonsillectomy is almost twice as high in females as in males, and that the rate of the combined procedure (T & A) is slightly higher for females, but the reasons for these differences have not been studied. A similar pattern was found for Manitoba, where the ratio for female to male procedures (for tonsillectomy and the combined procedure) was 1.39. The finding of higher rates of intervention for males in early childhood, that is eventually replaced by higher rates of intervention for females in adolescence, is consistent with general differences in morbidity found between the sexes (Sweeting 1995). However the benefits and risks of higher rates of tonsillectomy in responding to these general patterns has not received attention in the literature to date.

A pattern of differential surgical rates, both overall and by age, was found for treaty Indians in Manitoba. For children less than ten years of age, the rate of tonsillectomy for treaty Indians is approximately one-half that of other children in the province. In the 10 to 14 year age group, however, the rate of tonsillectomy for treaty Indians is much higher than that for other children. The differences in patterns of tonsillectomy for these two groups — a later age peak in rates for Indian children and a lower overall rate of surgery — are difficult to interpret. Are aboriginal children being delayed in obtaining access to necessary surgery? Or do they have different patterns of morbidity that reduce their need for early surgical intervention? Alternatively, are non-Indian children receiving surgical intervention that is less necessary? The current study was unable to find answers to these questions, but this is an area that deserves further study.

In contrast to findings of a differential by treaty status, we did not find a differential in rates of tonsillectomy by income for urban children. The finding of no difference in access to surgery may be appropriate if rates of morbidity are equivalent across income groups. However, to the extent that morbidity may be higher in lower income groups, then their equal rates of surgery may, in fact, represent diminished access to surgery in relative terms. Due to limitations in the validity of applying area-based measures of income derived in non-urban populations, this relationship could not be studied for rural areas.

In Manitoba, as in other Canadian provinces, the vast majority of procedures are performed by specialist anaesthetists and ENT surgeons in urban hospitals. However, a significant number and percentage of the tonsillar surgical and anaesthetic procedures are performed by general practitioners in relatively small rural hospitals. These patterns have remained stable over time. GP anaesthetists generally have additional training in special programs that have been developed to give rural practitioners competency in performing general anaesthetic procedures. However, for

surgery, other research has shown that GPs with limited surgical training as well as those with no additional surgical training play a role in providing surgical services in rural western Canadian hospitals (Chiasson and Roy 1995).

There are definite patterns of variation in rates of tonsillectomy for children across the province, depending on where they live. Children who reside in rural areas are roughly 25 percent more likely to undergo a tonsillectomy procedure than are children who live in Winnipeg. Furthermore, across Manitoba Health regions, rates of tonsillectomy vary almost three-fold. Rates were highest for children who live in the Norman region and lowest for those who live in Central region. These findings were unexpected and a source of puzzlement for the Review Panel. It is unclear why children residing in Winnipeg, who presumably have easier access to ENT specialists than their rural counterparts, would have lower rates of surgical intervention. Furthermore, since the rate of surgery for children living in Norman was almost twice that for children living in the Thompson region (and residents of both areas have high rates of general morbidity), it was concluded that patterns of morbidity were not likely to be responsible for the observed patterns. Even greater variation was found when rates for hospital service areas were reviewed: only one area had a very low rate, possibly indicating a potential problem of access to tonsillectomy; several other areas had very high rates.

Reasons for variation in surgical rates are not clear (MacPherson 1990), but it is unlikely that the variations seen in tonsillectomy are related primarily to differences in populations of the different areas. Adjustments have been made for age and sex differences in all the comparisons and the underlying patterns of health status are not consistent with the observed patterns of surgical intervention. Naylor (1994) has suggested that surgical variations are "like screening tests in medical practice. They tell us there may be a problem but before we decide on a course of treatment we need to consider a range of explanations." He also suggests that they provide opportunities

for providers and institutions to learn from each others' experiences to improve the quality, effectiveness and efficiency of care.

Issues relating to quality of care

In addition to the potential issues of quality raised by variation in rates across regions and differential patterns of use by different groups, several other quality of care issues were raised in the analyses and reviewed by the panel. The first of these relates to caseload volume. Tonsillectomy, while generally considered to be a safe procedure, is associated with some degree of risk. Furthermore, the ability to respond to complications usually requires experience in dealing with airway management in young children (which is considerably different than for adults and may be required under potentially difficult circumstances such as postoperative haemorrhage). It was noted that a relatively small percentage of procedures are performed by generalist physicians and in smaller hospitals, and that the number of procedures done in such circumstances has declined over time. Nevertheless, a significant number of physicians and facilities continue to do a very small number of procedures on an annual basis. The committee felt that quality of care may possibly be a concern when physicians and/or institutions perform very few procedures on an ongoing basis.

Another quality of care issue that was highlighted in the analyses was the performance of surgery on very young children (less than three years of age). Since much of the literature indicates that this is a very high risk group, particularly as an increasing percentage of cases are being performed for obstructive disease, it was felt that cases conducted in settings without the ability to intensively monitor these patients posed a higher risk of adverse outcome.

Another issue related to postoperative management. There is no definitive guidance in the literature about what percent of cases can be managed with an extended period of observation but without admission overnight. It is not clear if this approach is appropriate for rural hospitals, where it is more likely that patients must travel for some distance in the event of postoperative haemorrhage. In implementing a program of daycare tonsillectomy surgery, the British Columbia Children's Hospital developed criteria for selection of suitable patients that included residence less than 50 kilometres from the hospital or alternatively, overnight accommodation in town (Riding et al. 1991). For day surgery cases managed by Children's Hospital in Winnipeg, all out of town patients must stay in the city overnight. If they live more than a one hour drive from Winnipeg, they must stay in the city for an entire week unless arrangements can be made with a local surgeon to cover any emergencies that may arise (L DuVal, personal communication 1995). The pattern found in this study, of high use of 'zero day' postoperative stays by small rural hospitals, while efficient, may actually be less than optimal from a quality of care perspective. This area will require further consideration.

Efficiency

Recent changes in patterns of management of tonsillectomy have led to marked improvements in efficiency in use of hospital days. Almost 100 percent of cases performed in teaching and urban community hospitals are not admitted prior to surgery. Increased efficiencies could be achieved if all hospitals performing tonsillectomy procedures were to adopt similar approaches.

Teaching hospitals have been cautiously implementing day surgery practices that include sending patients home on the same day as surgery (DuVal, communication to Tonsillectomy Review Panel 1995). While the literature suggests that many cases can

be managed in such a manner, it is not clear how appropriate such practices are for rural hospitals. Attempts to achieve efficiencies must clearly be balanced against appropriate concern for reducing potential risk related to complications of surgery.

RELEVANCE OF THE RESEARCH FOR THE CLINICAL GUIDELINES AND ANALYSIS PROGRAM

Relevance of data analysis for guideline development

The analyses conducted for this report were undertaken to support the deliberations of the Tonsillectomy Review Panel, convened to review evidence about management of tonsillar disease in children. The Panel ultimately produced a clinical practice guideline that has been distributed to all Manitoba practitioners (see Appendix 1). Analyses were reviewed by the Panel at an early stage, both to ensure accuracy and relevance of the data, but more importantly, to support the guideline development process. The data proved useful in several ways.

One of the most important examples of the data's utility was in the Panel's discussion of caseload volume. The Panel reviewed data indicating that a large proportion of physicians and hospitals that provide tonsillectomy anaesthesia and surgery perform very small numbers of procedures on an annual basis. The Panel was concerned that such providers may be at risk of delivering poorer quality of care[6] and wished to address this issue in the guideline. On the other hand, the Panel had concerns that by encouraging low volume providers to give up performing these procedures, access to tonsillectomy surgery for rural children might be compromised. Before looking at the data, panel members believed that rural children are disadvantaged by poor access to, and hence, lower rates of surgery. In contrast, the data showed that rural children actually have higher rates of tonsillectomy than do children who live in Winnipeg (who presumably have easier access to surgical specialists). Moreover, the data

[6] Evidence in the literature provides some support for a link between the volume of surgery performed and resultant outcomes (Luft, Hunt and Maerki 1987; Showstack et al. 1987).

suggested that over the past five years, low volume practitioners were already withdrawing from providing tonsillectomy surgery. The data thus helped the Panel to decide to address the issue of caseload volume in the guideline.

The role of data analysis in educational interventions

While interest in clinical practice guidelines has never been greater, uncertainty persists about how effective they are at influencing clinical process and outcomes. Grimshaw and Russell (1993) found some evidence that explicit guidelines do improve clinical practice; however, the size of the improvements in performance was found to vary considerably. Davis and colleagues (1996), in a review of the evidence, suggested that educational strategies based solely on the dissemination of information, such as mailed, unsolicited materials or conferences, "demonstrate little or no behavioral or health care outcome changes." In contrast, they found that educational initiatives that used multiple measures or that possessed "reinforcing and enabling characteristics", such as academic detailing, use of local opinion leaders, and audit, feedback and reminders, are more likely to be successful. Data analyses conducted as part of the CGAP process provide useful information for the development and implementation of these more creative and complex approaches.

As an example, several findings of the research represent important topics for educational intervention. These topics include postoperative management of patients in an era of implementation of outpatient surgery; standards for conducting surgery on very young children; and standards relating to caseload volume. Furthermore, as expected, the analyses provided support for educational strategies targeted at improving understanding of the evidence about indications for surgery. The wide variation in rates of tonsillectomy across the province are suggestive that there is a high degree of "clinical uncertainty" as defined by Wennberg (1984) and Eddy (1984;

1990) about the indications for tonsillectomy and support an effort to clarify and disseminate understanding of the evidence around the issue.

Moreover, the analyses provide information about which groups of physicians (and institutions) would be likely to benefit from educational intervention. For instance, by virtue of the relatively higher rates of surgery for residents of rural hospital service areas, the data suggest that more liberal indications for surgery are being used among rural physicians than among urban-based practitioners and specialists. They are therefore more likely to benefit from a targeted intervention program focusing on updated evidence about benefits and risks. Since Lomas (1993) has suggested that changing practice is "dependent upon how much one is able to generate resonance for the findings in that physician's closed and local community", this information may help the Clinical Guidelines and Analysis Program to target more effectively the group of providers who are most likely to benefit from educational interventions. This targeting of educational initiatives is even more important when more expensive strategies requiring multiple approaches that incorporate 'reinforcing' elements are used.

Most importantly, the data provide important tools that can be used as part of the educational process. The most successful educational program that uses such an approach is the Maine Medical Assessment Foundation, a voluntary research and educational foundation that is supported by the Maine Medical Association. It began its work in 1980 to provide Maine physicians with the means to address the issue of variations in practice. It has used a process of review of population-based analysis and feedback of information to local groups of physicians. Individuals involved in the process suggest that until physicians see relevant data, they have no idea how their practice patterns compare to those of their peers. Furthermore, they find that even though there is often no "right rate", physicians consistently respond to "outlier" status by modifying their practice patterns. They have found the feedback process to

be a remarkably powerful tool in modifying behaviour, but stress that feedback must be undertaken in a confidential, educational, non-regulatory setting (Keller, Chapin and Soule 1990). In fact, Wennberg and others (1977), successfully used feedback of tonsillectomy rates to influence practice in the early 1970s. Rates of surgery for Manitoba Health regions and hospital service areas therefore represent a powerful tool to be added to the educational strategies of CGAP.

The role of data analysis in monitoring

One of the important features associated with the research that was conducted to examine patterns of tonsillectomy in Manitoba is that the same patterns can easily be studied at a later point in time to assess the impact of guidelines and other educational interventions. While development of the initial strategies for data analysis are fairly laborious, examining the same patterns in subsequent years is relatively simple. An investment in data analysis therefore permits a guidelines program to monitor its own effectiveness over time.

Strengths of the CGAP approach

The Clinical Guidelines and Analysis Program was developed to review and synthesize evidence based on scientific criteria, develop guidelines for practice based on an understanding of that evidence, review actual patterns of practice against what has been learned, and monitor change in response to guideline dissemination and data feedback strategies. It is clear that data analysis plays a large and important role in this set of activities. Moreover, the linkage between guideline and analysis activities is likely to support a very comprehensive approach to continuing medical education.

The American College of Physicians has recently proposed a new model for overseeing the delivery of medical care (1994). Components of this model include an integrated approach to reviewing utilization and quality, the use of science-based, explicit review criteria, and reliance on understanding patterns of care in lieu of case-by-case review. Manitoba's Clinical Guidelines and Analysis Program incorporates many of these strategies. In so doing, it hopes to foster an evidence-based approach to overseeing medical care.

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APPENDIX 1

MANAGEMENT OF TONSILLAR DISEASE IN CHILDREN

Guideline

MANAGEMENT OF TONSILLAR DISEASE IN CHILDREN

OBJECTIVES

1. To assist physicians in the development of appropriate **medical management** strategies for acute, recurrent and chronic tonsillitis and peritonsillar abscess.

2. To identify indications and contraindications for **surgical intervention** in tonsillar disease.

3. To identify factors associated with **optimal surgical management** of tonsillectomy and/or adenoidectomy, including surgical training, institutional requirements and caseload.

BACKGROUND

Tonsils are lymphoid tissue forming an integral part of the upper airway defence system against infection.

As part of the lymphoid defence system, the tonsils may become infected. In addition they may become hypertrophied and thus have the potential for physically obstructing the airway. **Infection and obstruction often coexist. For clinical management purposes, these two effects should be considered separately.**

Other diseases such as malignancy may affect the tonsils. Compared with infection and obstruction, these are rare.

OBJECTIVE 1
Medical Management

An algorithm for managing tonsillitis in children is presented in the companion chart: *ALGORITHM FOR MEDICAL MANAGEMENT OF TONSILLITIS IN CHILDREN*

ACUTE TONSILLITIS

Acute tonsillitis is inflammation of the tonsillar tissue, which may be viral or bacterial in origin. The following criteria should be met to establish the diagnosis of acute tonsillitis:

- evidence of inflammation of the tonsils

PLUS

at least one of the following:

- pyrexia of at least 38.5°C measured orally.
- enlarged, tender, anterior cervical lymph nodes.
- documentation of Group A beta-hemolytic streptococcal (GABHS) infection by throat swab (antigen detection or culture).

It is important to accurately document, in the medical record, each episode of acute tonsillitis. Future consideration for tonsillectomy may be based on review of such documentation.

When acute bacterial tonsillitis is suspected, penicillin is the antibiotic of choice. In patients allergic to penicillin, erythromycin is the drug of choice. If tonsillitis is suspected to be viral in origin, symptomatic treatment is recommended.

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RECURRENT TONSILLITIS

Recurrent tonsillitis refers to multiple distinct episodes of acute tonsillitis. Each presentation should be diagnosed and documented using the same criteria as for acute tonsillitis. Specific management of each episode will be determined by the suspected etiology (viral or bacterial).

CHRONIC TONSILLITIS

Chronic tonsillitis is an ill-defined entity, which may be associated with foci of bacteria deep in tonsillar tissue. It is characterized by persistent signs and symptoms of low-grade infection, including sore throat, malaise and abnormal tonsillar appearance. Consideration should be given to aggressive oral antibiotic therapy, but each individual case will merit specific management strategies. Referral to an otolaryngologist may be advisable.

PERITONSILLAR ABSCESS (Quinsy)

Peritonsillitis is inflammation of tissue surrounding the tonsils, which may be a precursor to abscess formation. **Peritonsillar abscess** is pus in the peritonsillar space. Antibiotic therapy **plus** drainage by either aspiration or incision is the accepted method of management.

▦ OBJECTIVE 2
Surgical Intervention

The physician must inform the patient of the relative risks and benefits of medical and surgical management. This information should include potential surgical and anaesthetic complications, including death, haemorrhage and airway obstruction.

INDICATIONS FOR TONSILLECTOMY

DEFINITE	PROBABLE	POSSIBLE
1. **Obstructive sleep apnea** (OSA) caused by tonsillar and adenoidal hypertrophy. • (Tonsillectomy and adenoidectomy indicated) 2. **Persistent signs of airway obstruction** such as mouth breathing, post nasal drip, dysphagia and/or snoring caused by adenotonsillar hypertrophy. (Tonsillectomy and adenoidectomy indicated)	1. Recurrent tonsillitis: at least seven (7) documented episodes of acute tonsillitis in one year OR at least five (5) episodes in each of two years OR at least three (3) episodes in each of three years •• 2. Recurrent peritonsillar abscess	1. Chronic tonsillitis after failure of medical management. 2. Chronic asymptomatic GABHS carrier state: tonsillectomy may rarely be indicated if the carrier is the proven source of overt infection in immediate family members and close contacts.
3. **Suspected malignancy of the tonsil** should be referred to an otolaryngologist for surgical management.	**Management with antimicrobial therapy is preferable to surgical intervention. For probable and possible indications, it is imperative that appropriate therapeutic courses of antibiotic be implemented prior to consideration of surgery.**	

•Obstructive sleep apnea (OSA) syndrome refers to repeated episodes of arrested breathing occurring during sleep. Children with OSA manifest specific symptoms and clinical features that can be determined by a thorough history and physical examination. Diagnosis can be further confirmed by appropriate ancillary studies, including overnight oximetry and, ideally, a formal sleep study. Physicians who suspect the diagnosis of OSA should consider referral to an otolaryngologist, especially in younger children.

••The decision for or against surgical intervention in patients with recurrent acute tonsillitis should be individualized. The frequency, severity and duration of episodes as well as their impact on the patient should be considered and balanced against the potential surgical risks of tonsillectomy.

RELATIVE CONTRAINDICATIONS TO TONSILLECTOMY AND/OR ADENOIDECTOMY

1. Patient under age four (4) years unless physician competent to manage paediatric anaesthetic emergencies is immediately available.

2. Haematologic Disorder
   - anaemia Hgb <100 gm/l; Hct<30%.
   - disorders of haemostasis, or family history of haematological disorder (consider referral to paediatric haematologist).

3. Allergic and reactive airway disease that has not been treated with a trial of appropriate therapy and elimination of environmental etiological factors (consider referral to allergist).

4. Active tonsillar infection that has not been treated with appropriate antimicrobial drugs (defer surgery).

5. Treatment with aspirin or non-steroidal anti-inflammatory drugs within two weeks prior to surgery.

6. Velopharyngeal Insufficiency
   - overt cleft of the palate (refer to cleft palate registry).
   - submucous (covert) cleft of the palate (refer to cleft palate registry).
   - neurologic or neuromuscular abnormalities leading to impaired palatal function.

NOTE: Despite the presence of these relative contraindications, urgent obstructive symptoms may necessitate tonsillectomy and/or adenoidectomy.

OBJECTIVE 3
Factors Associated With Optimal Surgical Management

SURGICAL TRAINING

One of the following is required:

- Royal College Certification (Canada) in otolaryngology, or in general surgery with specific experience in otolaryngology
- Surgical training in otolaryngology acceptable to the College of Physicians and Surgeons of Manitoba:
  - Higher qualification in surgery (international) with specific experience in otolaryngology.
  - Documented formal training in an approved surgical program, with specific experience in otolaryngology, but without higher surgical qualification.
  - Other surgical training with individual privileges approved by the College of Physicians and Surgeons of Manitoba.

Maintenance of competence should be ensured in the management of tonsillar disease (including surgical methods of tonsillectomy, current indications for tonsillectomy, and management of complications) by focused continuing medical education.

INSTITUTIONAL REQUIREMENTS

As for any surgical procedure, an institution should ensure adequate experience and training of

medical and nursing personnel.

Obstructive symptomatology is the current main indication for tonsillectomy. Children with obstructive symptoms, especially in younger age groups, are at higher risk for airway obstruction during the intra- and post-operative period.

Primary postoperative haemorrhage is the most frequent complication of tonsillectomy. Most occur in the first eight (8) hours postoperatively, but they may occur within the first twenty-four (24) hours. A secondary haemorrhage may occur up to seven (7) days after surgery.

Institutions should implement policies that address the complications of tonsillectomy. For the first 24 hours postoperatively, physicians competent in the management of paediatric anaesthetic and surgical emergencies, particularly hypovolaemic shock and airway obstruction, must be immediately available. The hospital should also ensure nursing competence to deal with these emergencies, especially in the recovery room.

CASELOAD

Both provider and institutional competence are, in part, related to caseload volume. Physicians and institutions should ensure that overall paediatric surgical experience as well as specific procedural experience is adequate.

Specifically, hospitals and medical staff should assess their current caseload of tonsillectomies and consider discontinuing the procedure unless sufficient numbers are performed.

The competent management of paediatric anaesthetic emergencies is also volume sensitive. Each individual anaesthetist should carefully consider appropriate maintenance of competence in this critical area of care.

⊞ DEFINITIONS

For purposes of this guideline:

• **Carrier state** is a condition in which a pathogen can be cultured but is not causing symptoms in the host.

• **Chronic tonsillitis** is an ill-defined entity, which may be associated with foci of bacteria deep in tonsillar tissue. It is characterized by persistent signs and symptoms of low-grade infection, including sore throat, malaise and abnormal tonsillar appearance.

• **Obstruction** from tonsillar and adenoidal hypertrophy refers to a variety of airway obstructive signs and symptoms (mouth breathing, post nasal drip, dysphagia, snoring) associated with large adenoids or tonsils. It may be acute or chronic.

• **Obstructive sleep apnea (OSA)** syndrome is characterized by repeated episodes of arrested breathing occurring during sleep. Despite continued respiratory effort, the airway above the larynx intermittently closes during sleep, resulting in cessation of airflow.

• **Peritonsillar abscess** is pus in the peritonsillar space. It may be preceded by peritonsillitis.

• **Peritonsillitis** is inflammation of the tissue surrounding the tonsils. It may be a precursor to peritonsillar abscess.

• **Pharyngitis** refers to generalized inflammation of the throat, which may be bacterial or viral in origin.

• **Tonsillitis** is inflammation of the tonsillar tissue, which may be viral or bacterial in origin. It may occur as an acute, chronic or recurrent condition and needs to be differentiated from pharyngitis, referred pain from otitis media, and non-infectious causes of pain.

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CLINICAL GUIDELINES AND ANALYSIS PROGRAM (CGAP)

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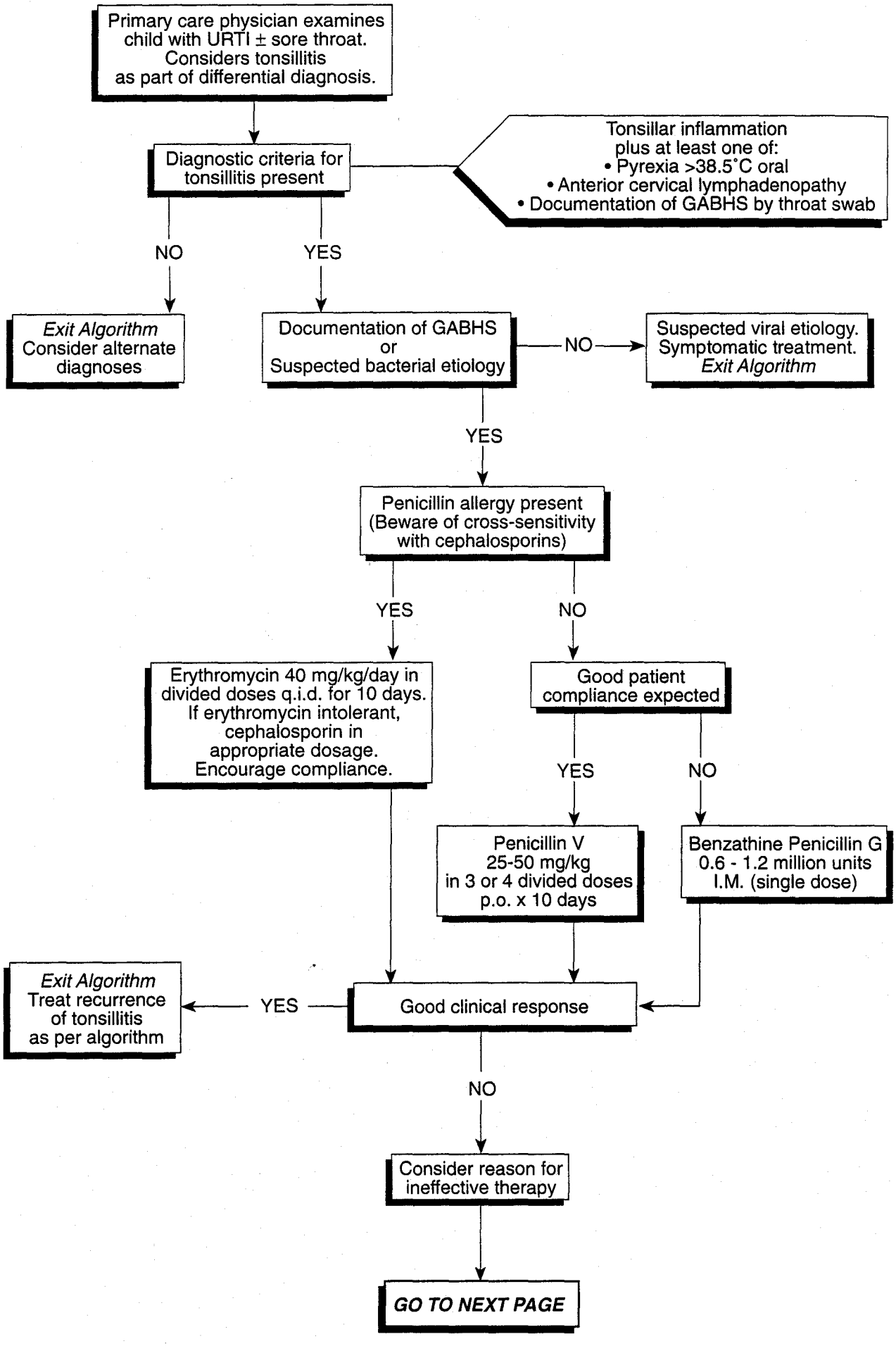
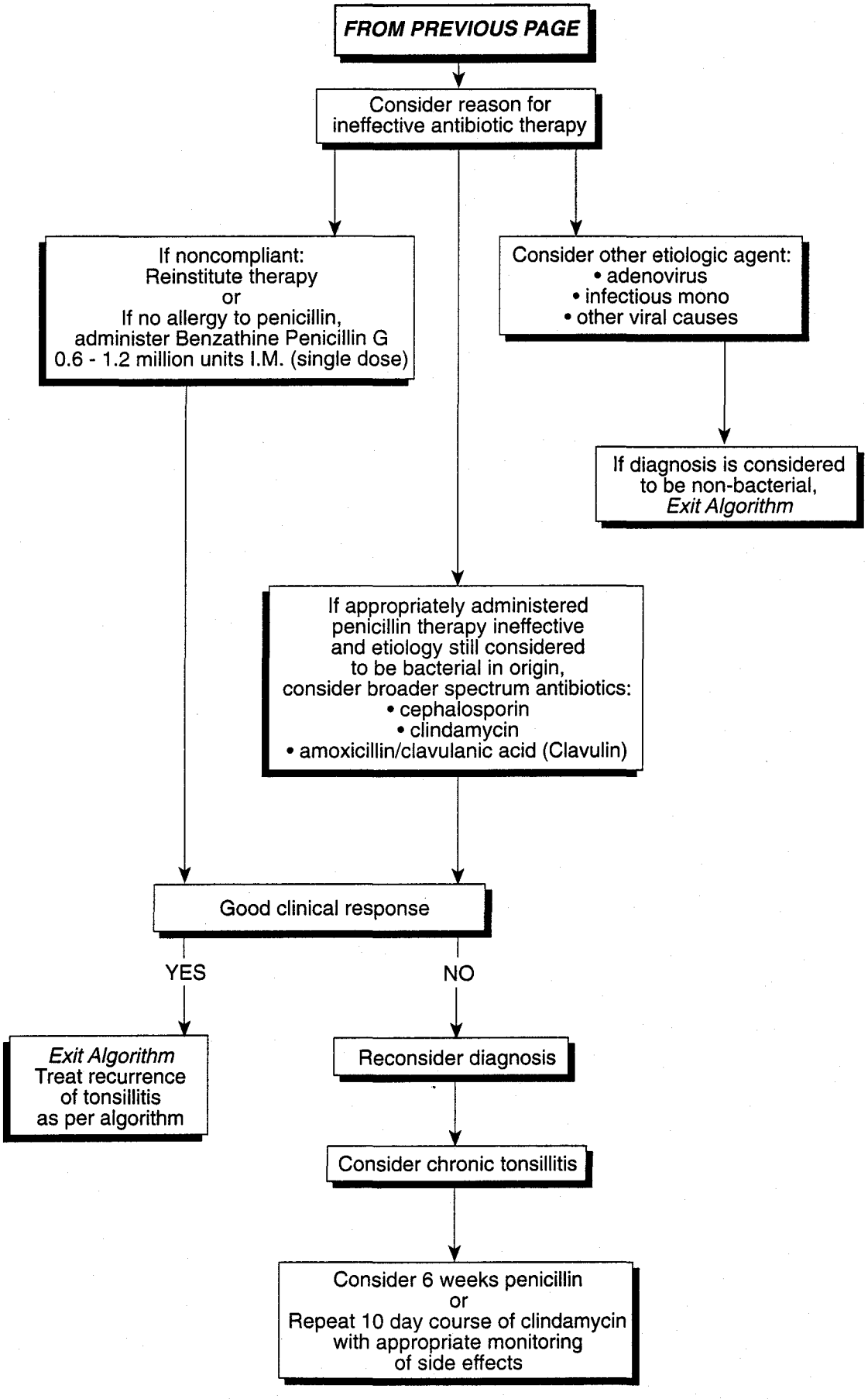
The objectives of CGAP are to examine the effectiveness and efficiency of medical interventions, to develop clinical practice guidelines based upon the best evidence, and to implement educational strategies to assist physicians in their practices.

Algorithm for Medical Management of Tonsillitis in Children



Algorithm



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The College of Physicians & Surgeons of Manitoba

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