Tonsillectomy Rates for Manitoba Children: Temporal and Spatial Variations

by Marni Brownell

Abstract

This study compared tonsillectomy rates for Manitoba children across geographic regions and over time. Shortly after the publication of clinical guidelines for tonsillectomy, provincial rates of this procedure dropped by over 25% between 1994/95 and 1996/97. By 1998/99, rates for non-Winnipeg children had increased to pre-guilde line levels, whereas the rates for Winnipeg children remained lower. Significant regional variation existed in all years examined, suggesting that quality of care remains an issue for this procedure.

Introduction

n 1973, Wennberg and Gittelsohn published a paper examining the rates of surgical procedures performed in various New England communities, finding considerable geographic variations. For example, they found that the rate of tonsillectomy in Vermont ranged from three to 15 per 1,000 residents. Since that study, numerous “small area” analyses have been done. These studies are of interest to health services managers and policy and decision-makers because large variations in utilization of health services suggest overuse in areas with above-average rates and underuse in areas with below-average rates. Although “small area” studies cannot resolve the question of what utilization rate is appropriate, they can highlight potential areas of concern regarding quality of care. Indeed, wide variation in surgical rates may suggest a high degree of “clinical uncertainty” surrounding indications for the procedure in question, which itself can threaten the quality of care, particularly when the procedure provides questionable benefit.

Substantial regional variations in tonsillectomy rates found in Manitoba in the early 1990s suggested potential quality of care concerns, and were part of the impetus to develop a clinical practice guideline regarding the management of tonsillar disease in children; the guideline was distributed to all Manitoba practitioners in June 1995. Shortly after the publication of clinical guidelines for tonsillectomy, provincial rates of this procedure dropped by over 25% between 1994/95 and 1996/97. By 1998/99, rates for non-Winnipeg children had increased to pre-guideline levels, whereas the rates for Winnipeg children remained lower. Significant regional variation existed in all years examined, suggesting that quality of care remains an issue for this procedure. Preliminary results in Manitoba suggested that following dissemination of the guideline, tonsillectomy rates fell dramatically. In this paper these rates are revisited to assess the longer term impact of the guideline on behaviour. The specific aspects of the guideline examined include whether substantial regional variation persisted, whether caseload volume changed, and whether there was a change in the performance of tonsillectomy on very young children. Although such small area variation analyses alone are not enough to evaluate the effectiveness of the guideline or assess the quality of care, they are an important means of alerting healthcare managers and decision-makers to possible quality problems.
Methods

Data Source and Study Population

The data were drawn from the Manitoba Population Health Research Data Repository, housed at the University of Manitoba. These data are universal and comprehensive, anonymized encounter-based records of Manitobans’ interactions with the healthcare system. The databases in the Repository have been established as both reliable and valid for examining health and healthcare use.\textsuperscript{7,8} Tonsillectomy rates were calculated for each year from 1994/95 to 1998/99 based on hospital discharge abstracts. Rates were calculated for children aged 0 to 19 years, residing in Manitoba during the study period, based on information from the registration file, which contains a record for every individual eligible to receive insured health services. Information on physician practice was taken from the physician database.

Defining Tonsillectomy Procedures

The ICD-9-CM procedure codes used to identify children undergoing tonsillectomy procedures were: 28.2-28.29, tonsillectomy without adenoidectomy; 28.3-28.39, tonsillectomy with adenoidectomy; and, 28.6-28.69, adenoidectomy without tonsillectomy.

Analyses

Most of the analyses used a population-based approach, in which tonsillectomy procedures were attributed to the geographic region of residence, regardless of where the surgery took place. Age- and sex-standardized rates were calculated using the direct method of standardization. Rates were standardized to the 1996 (December) population structure from the registration file. Rates are reported for each of several Manitoba regions. At the provincial (Manitoba) level, 12 subregions called Regional Health Authorities (RHAs) were used. For Manitoba’s largest city, Winnipeg, which is itself an RHA, 12 sub-regions called Community Areas (Winnipeg CAs) were used. Summary rates are given for the total Manitoba child population, Winnipeg, non-Winnipeg (all children residing outside of Winnipeg), rural south (children residing in rural regions below the 53\textsuperscript{rd} parallel) and north (children residing in regions above the 53\textsuperscript{rd} parallel).\textsuperscript{*} Comparisons of rates across regions used t-test methodology developed by Carriere and Roos.\textsuperscript{9} To adjust for multiple comparisons between each RHA or Winnipeg CA and an overall provincial or Winnipeg rate, 99% confidence intervals were used. Rates were suppressed where cell counts were less than five. The Cochran-Armitage trend test was used to assess whether changes in rates occurred across study years.\textsuperscript{10}

Previous research suggests a strong relationship between child health indicators and the healthiness of the regional population within which the child lives.\textsuperscript{11} To determine whether tonsillectomy rates were associated with the healthiness of the population within a region, rates for the RHAs and Winnipeg CAs examined in this paper were correlated with the regions’ premature mortality rate (PMR), using Spearman’s rank correlation. PMR is the

Figure 1: Rate of tonsillectomy procedures for children aged 0-19 years, by RHA, 1994/95, 1996/97, 1998/99

Figure 2: Rate of tonsillectomy procedures for children aged 0 to 19 years by Winnipeg CA, 1994/95, 1996/97, 1998/99

\textsuperscript{*} The 53\textsuperscript{rd} parallel is about 350 kilometres north of Winnipeg, near the top fifth of Lake Winnipeg.
best single measure to reflect the healthiness of a group of people and their need for healthcare services,\textsuperscript{12-14} and is highly correlated with the socioeconomic status of the population.\textsuperscript{11} The regional graphs (see Figures 1 and 2) presented in this paper are ordered by PMR, from lowest (most healthy) to highest (least healthy).

Rates are also given by neighbourhood income level. Rural and urban neighbourhoods were each divided into five different income levels (quintiles) based on 1996 census information available through Statistics Canada. The average household income was derived for each postal code by assigning the average household income for the Enumeration Area (EA) to each postal code within that EA. The postal codes were then sorted into urban (within city limits of Winnipeg and Brandon) and rural (all other). For both urban and rural postal codes, each postal code was sorted into one of five categories, ranging from one category containing the poorest 20\% of postal codes to a category containing the wealthiest 20\% of postal codes. Thus, each class of postal codes formed an income quintile, with the lowest income quintile representing postal code areas with the lowest average income, and the highest income quintile representing areas with the highest average income. Income quintile brackets for both urban and rural areas are available from the author on request. This area-level income measure provides a good approximation of household income.\textsuperscript{15} Cochran-Armitage trend tests were used to assess the significance of the relationship between tonsillectomy rates and neighbourhood income level.

Analyses of caseload volume and procedures performed on very young children (less than 3 years) used a provider-based approach rather than a population-based approach. The provider-based approach attributes tonsillectomy procedures to the location of the physician’s practice, rather than the region of the child’s residence. Physicians were attributed to either a non-Winnipeg or Winnipeg practice based on the residence of the greatest percentage of their patients.

Prior to undertaking the research described in this article, the project on which it is based was reviewed and approved by the Human Research Ethics Board, University of Manitoba, and the Manitoba Health Access and Confidentiality Committee.

\textbf{Results}

Figure 1 shows the rates of tonsillectomy procedures for 1994/95, 1996/97 and 1998/99 for the RHAs. The trends observed across years suggest that the rate of this procedure dropped in most regions in response to the clinical guideline (reflected in the 1996/97 data) but increased after that time. For the rural south, the north, Winnipeg and Manitoba overall, the 1996/97 rates were significantly lower than the rates found in 1994/95 (Cochran Armitage test for both Winnipeg and Non-Winnipeg, p<.001). By 1998/99, however, the rates for the rural south and the north were significantly higher than those found in 1996/97 (Cochran Armitage, p<.001), and no different statistically from the 1994/95 rates. For Winnipeg, the rates did not increase significantly between 1996/97 and 1998/99, and the 1998/99 rates remained significantly lower than the 1994/95 rates (Cochran Armitage, p<.001).

Regional variation in rates was evident regardless of which year was examined, although patterns for some RHAs changed over time. As was found previously\textsuperscript{5,6} Winnipeg children continued to have significantly lower rates of tonsillectomy than children residing in the other RHAs. In 1998/99, children living outside of Winnipeg were 30.5\% more likely to have their tonsils removed than those residing in Winnipeg. Variation in rates of tonsillectomy procedures was also evident among children residing in the different Winnipeg CAs (see Figure 2). Taking the RHAs and Winnipeg CAs together, the 1998/99 tonsillectomy rate ranged from 2.3 per 1,000 children residing in the Downtown area of Winnipeg to 6.9 per 1,000 children living in the South Eastman region of the province.

The tonsillectomy rates shown in Figures 1 and 2 represent rates for children residing in each of the RHAs, but give no indication of where the procedure was performed. Whereas almost all tonsillectomy procedures performed on Winnipeg children occur in Winnipeg hospitals, some non-Winnipeg children have these procedures performed outside their own RHA. In 1994/95, 40\% of non-Winnipeg children travelled to Winnipeg to have the procedure performed; by 1998/99 this figure had risen to 54\%. When the rates of the procedure performed in the child’s own RHA and within Winnipeg for non-Winnipeg children were compared across years, it became evident that the increase in rates of this procedure for these non-Winnipeg children was
attributable primarily to higher rates in Winnipeg hospitals (see Figure 3).

Trend tests showed a significant relationship between income quintile and tonsillectomy procedures for rural children only, with rural children from lower income areas less likely to have their tonsils removed than rural children from more affluent areas, (see Figure 4, Cochran-Armitage p=0.001). No relationship was found between tonsillectomy procedure rates and PMR (p=.3855 for non-Winnipeg RHAs; p=.6967 for Winnipeg CAs).

The number of physicians performing tonsillectomy procedures on children 0 to 19 years decreased for both Winnipeg and non-Winnipeg physicians. Non-Winnipeg physicians performing tonsillectomies numbered 41 in 1994/95 and this number dropped fairly steadily each year, to 28 in 1998/99. For Winnipeg physicians the number performing tonsillectomy went from 19 in 1994/95 to 14 in 1998/99. Much of the decline in the number of non-Winnipeg physicians came from those who were performing less than 10 procedures per year (see Figure 5), however these low-volume practitioners still accounted for almost 60% of the non-Winnipeg physicians performing tonsillectomy in 1998/99. Whereas Winnipeg physicians performing fewer than 10 tonsillectomy procedures a year were responsible for a very small proportion (1% or less) of the cases performed in Winnipeg each year, non-Winnipeg physicians with very small caseloads actually accounted for anywhere from 12 to 18% of the total volume of procedures performed outside of Winnipeg, and much of the decline in the number of procedures by non-Winnipeg physicians was attributable to higher-volume practitioners (see Figure 6).

The number of tonsillectomy procedures performed on children under the age of 3 years did not change over the study period. Although the majority of these procedures were performed in teaching hospitals or large rural facilities throughout the study period, small numbers of cases (less than five) had surgery in smaller rural facilities in the two most recent years of the study.

Discussion

Following publication of the clinical guideline for tonsillectomy procedures in Manitoba in 1995, rates dropped dramatically throughout the province. The current study found that the rate for children residing in Winnipeg remained lower in subsequent years, whereas the rate for children residing outside Winnipeg increased to pre-guideline levels. Much of the increase for non-Winnipeg children can be attributed to an increase in referrals from non-Winnipeg physicians to Winnipeg hospitals. One of the concerns during the development of the tonsillectomy guideline was that in rural areas there was often inadequate caseload volume to insure quality of care. For instance, over 50% of the non-Winnipeg surgeons performing tonsillectomies did fewer than 10 of these surgeries per year, and over 45% of the hospitals where these procedures were performed had fewer than 25 of these procedures per year. Although the number of non-Winnipeg physicians performing tonsillectomies decreased over the study period, and this decrease was mainly due to physicians
who previously performed fewer than 10 tonsillectomies a year, the proportion of non-Winnipeg physicians performing less than 10 tonsillectomies per year, and the percent of cases performed by these physicians did not change appreciably over the study period. Thus, although referral patterns for non-Winnipeg children changed over the study period, with more non-Winnipeg children travelling to Winnipeg for their surgeries, and this may have been partly due to a number of non-Winnipeg physicians with low caseload volumes responding to the guideline and referring patients to Winnipeg, at the end of the study period, more than half of the non-Winnipeg physicians performing tonsillectomy were still performing less than 10 procedures a year. These numbers may signify a threat to quality of care if the number of procedures performed is insufficient for practitioners to maintain their skills. In short, it appears the guideline did not alter the rate of tonsillectomies performed on non-Winnipeg children, nor did it affect the proportion of non-Winnipeg cases performed by low caseload volume physicians, but it did increase the proportion of tonsillectomies on non-Winnipeg children done in Winnipeg.

Because there is a higher risk of postoperative complications after tonsillectomy in very young children, the guideline specified that the procedure was contraindicated for this population where intensive monitoring and expertise in managing paediatric anaesthetic emergencies are limited. Although most of the procedures performed on very young children were conducted in teaching hospitals or large rural facilities, small numbers of procedures were performed in smaller rural facilities in two of the three years following the publication of the guideline. These facilities are less likely to have the expertise and intensive monitoring capabilities necessary for managing complications in very young children, should they arise, and highlights another area where quality of care may be compromised.

Further research is necessary before a judgement can be made about the success (or lack thereof) of the tonsillectomy guideline in Manitoba. Health services managers and policy makers interested in exploring the uptake of clinical guidelines should be aware that the success of practice guidelines is dependent on a number of factors including the clarity and the source of the guidelines, the existence of incentives for changing practice to conform with guidelines, and the existence of an infrastructure to ensure compliance with evidence-based standards of practice.

The referral to Winnipeg hospitals of rural children may suggest that, in at least one aspect, the quality of care for tonsillectomy patients improved for some rural Manitoba children. However, the increase in rates to pre-guideline levels begs the question of why rural children still have significantly higher rates of tonsillectomies than children residing in Winnipeg. Indeed, Black et al. reported that rural children were 28% more likely to have their tonsils removed than their Winnipeg counterparts prior to publication of the guideline in 1995. The current study found this value was little changed in 1998/99, with rural children 30.5% more likely to have their tonsils removed than Winnipeg children.

† The values from this study and the Black et al. report are not completely comparable due to the ages studied. Black et al. looked at children 0 to 14 years, whereas the current study included children 0 to 19 years. The inclusion of older patients narrows the difference between rural and urban rates.
The large regional differences in tonsillectomy rates raise the question: are the differences due to differences in need, to differences in physician practice styles or some other factor? Our findings that variations in tonsillectomy rates were not associated with the healthiness of the populations within the regions, as measured by PMR, and that tonsillectomy rates were associated with income differences only for children living in rural areas suggest that resources, access, patient (parental) preference and practice style may play a greater role in these variations than does need. Rural children from the middle income quintile were 22% more likely to have their tonsils removed as those from the lowest income quintile, and rural children from the highest income quintile, 16% more likely to have their tonsils removed than those from the middle income quintile. Availability of resources to travel to Winnipeg for the procedure may contribute to these differences. If differences in practice style are also a major factor in the variation in tonsillectomy rates, these differences may be a function of a high degree of “clinical uncertainty” about when tonsillectomy is appropriate. This uncertainty may persist in Manitoba despite efforts to clarify these indications. Further research on variation in tonsillectomy rates should seek to determine whether the rate of tonsillar disease, access to physicians or hospitals, physician-specific practices and referral patterns, and the criteria for tonsillectomies vary by region, in an attempt to answer the question of whether quality of care continues to be an issue for tonsillectomy procedures in Manitoba.

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References

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