Ethnic Variation in Cholecystectomy Rates and Outcomes, Manitoba, Canada, 1972–84

MARSHA M. COHEN, MD, T. KUE YOUNG, MD, AND KAREN M. HAMMARSTRAND, MA

Abstract: We used population-based data from the Province of Manitoba's universal health insurance plan to compare the cholecystectomy experience of Native Americans and non-Natives from 1972 to 1984. The age-adjusted cholecystectomy rates for Native females were higher than for non-Native females with the peak rate occurring at age 30–39 for Native Americans and at age 60–69 for non-Natives. The rates for males were three times lower than for females and did not differ between Natives and non-Natives. Native Americans were more likely readmitted to hospital for surgical complications than non-Natives and this held true after controlling for age, sex, rural versus urban residence, teaching versus non-teaching hospital, multiple discharge diagnoses or complex versus simple cholecystectomy (relative odds 1.46, 95 per cent confidence interval 1.17, 1.18). The explanation for the relatively high rates of cholecystectomy among Native American females may be related to high rates of known risk factors for gallstone disease (such as obesity and high parity). However, the higher rates of surgical complications require further study. (*Am J Public Health* 1989; 79:751–755.)

Introduction

A high prevalence of gallbladder disease has been demonstrated in several North American Indian tribes, such as the Pima in Arizona,[1] the Chippewa in north Minnesota,[2] and the Micmac in Nova Scotia.[3] There is speculation that the rise in gallbladder disease among Native Americans constitutes a "New World Syndrome" of metabolic diseases which includes also obesity and diabetes, probably with a common genetic and environmental basis.[4]

While the occurrence of gallbladder disease among Native Americans has been well studied, the rates and outcomes of its surgical treatment among these groups have received limited attention.[5,6] In Manitoba, the existence of population-based data on all health service utilization under the province's universal health insurance plan provides an opportunity to examine the cholecystectomy experience of all residents since the 1970s, and to compare rates and outcomes between Native Americans and the rest of the population.

Methods

For residents of the Province of Manitoba (population about one million, about 50 per cent urban, 50 per cent rural), all physician and hospital care is covered by the Manitoba Health Services Commission (MHSC). Records of health care utilization are routinely filed with the MHSC and, since there are no premiums or user charges, the health insurance claims are known to be complete and highly reliable for the study of surgical rates.[7] Manitoba hospital claims correspond closely to the hospital medical record as to the date of surgery, major surgical procedures performed, and important diagnoses. Record linkage is possible using masked numerical identifiers since neither names nor addresses are released to the researchers. In addition, the MHSC also maintains a continuously updated population-based registry (census) of all residents eligible for inclusion in the plan.

For this study, all hospital records containing a procedure code for gallbladder surgery for the years 1972–78 (ICD-8 codes 43.0–43.9), and for 1979–84 (ICD-9 codes 50.1–51.99) were selected. Status Native Americans were identifiable from special residence codes. This code, however, did not include non-Status Native Americans or Metis. This determination of Indian status in Canada is legalistic and complex, based on the Indian Act. Metis is a distinct cultural group composed of descendants of mixed Native-White marriages during the early settlement of the Canadian West. The US practice of designating people of aboriginal descent with "blood quantum" is not used in Canada. However, because Natives constitute less than 5 per cent of the provincial population, the cholecystectomy rates for the rest of the population would be only slightly overestimated by including the non-Status groups. Data available for each case included demographic information, diagnoses associated with the admission (up to eight diagnoses are recorded), specialty of the surgeon (1972–78 only), and type of hospital (urban teaching, urban non-teaching, rural large, rural small).

From these computer files, we determined the number of cases by age, sex, type of hospital where surgery had taken place, specialty of the attending surgeon, and region of residence within the province (1979–84 only). Using population counts from the MHSC, we next determined the age-adjusted cholecystectomy rate (by the direct method with the 1981 total provincial population as the standard) and the age-specific rates for males, females, Native and non-Natives. The denominators for these rates were obtained from the MHSC registry. Many of the analyses were divided into two time periods 1972–78 and 1979–84 to correspond to the eighth and ninth revisions of the International Classification of Diseases in use at the time and to examine time trends.

Since deaths from cholecystectomy or gallstone disease are rare, (in Manitoba, 0.7 per cent up to two years after surgery[8]), we used readmissions after surgery as the measure of morbidity associated with cholecystectomy. This method involved computer linkage of the original surgical event with subsequent hospitalizations due to known complications associated with the original surgical procedure.[9] In brief, specialist physician panels judged all readmissions to hospital after cholecystectomy and determined which were related to the original surgery. Computer algorithms using diagnostic codes were then developed based upon the physicians' judgments. Agreement between the computer algorithms and the physicians' judgments was very high.[9] A list of the

From the Department of Community Health Sciences, University of Manitoba. Address reprint requests to Marsha M. Cohen, MD, Assistant Professor, Department of Community Health Sciences, University of Manitoba, 750 Bannatyne Avenue, Winnipeg, Canada R3E OW3. Dr. Young is Associate Professor and Ms. Hammarstrand is Research Assistant, both in that department at the University. This paper, submitted to the Journal June 17, 1988, was revised and accepted for publication October 20, 1988.

TABLE 1—Demographic and Medical Care Characteristics by Time Period and by Native Status

Demographics	1972–78		1979–84	
	Native American (n=631)	All Others (n=22,917)	Native American (n=696)	All Others (n=13,139)
Mean Age (SD)	39.8(15)	50.0(16)	39.4(15)	51.8(17)
% Female	88.0	72.0	82.0	68.6
% Hospital Type				
Urban teaching	28.7	25.7	26.5	19.5
Urban non-teaching	19.8	44.8	20.5	49.5
Rural 100+ beds	29.6	14.6	31.9	16.8
Rural <100 beds	21.9	14.8	11.9	14.1
% Specialty of Surgeon				
General surgeon	56.3	61.1	NA	NA
Other Surgeon	2.5	2.2	NA	NA
Rural general practice	34.2	18.4	NA	NA
Urban general practice	3.7	4.2	NA	NA
Other physician	3.3	14.1	NA	NA
% Residence				
Rural	NA	NA	30.7	29.9
Northern	NA	NA	42.7	1.5
Urban	NA	NA	26.6	68.6

NA = Not available

reasons for readmission up to 120 days which are included in the study is found in the Appendix.

In order to determine which factors might be associated with the risk of readmission, we performed a multiple logistic regression[10] which included age, sex, type of hospital, urban versus rural residence, and whether the original surgery was a simple or a complicated cholecystectomy; as a case-mix measure, we used the number of admission diagnoses associated with the original surgical admission.[11]

Results

Demographic and medical care characteristics of the cases by time period and Native status are seen in Table 1. In both periods the Native population was younger than the rest of the population and included proportionally more women. The majority of Native cases were operated upon in non-teaching hospitals, most of which were in rural areas in contrast to the rest of the population. Data on specialists were only available for the earlier time period. Native Americans were more likely to have received their operation from a rural general practitioner (34.2 per cent) than the rest of the population (18 per cent). In keeping with the distribution of the population of the province, the Native groups were much more likely to live in the north.

The total age-adjusted rate of cholecystectomy over time by sex and Native status is seen in Figure 1. Not surprisingly, the rate for females was about three times higher than that for males. For non-Native females, the rate of operation fell markedly over time. However for Native women, the rates remained high over the 13 years. For males, the rates for non-Natives fell slightly but rose somewhat for Natives. The age-specific rates for Native females peaked at ages 40–49 in 1972–78 and at ages 30–39 for 1979–84 (Figure 2) while for other females, the peak rates were at ages 60–69. The rates for Native females were higher than those for other females except among the elderly. For males, the highest age-specific rates were seen at ages 70–79 for both racial groups (Figure 3).

Table 2 shows the proportion of cases who had readmissions following surgery for the two time periods. Native Americans were more likely to be readmitted to hospital and were more likely to have multiple admissions. In the second time period, Native Americans were still more likely to be

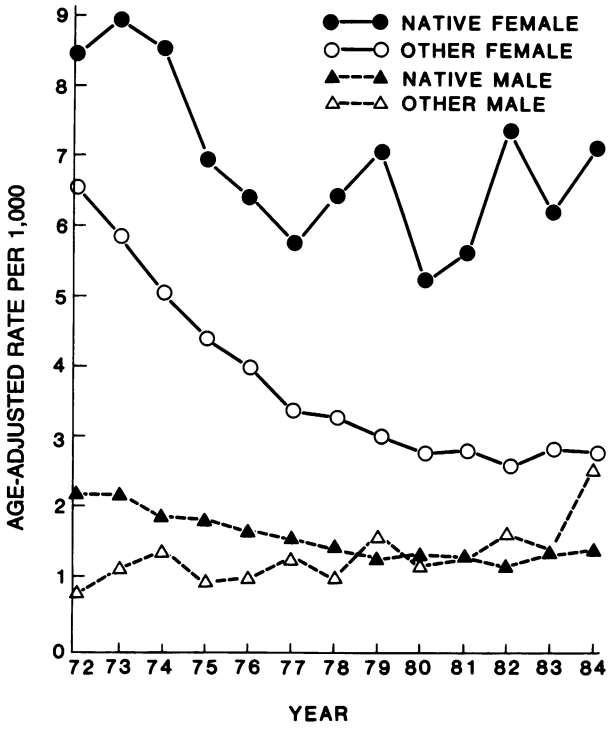

FIGURE 1—Age-adjusted Cholecystectomy Rate per 1,000 Population 1972–84 by Native Status and Gender, Manitoba, Canada

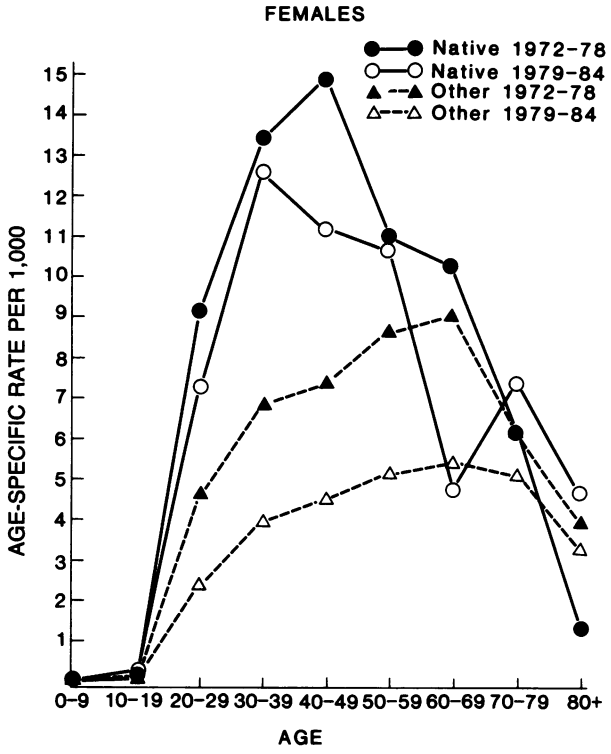

FIGURE 2—Age-specific Cholecystectomy Rate per 1,000 Females, by Native Status and Time Period (1972–78, 1979–84), Manitoba, Canada

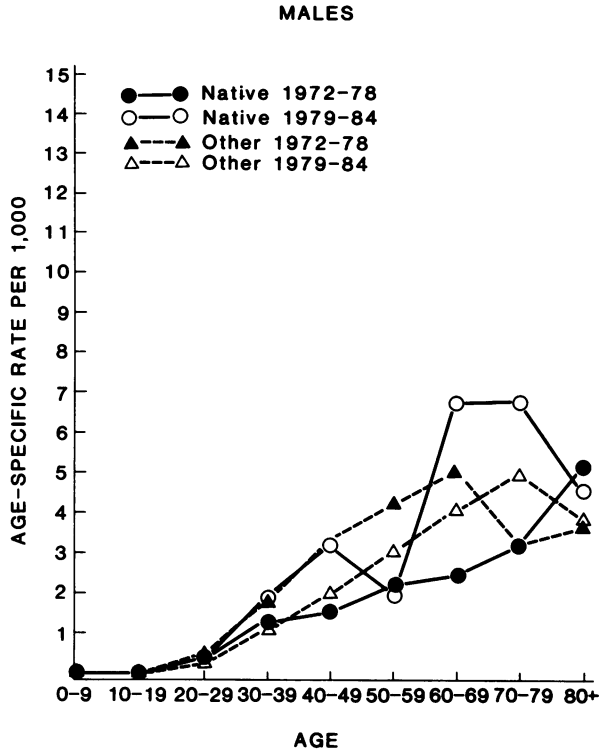

FIGURE 3—Age-specific Cholecystectomy Rate per 1,000 Males, by Native Status and Time Periods (1972–78, 1979–84), Manitoba, Canada.

readmitted than the rest of the population but the proportion of Natives having a readmission fell from 11.9 per cent to 7.8 per cent.

The results of the multiple logistic regression are seen in Table 3. Advancing age was associated with an increased risk of readmission to hospital for a surgically related complication. Females were less likely than males to be readmitted. Patients living in rural areas were more likely to be readmitted to hospital and having had the original surgery in a rural hospital (large or small) or at a Winnipeg teaching hospital placed one at elevated risk as compared to a nonteaching urban hospital. For those with multiple diagnoses (at time of the original surgery), there was a risk of 1.72 for readmission as compared to those whose only diagnosis was cholelithiasis. Complex surgery was not a risk factor for readmission as compared to simple cholecystectomy. After adjustment for all factors in Table 3, being a Native American placed one at 1.46 odds for readmission (95 per cent confidence interval = 1.17, 1.81).

Discussion

This study demonstrates that Native American women in Manitoba experienced a high rate of cholecystectomy. The age of operation was much earlier; they suffered from a high rate of postoperative readmissions; and the rate of this surgery has not declined much over time. Two explanations, not necessarily mutually exclusive, can be offered: Native women are at higher risk for developing gallbladder disease; Native Americans receive differential care within the health care system of Manitoba.

The high risk for gallbladder disease among North American Native Americans has been recognized for some time, particularly among tribes in the southwestern USA.[2,3,5,6,12,13,14] All Native groups studied had higher prevalence than the White population as exemplified by the Framingham Study,[15] with the Pima occupying the extreme high end of the spectrum, similar to their position with regard to diabetes.

A female excess is observed among both Natives and the rest of the population, although the female/male ratio is higher among the former. Cholecystectomy rates are not synonymous with prevalence of gallstones and may be affected by such factors as lack of agreement about indications for surgery.[16] However, virtually every study—whether autopsy, population-based, or of surgical rates—demonstrates a female/male ratio of at least 2:1.[17] Therefore the female excess in cholecystectomy rates likely reflects an excess in gallstone disease in Manitoba women. It can be speculated that the greater female excess and younger age of onset among Natives can be attributed to the higher prevalence of obesity and greater fertility among younger Native women. Both obesity and parity have been implicated as risk factors for gallbladder disease,[17–19] although the evidence is less consistent for Natives.[1–3,14,15] According to the 1981 Canada Census, an average of 4.8 children were born to ever-married Native women living on reserves, compared to 2.5 among others. Thirty-five per cent of Native women gave birth to six or more children, compared to only 8 per cent among non-Natives.[20] In terms of obesity, the Nutrition Canada Survey during the early 1970s indicated that Native women had higher mean weight than Canadians nationally at all age groups, whereas in men higher weights were observed only among those over the age of 50.[21]

Although the health care utilization pattern among Natives differs from that of the rest of the population, this is not sufficient to account for the higher surgical and readmission rate. The persistently high female rate is likely the result of a sustained disease burden unaffected by changing surgical practice in the province. The reason for the higher readmission rate is not known. Natives were as likely to receive bile duct exploration and the overall length of stay was also similar. Thus the differences were not likely due to retained stones at initial surgery.

Ethnic differences in post-cholecystectomy complications persist after controlling for various demographic and

TABLE 2—Percentage Readmitted to Hospital after Cholecystectomy by Time Period and Native Status

	1972–78			1979–84		
	Native American	All Others	Rate Ratio (95% CI)	Native American	All Others	Rate Ratio (95% CI)
First readmission	9.0	3.8	2.4(1.8, 3.1)	6.0	4.1	1.5(1.1, 2.0)
Second readmission	2.2	0.4	5.0(2.9, 8.7)	1.4	0.7	2.0(1.1, 3.9)
Third readmission	0.6	0.1	5.8(2.1, 15.9)	0.3	0.2	1.5(0.3, 4.5)
All readmissions	11.9	4.3	2.7(2.2, 3.5)	7.8	5.0	1.6(1.2, 2.0)

TABLE 3—Relative Odds for Readmission to Hospital after Cholecystectomy (logistic regression results)

Variables	Reference	Relative Odds	95% Confidence Interval
Age	60+/<40	1.88	1.64, 2.15
	40–60/<40	1.17	1.02, 1.35
Sex	Females/males	0.77	0.69, 0.86
Residence	Rural/urban	1.17	1.03, 1.30
Hospital type	Rural large/urban NT*	1.50	1.32, 1.74
	Rural small/urban NT*	1.36	1.14, 1.63
	Urban teaching/urban NT*	1.29	1.10, 1.45
Discharge diagnosis	Multiple diagnosis/ cholelithiasis only	1.72	1.53, 1.93
Type of gallbladder surgery	Cholecystectomy plus other procedure/cholecystectomy only	1.01	0.94, 1.12
Native status	Native/Other	1.46	1.17, 1.81

*Urban non-teaching hospital

medical care factors in a multivariate analysis. However, the types of "risk factor" information routinely available from health insurance claims data is limited. Differences in the distribution of lifestyle (smoking, diet, alcohol, physical activity), socioeconomic status, anthropometric and physiological indices (obesity, lipids, blood sugar, etc.), and parity may account for the observed "ethnic" differences and the continuing high rates.

Most studies of post-cholecystectomy complications tend to derive from one or more teaching hospitals or from one surgeon's experience.[22,23] These studies give complication rates reflecting only immediate postsurgical morbidity and underestimate the true rate of adverse events which may occur after discharge from hospital.[8] Our study is population-based and includes all readmissions even if they occurred at different hospitals than the original surgical event. While not a definitive measure of complications of cholecystectomy, the use of readmissions data served to illustrate the differences between the Native experience and that of the rest of the population.

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(continued)

APPENDIX
Diagnoses, ICDA-8 CODES, ICD-9-CM Codes Used to Study Complications of Surgery at Readmission

Diagnoses/Complications	ICDA-8 Codes	ICD-9-CM Codes
General Complications		
Postoperative hemorrhage	998.1, 629.5	998.1, 623.8
Anemia	280, 285	280, 285
Postoperative wound infection, peritonitis, cellulitis	998.5, 567, 682.9	998.5, 567, 682.9
Pelvic inflammatory disease	616.0	614
Pulmonary embolism and infarction	450	415.1
Phlebitis and thrombophlebitis	451	451
Other venous embolism and thrombosis	453	453
Cystitis, pyelonephritis urinary tract infection	595, 590.1, 599.0	595, 590.1, 590.8, 599.0
Pneumonia	485, 486	485, 486
Incisional hernia, disruption of operative wound	551.2, 553.2, 998.3	551.2, 552.2, 553.2, 998.3
Fistula of bladder, postoperative fistula	596.0, 998.6	596.1, 596.2, 619.0
Abdominal pain	785.5	789.0
Other surgical complication	998.9	998.8, 998.9
Cholecystectomy-related Complications		
Cholecystitis, cholangitis	575	575.0, 575.1, 576.1
Cholelithiasis	574	574
Other diseases of gallbladder, biliary ducts	576	575.2 to 575.9, 576.2 to 576.9
Jaundice	785.2	782.4
Gastroenteritis, colitis	009.2	009.0, 009.1
Intestinal obstruction, peritoneal adhesions	560, 568	560, 568
Acute pancreatitis	577.0	577.0
Gastritis, duodenitis	535	535

Two HRSA Programs Benefit the Homeless

• The Health Resources and Services Administration (HRSA) of the US Public Health Service recently announced an award of about $14 million by HRSA to 109 existing health care projects for the homeless in 43 states and the District of Columbia. These 1989 funds will supplement the second year of operation for the projects; $46 million was provided in the first year of operation.

The projects have provided health care to more than 236,000 homeless persons, including many family units with children. Approximately 60 percent of those served are minority group members. In 1989, the number of homeless persons served by the 109 projects is expected to total more than 450,000.

• The "doctors on wheels" project—a major effort to provide outreach health care for the homeless of New York City—is supported by HRSA under its health care for the homeless program. The mobile unit, which is equipped with supplies and a small waiting room, is staffed by health professionals and makes regular stops each week at facilities for the homeless in Manhattan. Sponsored by the New York Children's Health Project, the program is directed by Dr. Irwin Redlener, chief of ambulatory pediatrics at the hospital.

During the three-year fiscal period 1987–89, the project received nearly $1 million from HRSA. The project also operates a second van that serves the homeless in the Brooklyn and Queens sections of New York City. The first mobile unit was acquired with the assistance of singer Paul Simon.

For further information about these projects, contact Frank Sis at HRSA, USPHS, Department of Health and Human Services, 5600 Fishers Lane, Room 14-43, Rockville, MD 20857. Tel: (301) 443-3376 or -3377).