Original Articles

Ten-year trends in Canada for selected operations

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Of 16 operations common in Canada the national rates over a 10-year period for the 9 discretionary procedures varied much more than those for the nondiscretionary operations. The rates of tonsillectomy and adenoidectomy, hemorrhoidectomy, varicose vein stripping and appendectomy decreased substantially, whereas those of extraction of lens, cesarean section and colectomy increased. The rates of hysterectomy and cholecystectomy first increased and then decreased. With the exception of Newfoundland the provinces generally followed these trends. Neither the Canadian nor the provincial rates were significantly associated with the availability of hospital beds or surgeons. Factors other than resources probably accounted for much of the variation among the provinces.

Sur 16 opérations courantes au Canada le taux national des 9 interventions discrétionnaires a varié bien davantage sur une période de 10 ans que celui des opérations non discrétionnaires. La fréquence des amygdalectomies et des adénoïdectomies, des hémorroïdectomies, des éveinages de veines variqueuses et des appendicectomies a diminué considérablement, alors que celle des extractions de cristallins, des césariennes et des colectomies a augmenté. Le taux des hystérectomies et des cholécystectomies a d'abord augmenté pour diminuer ensuite. À l'exception de Terre-Neuve les provinces ont généralement suivi ces tendances. Ni les taux canadiens, ni ceux des provinces n'étaient reliés à la disponibilité des lits d'hôpitaux ou au nombre de chirurgiens. Des facteurs autres que les ressources expliquent probablement une grande partie des variations entre les provinces.

Some rather common surgical procedures are done much more frequently in certain regions. Whether the comparison is international or between adjoining counties, variation is often evident.[1-10] The differences have been attributed to local availability of hospital beds and surgeons, insurance coverage, arrangements for medical service payments and disease prevalence. The attitudes and preferences of patient and physician may also play a part.[11]

An initial study of provincial rates for primarily discretionary operations, where both physicians and patients could have chosen nonsurgical alternatives, showed variations of as much as 100% in 1968. These rates were positively correlated with the numbers of physicians performing surgery.[4] To better establish baseline rates and show trends, the study was extended for 5 years, to 1972.[5] The numbers of physicians performing surgery were again positively correlated with the numbers of discretionary operations, but in only 3 of the 5 years. When Newfoundland, which had had consistently lower rates, and fewer hospital beds and physicians per capita, was removed from the analysis, these correlations could no longer be demonstrated.

We decided to study the trends and relationships further by again extending the period, giving coverage from 1968 to 1977. By confining the study to Canada, and by standardizing for age and sex, the effect of these demographic factors on surgical rates could be controlled. Since the manner of payment for surgical services is similar in all provinces and all now have universal insurance, the effect of these variables was held constant. It was possible, then, to analyse the influence of manpower and hospital beds on surgical rates.

Methods

Total standardized rates per 100 000 population were calculated for 16 operations coded in the seventh revision of the International Classification of Diseases (IDC-7)[12] and the eighth revision of the International Classification of Diseases, Adapted (ICDA-8).[13] Of the 16 specific operations,‡ those considered as primarily discretionary were hysterectomy, cholecystectomy, all tonsillectomy and adenoidectomy, extraction of lens, prostatectomy, hemorrhoidectomy, varicose vein stripping, nonrecurrent inguinal herniorrhaphy and cesarean section. The primarily nondiscretionary operations were

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‡Codes and tables of supporting data are available from the authors on request.

radical mastectomy, partial thyroidectomy, heart valve surgery, lobectomy–pneumonectomy, nephrectomy, partial and complete colectomy, and appendectomy. These operations were selected because they are commonly done, accounting for approximately one third of all primary operations in Canada, are the procedures that have been studied elsewhere, and are readily definable in terms of both ICD-7 and ICDA-8 codes.

Statistics for the following calculations were gathered from the annual reports of Statistics Canada (cat. nos. 82-208, 83-210 and 84-204), Department of National Health and Welfare (DNH&W) yearly health manpower inventories and a DNH&W bulletin.[14] Direct age- and sex-standardized annual rates[15] per 100 000 population were calculated for 12 of the discretionary and nondiscretionary operations in every province and the country, with the reference standard being the 1968 Canadian population. Sex-specific rates were used for three operations (hysterectomy, radical mastectomy and prostatectomy), while the rates for cesarean section were calculated per 100 live births. Hospital bed ratios were calculated per 1000 population on the basis of the general and allied special bed capacity of public, proprietary and federal hospitals. Only fellows of the Royal College of Physicians and Surgeons of Canada and their Quebec counterparts were considered in determining ratios of surgeons per 100 000 population. (The data for physician ratios in 1968 were unavailable.)

For each province the ratios of beds and surgeons and the overall rates of surgery were arranged in descending order. They were then compared with each other through Spearman correlations, which measure the similarity between the ordering of two ranked series.

Results

In the provinces and for Canada the rates of discretionary operations showed much greater change than those of nondiscretionary operations. In Canada the rates of three operations (tonsillectomy and adenoidectomy, hemorrhoidectomy and varicose vein stripping) decreased substantially over the 10 years, whereas the rates of two (extraction of lens and cesarean section) increased and the rates of two others (hysterectomy and cholecystectomy) increased at first, then decreased. The rates of prostatectomy and nonrecurrent inguinal herniorrhaphy changed only slightly. Among the nondiscretionary operations, thyroidectomy showed a slight decrease overall and appendectomy a greater decrease in frequency. Colectomy was the only one of these to show a large increase in frequency. The rates of the other four nondiscretionary operations remained essentially unchanged.

Six of the surgical procedures, one of them nondiscretionary, were selected for further examination.

Tonsillectomy and adenoidectomy

Tonsillectomy and adenoidectomy rates for Canada decreased steadily over the 10 years (Fig. 1). Newfoundland's rate was lowest for most of the period, whereas those of the other provinces were tightly clustered and more consistent with the national trend. The Canadian rate fell 49%, with two thirds of the decrease taking place in the first 5 years. With Newfoundland excluded, the ratio of the highest provincial rate to the lowest was 1.5:1 in 1968 and 1.6:1 in 1977.

In seven of the provinces and Canada as a whole the downward trend in tonsillectomy and adenoidectomy appears to have levelled off in 1976, before increasing slightly or remaining the same in 1977. Nova Scotia, which had had the second-lowest rate in 1968, had the highest in 1977, with an increase of 13% between 1975 and 1977; however, the rate in 1977 was still 17% below the 1968 rate. Newfoundland's rate became comparable to those of the other provinces; after some years of decline it rose by 28% between 1973 and 1977.

Cholecystectomy

Between 1968 and 1972 the cholecystectomy rates increased in all provinces, the Canadian rate rising 23% (Fig. 2). From 1972 to 1977 the trend was reversed, and the Canadian rate decreased 36%. The net effect was a decrease of 21% over the 10-year period. Provincial

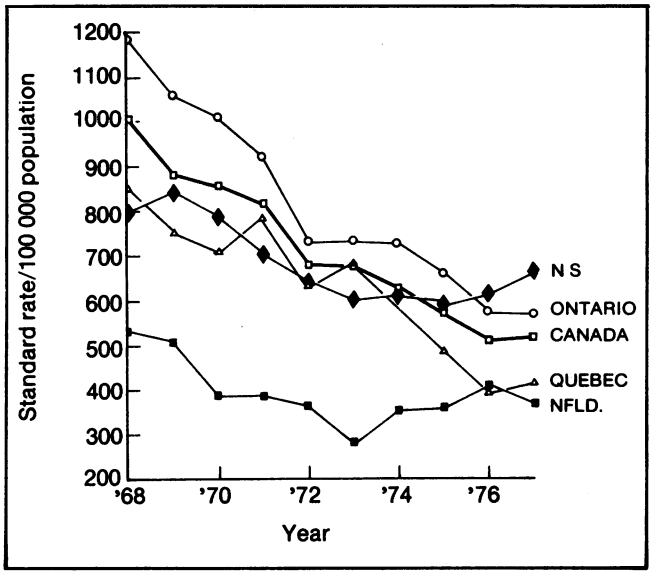

FIG. 1—Tonsillectomy and adenoidectomy rates. Rates in Figs. 1, 2, 3, 5 and 6 are age- and (where applicable) sex-standardized per 100 000 population, with the applicable 1968 Canadian population as reference standard.

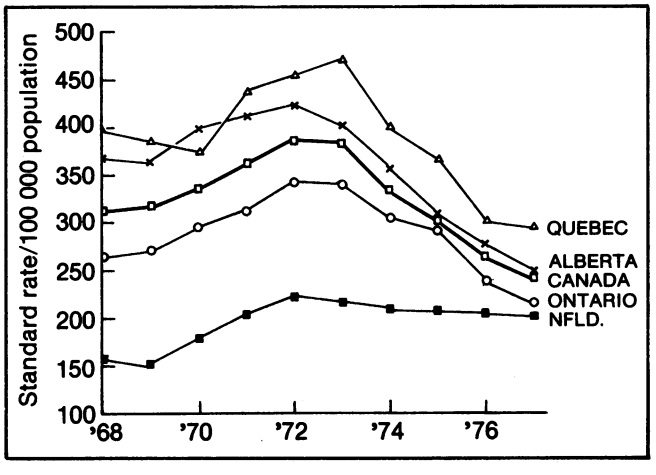

FIG. 2—Cholecystectomy rates.

differences narrowed, even though Newfoundland had had the lowest rate and Quebec the highest of all the provinces.

Hysterectomy

As observed for cholecystectomy, a large increase (41%) in the Canadian hysterectomy rate was followed by reductions during the last 5 years (Fig. 3). The net 10-year change was an increase of only 5%. Generally the rates peaked in all the provinces by 1971 or 1972 and, with the exception of Newfoundland, then fell. The decrease levelled off by 1976, and five provinces even showed increases in 1977. The ratio of the highest provincial rate to the lowest was 1.8:1 in 1968 and 1972 and 1.7:1 in 1977. With the exceptions of Newfoundland, Nova Scotia and Saskatchewan, the provinces again reflected national trends. Nova Scotia ranked sixth in 1968, but after 1972 it had the highest rate, some 35% above the national average by 1977. Saskatchewan had the fourth-highest rate in 1968 but the lowest from 1974 through 1977. The 46% drop in the Saskatchewan rate between 1972 and 1975 was nearly twice that of any other province.

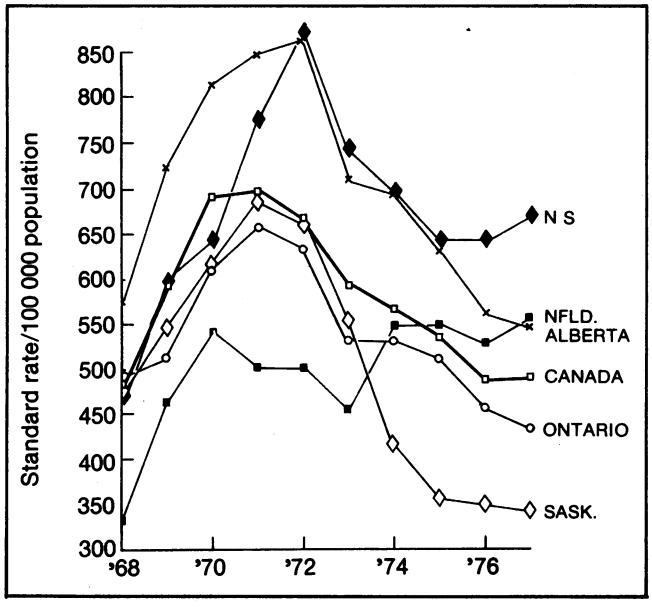

FIG. 3—Hysterectomy rates.

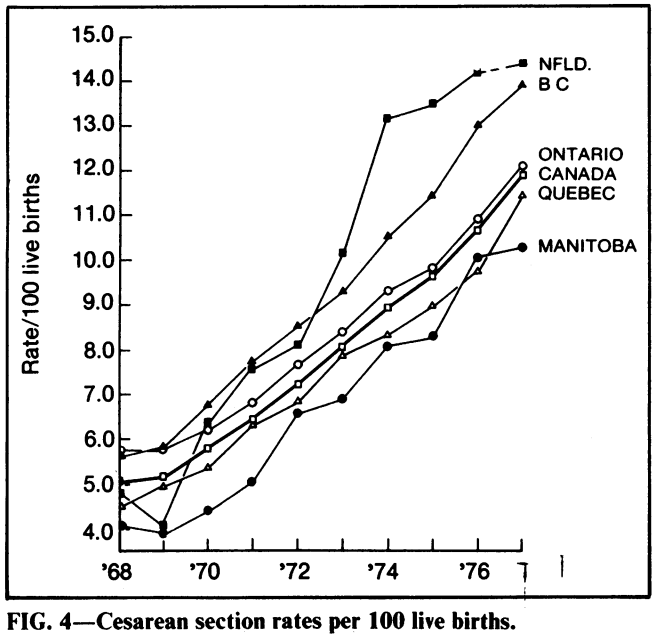

FIG. 4—Cesarean section rates per 100 live births.

Cesarean section

In 10 years the Canadian rate for cesarean section increased 236%, and the provinces parallelled this trend (Fig. 4). The ratio of the highest provincial rate to the lowest was 1.5:1 in 1968 and 1972 and 1.4:1 in 1977. Newfoundland was again of interest, in this instance because its already high rates became the highest in Canada after 1973. There is no indication that the rates have peaked in any province.

Prostatectomy

The prostatectomy rates remained relatively stable over the decade in question (Fig. 5). Slight increases in the first 5 years were balanced by minor decreases in Manitoba and British Columbia.

Colectomy

Of the rates for the seven nondiscretionary procedures, only those for appendectomy, which decreased, and those for colectomy, which increased, showed substantial changes over the 10-year period. The colectomy rates increased by 59%, and the provinces generally reflected this trend (Fig. 6). In comparison with the discretionary operations studied, the number of colectomies was small, so wide percentage fluctuations in the rates could result from just a few operations. The ratio of the highest provincial rate to the lowest was 2.0:1 in 1968 and 1.5:1 in 1977.

Operations, beds and surgeons

The overall rate of operations in Canada rose in the early 1970s and then declined, until it was lower than it had been in 1968. In that period, hospital bed ratios changed little, while numbers of surgical specialists per 100 000 population increased about 19% (Fig. 7).

Spearman correlations between the total surgical rates (unstandardized) for the provinces for every second year, beginning with 1968, and the ratios of hospital beds and surgeons were calculated. A statistically significant correlation was obtained with hospital beds in only 2 of the years, and there was no correlation of the surgical rate with the rank ordering of surgeons.

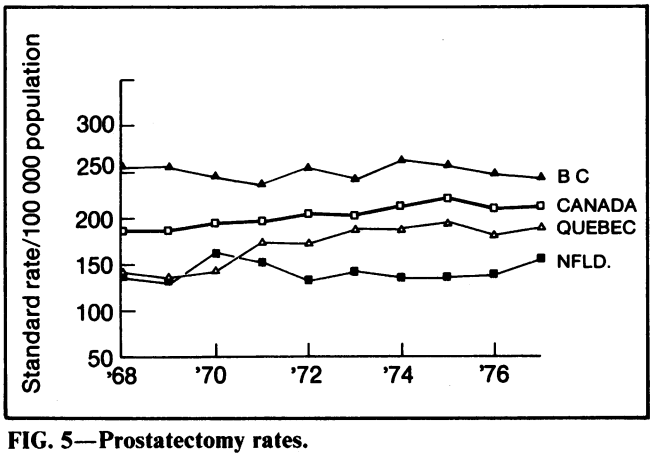

FIG. 5—Prostatectomy rates.

For only a few of the operations were significant correlation coefficients ($P > 0.05$) obtained with both the availability of hospital beds and the numbers of surgeons in each of 1968, 1971, 1974 and 1977. In 3 of the 4 years examined, bed availability was associated with the rates of thyroidectomy and appendectomy, while surgeon availability was associated with the rate of colectomy. Since nondiscretionary operations accounted for only a very small proportion of all operations,[16] these isolated statistical associations are of questionable significance.

Discussion

Although most provinces reflected the national trends of the study period, Newfoundland was a notable exception. Except for cesarean section, its rates of surgery were consistently the lowest. All Newfoundland rates increased after 1973, regardless of the general Canadian trend, yet had only approached the lower part of the provincial range by 1977. These increases may be explained in part by the opening of the Health Sciences Centre and medical school at Memorial University. Although the institution did not have much effect on the bed ratio in Newfoundland, it would have contributed greatly to the exceptional 76% increase in the physician/population ratio.

This 10-year analysis has brought out several different trends for common operations. Cesarean section rates have been rising since the mid-1960s. This increase has been prompted by such technologic changes as fetal monitoring and by the general increase in the age of childbearing. Then, too, the operation is widely believed to have become much safer for both mother and fetus.[17] This rise has also been observed in the United States.[18] Perinatal mortality, considered to be the best vital statistic here, has indeed decreased during this period, but it had been declining steadily for decades. Other favourable results, such as reduced incidence of long-term neurologic defects, have not been conclusively demonstrated.

In Nova Scotia, where the relatively high rates for tonsil surgery and hysterectomy have recently risen, the increases may stem from the adoption of universal insurance in the early 1970s. This was one of three provinces that formerly had less than 75% coverage.

The Canadian cholecystectomy rate is unusually high.[2] In 1976 it was 1.4 times greater than in the United States and 4 times higher than in England and Wales.[19] In Canada, Quebec had the highest rates during the study period. For most of the other operations, though, the Quebec rates were the same as or lower than those of the whole country. Gallbladder disease may indeed be more prevalent in this ethnically distinct population,[20] but it is also possible that Quebec surgeons are more in agreement about indications for the operation than usual.[21] These physicians may well have trained in their home province and can be expected to practise there. High though the Quebec cholecystectomy rates are, however, they have moved up and down with the general Canadian trends.

Reversal of the rising trends in both cholecystectomy and hysterectomy is particularly interesting. Improved radiologic and ultrasound technology has facilitated gallbladder visualization, perhaps reducing the need for surgery in questionable cases. About 75% of cholecystectomies are done on women, and changing public awareness and concern may have had a moderating effect on the rate of both operations.

The decrease in the Saskatchewan hysterectomy rates, which had been twice the national average, coincided with a widely publicized provincial audit of hysterectomies.[22] The report called attention to "unjustified" hysterectomies at specific hospitals and recommended greater precision in determining indications.

Changing technology, disease prevalence, ethnic differences, consumer expectations and amount of medical insurance, and differing treatment styles and judgements, may all be involved in the general trends and differing rates of surgery. The relations between surgical rate and availability of hospital beds and surgeons were inconsistent. We feel that earlier findings of an association between resources and rates have not been substantiated. While resources may still be important in explaining variations at the national level, provincial rates are responsive to factors other than resources.

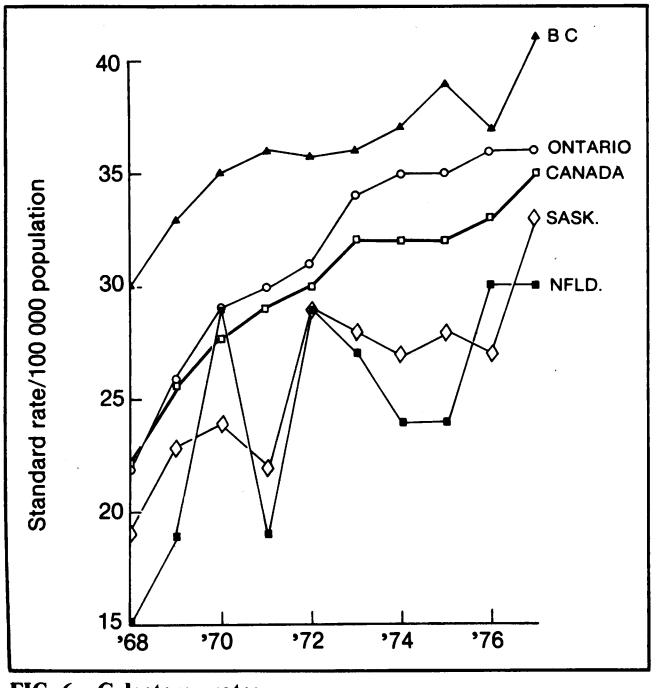

FIG. 6—Colectomy rates.

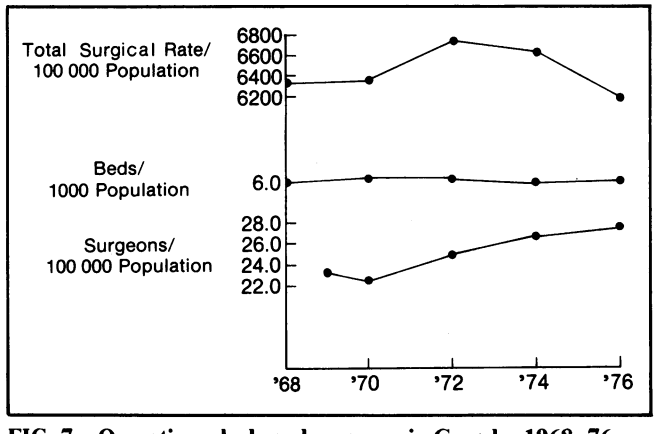

FIG. 7—Operations, beds and surgeons in Canada, 1968–76.

Conclusions

There is a definite need for continuing surveillance and analysis of trends in surgical rates and other medical treatments. Had cholecystectomy or hysterectomy rates been examined at 10-year intervals, for instance, the study would have shown only small changes, and the great fluctuations would have been missed. Differences between regions and changes with the passage of time have important implications for health and policy planners. Policies, publicity and consumer interest can influence the rates for discretionary operations, although the nondiscretionary ones are less likely to respond to such forces.

The question of too much or too little surgery in different times and places is not to be resolved by this analysis. An answer for that is to be sought by comparing the results of surgery and of alternative treatments. The efficacy of different treatments must be established before the "best" surgical rate for a given population can be determined.

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Expanding the nurse's role to improve preventive service in an outpatient clinic

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To help resolve the conflicting demands of primary and secondary care in hospital medical clinics, a program was developed whereby, with the physicians' agreement, nurses would select and vaccinate clinic patients eligible for influenza vaccination. In a controlled trial the nurses offered vaccination to half of the eligible patients attending morning sessions and vaccinated 35% of them. In contrast, physicians in the afternoon sessions, who were unaware of the program, vaccinated only 2% of similar patients. These results show that, although these physicians agree with guidelines for influenza vaccination, they are not currently providing the service. The use of nursing personnel to provide this and other types of primary medical care for clinic patients is a reasonable alternative.

Afin de satisfaire les exigences contradictoires des soins de première et deuxième ligne dans les cliniques médicales en milieu hospitalier un programme a été mis au point, avec l'accord des médecins, permettant aux infirmières de choisir et de vacciner les patients admissibles à la vaccination antigrippale. Dans un essai contrôlé les infirmières ont offert le vaccin à la moitié des patients admissibles qui se sont présentés aux séances de l'avant-midi et ont vacciné 35% d'entre-eux. En comparaison, au cours des séances de l'après-midi les médecins, qui n'étaient pas informés de ce programme, ont vacciné seulement 2% de patients semblables. Ces résultats démontrent que bien que ces médecins acceptent les directives de la vaccination antigrippale ils n'offrent pas présentement ce service. L'utilisation du personnel infirmier à cette fin, ou pour offrir d'autres types de soins de première ligne aux patients des cliniques, constitue un choix raisonnable.

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