

# Surgery and anesthesia in Ontario

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Operative and case-fatality rates in Ontario for eight elective (discretionary) and seven nonelective (nondiscretionary) operations and the proportions of these operations and their anesthetic procedures performed by general practitioners were calculated.

Cholecystectomy increased in frequency 32% from 1968 through 1973, tonsillectomy and adenoïdectomy decreased 37%, and hysterectomy increased 41% from 1968 to 1972, then decreased 14%. Except for colectomy the rates for nonelective operations changed only slightly over the 6 years.

Case-fatality rates (hospital deaths per 10 000 operations) for the discretionary operations in 1973 were as follows: extraction of lens, 23.1; tonsillectomy and adenoïdectomy, 0.4 (2 deaths among 52 938 operations); varicose vein stripping, 6.1; nonrecurrent inguinal herniorrhaphy, 21.9; cholecystectomy, 61.0; hemorrhoidectomy, 9.8; prostatectomy, 115.9; and hysterectomy, 9.6. In 1973 general practitioners did 32% of tonsillectomies and adenoïdectomies (61% in 1971), 10 to 20% of inguinal herniorrhaphies, hemorrhoidectomies and appendectomies and 6% or less of the other operations. However, they performed 35% or more of the anesthetic procedures for these four operations as well as for varicose vein stripping, cholecystectomy and hysterectomy. Rates of general-practice surgery and anesthesia in an urban centre in Ontario were substantially less than those for the province as a whole.

On a calculé pour l'Ontario la fréquence opératoire et le taux de mortalité associés à huit opérations facultatives et à sept interventions non facultatives, et les proportions de ces opérations et des anesthésies effectuées par des praticiens généraux. La fréquence des cholécystectomies a augmenté de 32% entre 1968 et 1973, celle des amygdaléctomies et des adénoïdectomies a diminué de 37%, et celle des hystérectomies ont augmenté de 41% entre 1968 et 1972 pour diminuer ensuite de 14%. A

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l'exception de la colectomie les taux des autres interventions non facultatives n'ont subi que des changements mineurs au cours de ces 6 années.

En 1973 les taux de mortalité (le nombre de décès hospitaliers par 10 000 opérations) pour les opérations facultatives étaient les suivants: enlèvement du cristallin, 23.1; amygdaléctomie et adénoïdectomie, 0.4 (2 décès pour 52 938 opérations); phlébectomie, 6.1; herniorrhaphie inguinale nonrécidivante, 21.9; cholécystectomie, 61.0; hémorroïdectomie, 9.8; prostatectomie, 115.9; et hystérectomie, 9.6. En 1973 les praticiens généraux ont réalisé 32% des amygdaléctomies et des adénoïdectomies (comparativement à 61% en 1971), 10 à 20% des herniorrhaphies inguinales, des hémorroïdectomies et des appendicectomies, et 6% ou moins des autres interventions. Toutefois, ils ont réalisé 35% ou plus des anesthésies pour ces quatre opérations, de même que pour les phlébectomies, les cholécystectomies et des hystérectomies. Les fréquences des interventions chirurgicales et des anesthésies en pratique générale pour les centres urbains de l'Ontario étaient sensiblement inférieures à celles de la province dans son ensemble.

Rates of elective surgery in England and Wales are much lower than those in the United States<sup>1</sup> and Canada.<sup>2</sup> US rates are also higher than Swedish

rates.<sup>3</sup> Wide variation in rates has also been found between different regions of Kansas<sup>4</sup> and Vermont.<sup>5</sup> In Canada, interprovincial variation in rates of elective surgery from 1968 to 1972 was 100% or more.<sup>6</sup> The Kansas, Vermont and interprovincial studies all identified positive correlations between rates of elective surgery and numbers of surgical personnel. The larger proportion of general practitioners doing surgery in North America has also been suggested as one cause of the differences between rates in England and Wales as compared with Canada and the US.

In this paper we report the Ontario rates for eight elective (discretionary) and seven nonelective (nondiscretionary) operations (Table I) from 1968 through 1973, the 1973 case-fatality rates for these operations, and the proportions of these operations and the related anesthetic procedures performed by general practitioners in 1973 for the entire province and for one urban centre in Ontario with a medical school.

## Methods

Numbers of surgical operations by age and sex for Ontario were supplied by the Ontario Health Insurance Plan (OHIP) and were derived from hospital discharge summaries. Crude rates were standardized by age and sex, the 1968 population of Canada being the reference standard.

For each type of operation OHIP also tallies the numbers of "live dis-

Table I—Discretionary (elective) and nondiscretionary (nonelective) operations studied

Operation	Code	
	ICDA-8* no.	Ontario fee schedule
<b>Discretionary</b>		
Extraction of lens	14.1 - 14.5	E140 - E141
All tonsillectomy and adenoïdectomy	21.1 - 21.4	S063 - S065
Varicose vein stripping	24.4	R841 - R844
Nonrecurrent inguinal herniorrhaphy	38.2	S326 - S328 - S331
Cholecystectomy	43.5	S278 - S289
Hemorrhoidectomy	51.3	S247
Prostatectomy	58.1 - 58.3	S645 - S651 S654 - S655
Hysterectomy	69.1 - 69.4 70.1 - 70.2	S757 - S763 S768 - S769
<b>Nondiscretionary</b>		
Partial thyroidectomy	22.1	S789 - S791
Heart valve surgery	29.2 - 29.4	
Lobectomy - pneumonectomy	34.2 - 34.4	M142 - M147
Appendectomy	41.0 - 41.1	S205 - S206
Colectomy, partial and complete	47.5 - 47.6	S166 - S174
Nephrectomy	54.4 - 54.5	S412 - S420
Radical mastectomy	65.3 - 65.6	R109

\*International Classification of Diseases, Adapted, 8th revision.<sup>7</sup>

charges" and deaths so that annual case-fatality rates can be calculated. Case-fatality rate is defined as the number of deaths per 10 000 operations, death having occurred after the operation but before discharge from hospital. Since the cause of death is not included in the summary printouts there is no absolute evidence that a death was directly or indirectly related to the operation or the underlying condition for which it was done.

Numbers of general practitioners and specialists who performed each type of operation and anesthetic procedure were also obtained from OHIP. Code A identifies a surgeon, code C, an anesthetist, and code 00, a general practitioner. This information is generated from billing information submitted by physicians. Hospital discharge reports use code numbers of the International Classification of Diseases, Adapted, 8th revision<sup>7</sup> (ICDA-8), whereas the Ontario fee schedule uses a specially designed one-letter, three-digit coding system; for this study the OHIP billing codes were converted to ICDA numbers (Table I). Because of problems of conversion and under-reporting, the number of operations tallied from the billing forms was less than the number derived from the hospital discharge summaries. In calculating proportions of operations and anesthetic procedures performed by general practitioners for each type of operation we took numerators and denominators from OHIP billing information.

## Findings and comments

### Operative and case-fatality rates

Between 1968 and 1973, 97% or

more Ontarians had hospital and medical insurance, the number of surgeons increased 9% and there were minimal changes in the ratio of numbers of hospital beds to population. However, the age- and sex-standardized operative rates for seven of the eight discretionary operations (all but nonrecurrent inguinal herniorrhaphy) changed substantially; except for that of colectomy the rates for the nondiscretionary operations remained relatively unchanged (Table II). About 960 more colectomies were performed in 1973 than in 1968; in the intervening period there was a 3% increase in the death rate for colonic and rectal cancer and an absolute increase of 11% in the number of deaths due to these cancers.

Case-fatality rates for 1973 are summarized in Table III. Rates of 11 per 10 000 or less were recorded for (in order of increasing magnitude) tonsillectomy and adenoidectomy, varicose vein stripping, partial thyroidectomy, hysterectomy, hemorrhoidectomy and appendectomy. Rates of 12 to 25 per 10 000 were recorded for herniorrhaphy, extraction of lens and radical mastectomy.

Among the operations performed in all age groups (herniorrhaphy, cholecystectomy, hysterectomy and appendectomy) case-fatality rates were highest in the oldest — 65 years and over (Table IV). However, when individual operations were examined in discrete age categories, the number of operations and the number of deaths were found to be small; thus, the usefulness of the age-specific case-fatality rate is questionable except as a baseline — for example, the apparent rate of 3.2 deaths per 1000 hysterectomies in the 15- to 24-year age group reflects

1 death in 322 procedures.

For six of the operations 1969 US case-fatality rates were available.<sup>8</sup> The 1969 US rate for tonsillectomy and adenoidectomy was the same as the 1973 Ontario rate, but for the other five operations the 1969 US case-fatality rates were higher than the 1973 Ontario rates (prostatectomy, 164.1 v. 115.9; hysterectomy, 20.4 v. 9.6; appendectomy, 35.2 v. 10.9; colectomy, 846.9 v. 704.0; and radical mastectomy, 40.3 v. 23.2). However, the data were not reported in exactly the same way in the two countries and 4 years elapsed between the two studies.

### Proportions of operations and their anesthetic procedures performed by general practitioners

In Ontario, physician billing information specifies whether a particular operation or anesthetic procedure was performed by a specialist or by a general practitioner. A specialist is defined as one who holds a certificate from the Royal College of Physicians and Surgeons of Canada in the specialty that normally is considered to encompass the service in question. Because some of the surgeons and anesthetists were fully trained (in Canada or elsewhere) but did not hold a certificate, the percentages of general practitioners and family doctors performing operations and anesthetic procedures are over-estimated in Table V.

General practitioners performed 32% of all tonsillectomies and adenoidectomies in 1973 (61% in 1971<sup>9</sup>) but only 14% or less of the other operations studied. For anesthesia the situation was different. Except for lobectomy-pneumonectomy and nephrectomy, anesthetic procedures were per-

Table II—Operative rates\* per 100 000 population† Ontario, 1968-73

Operation	1968	1969	1970	1971	1972	1973	Trends
<b>Discretionary</b>							
Extraction of lens	100	98	102	104	112	114	+ 14%
All tonsillectomy and adenoidectomy	1186	1065	1012	937	741	745	Steady decrease, - 37%
Varicose vein stripping	118	117	114	108	104	97	- 18%
Nonrecurrent inguinal herniorrhaphy	259	242	244	251	237	257	1968-72, - 8% 1968-73, 0
Cholecystectomy	261	272	297	318	347	345	Essentially no change Steady increase, + 32%
Hemorrhoidectomy	104	100	93	88	89	84	- 19%
Prostatectomy‡	184	186	196	192	219	220	+ 20%
Hysterectomy§	448	514	614	652	630	542	1968-72, + 41% 1968-73, + 21% 1972-73, - 14%
<b>Nondiscretionary</b>							
Partial thyroidectomy	22	17	19	18	18	18	Minor decrease
Heart valve surgery	6	6	6	8	7	7	No change
Lobectomy - pneumonectomy	7	7	6	8	9	9	No change
Appendectomy	242	231	223	207	207	212	- 12%
Colectomy, partial and complete	22	26	29	30	31	34	+ 55%
Nephrectomy	12	13	12	12	13	13	No change
Radical mastectomy‡	57	58	55	60	57	56	No change

\*Sources: Statistics Canada and Ontario Health Insurance Plan.

†Age- and sex-standardized; reference standard, 1968 population of Canada.

‡Age-standardized for men.

§Age-standardized for women.

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Avoid concurrent salicylate therapy, unless administered under careful supervision:

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- Salicylates and citrates antagonize the uricosuric action of Anturan and may therefore interfere with uric acid excretion.

It should be administered with care to patients with a history of healed peptic ulcer.

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Patients receiving Anturan should be kept under close medical supervision and periodic blood counts are recommended. Use cautiously in patients with known sensitivity to phenylbutazone and other pyrazoles.

Recent reports have indicated that Anturan potentiates the action of sulfonamides, e.g., sulfadiazine, sulfisoxazole. Other pyrazole compounds e.g. phenylbutazone, potentiate the hypoglycemic effects of sulfonylureas. There have also been reports that phenylbutazone enhances the effects of insulin in diabetics. Therefore, it is recommended that Anturan be used with caution in conjunction with insulin, sulfonamides, the sulfonylurea hypoglycemic agents and, in general, with agents known to displace, or to be displaced by other substances from serum albumin binding sites.

Because Anturan is a potent uricosuric agent, it may precipitate urolithiasis and renal colic, especially in the initial stages of therapy, in hyperuricemic patients. For this reason, an adequate fluid intake and alkalinization of the urine are recommended. In cases with significant renal impairment, periodic assessment of renal function is indicated.

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Table III—Case-fatality rates\* per 10 000 operations,† Ontario, 1973

Operation	No. of operations	Total no. of deaths‡	No. of deaths per 10 000 procedures
<b>Discretionary</b>			
Extraction of lens	9 944	23	23.1
All tonsillectomy and adenoidectomy	52 938	2	0.4
Varicose vein stripping	8 242	5	6.1
Nonrecurrent inguinal herniorrhaphy	20 576	45	21.9
Cholecystectomy	29 335	179	61.0
Hemorrhoidectomy	7 135	7	9.8
Prostatectomy	8 972	104	115.9
Hysterectomy	22 935	22	9.6
<b>Nondiscretionary</b>			
Partial thyroidectomy	1 526	1	6.6
Heart valve surgery	593	58	978.1
Lobectomy - pneumonectomy	723	44	608.6
Appendectomy	16 490	18	10.9
Colectomy, partial and complete	2 912	205	704.0
Nephrectomy	1 088	33	303.3
Radical mastectomy	2 587	6	23.2

\*Source: Ontario Health Insurance Plan.

†No. of hospital deaths/total no. of procedures × 10 000.

‡During admission in which operation was performed.

Table IV—Case-fatality rates\* for selected operations, Ontario, 1973

Operation	Age (yr) and death rate per 1000 procedures					Total
	0-14	15-24	25-44	45-64	≥65	
Nonrecurrent inguinal herniorrhaphy	0.2	0	0.2	0.1	12.4	2.2
Cholecystectomy	0	0.3	1.0	4.4	27.6	6.1
Hysterectomy†	0	3.2	0.4	0.7	9.5	1.0
Appendectomy	0.2	0.2	0	5.1	22.8	1.1

\*Source: Statistics Canada.

†Age-specific for women.

Table V—Percent\* of operations and anesthetic procedures performed by general practitioners, Ontario and one urban centre with a medical school, 1973

Operation	Standardized rate per 100 000 population†	% performed by general practitioners			
		Operations		Anesthetic procedures	
		Ontario	Urban centre	Ontario	Urban centre
<b>Discretionary</b>					
Extraction of lens	114	2	—	26	16
All tonsillectomy and adenoidectomy	745	32	5	45	12
Varicose vein stripping	118	6	4	36	15
Nonrecurrent inguinal herniorrhaphy	259	14	7	41	13
Cholecystectomy	345	6	5	38	10
Hemorrhoidectomy	104	11	6	40	14
Prostatectomy‡	220	1	—	29	20
Hysterectomy§	542	6	2	37	9
<b>Nondiscretionary</b>					
Partial thyroidectomy	22	3	3	27	12
Lobectomy - pneumonectomy	7	2	2	11	38
Appendectomy	242	13	4	43	9
Colectomy, partial and complete	22	2	2	30	30
Nephrectomy	12	1	1	20	25
Radical mastectomy§	57	6	4	31	9

\*Source: Ontario Health Insurance Plan.

†Population of Ontario: 1973 (estimated), 7 939 000; 1971 (actual), 7 703 000. Reference standard, 1968 population of Canada.

‡Age-standardized for men.

§Age-standardized for women.

formed by general practitioners in 25% or more of each type of operation. Although the proportion of all tonsillectomies and adenoidectomies performed by general practitioners decreased by almost one half between 1971 and 1973, the proportion of anesthetic procedures performed by general practitioners for this operation decreased minimally — from 54% to 45%.

In general, the proportions of operations and anesthetic procedures performed by general practitioners were substantially less in the one urban centre (where less than 10% of Ontario's population lived) than in the province as a whole. Less complicated discretionary operations such as tonsillectomy and adenoidectomy and non-recurrent inguinal herniorrhaphy were performed far less frequently by general practitioners in the urban centre than in the province as a whole, the proportions being 5% v. 32% and 7% v. 14%, respectively; the trend was similar for anesthesia, the proportions being 12% v. 45% and 13% v. 41%, respectively, for the two operations. For most nondiscretionary operations, which were also performed less frequently by general practitioners, the differences in proportions between the urban centre and the province as a whole were less striking; however, the proportions were all low. For lobectomy-pneumonectomy and nephrectomy it appears that more anesthetic procedures were performed by general practitioners in the urban centre than in Ontario as a whole. This finding may reflect the small number of these operations done in the urban centre (100 or fewer of each operation) or the fact that anesthetic procedures for these operations were being performed by fully trained specialists without certification. At another urban centre in Ontario two of eight full-time members of the medical school's department of anesthesia had been trained as specialists but did not hold certificates.

## Discussion

These findings have implications for the regulation of medical practice, limited licensure, regionalization and training programs in family and general practice.

Surgical and anesthetic procedures in at least one Ontario city are performed mainly by specialists. In rural, less populous areas certain elective operations are done in varying amounts by general practitioners. A greater proportion of anesthetic than of surgical procedures are performed by general practitioners in both urban and non-urban locations.

Limited licensure could stop general-practice surgery and anesthesia in On-

tario. Limitation of hospital privileges in many urban hospitals has, in effect, resulted in functional limited licensure. This trend can be expected to continue. In rural areas the problems are different. Many do not have populations adequate to support surgeons and anesthesiologists. Specialists based at regional medical centres and highly developed transport systems might make it feasible for general practitioners to stop performing surgical and anesthetic procedures in rural as well as urban Ontario. At present it seems far more reasonable to specify the operations and the patients requiring specialist surgeons and anesthesiologists. General practitioners performing surgical and anesthetic procedures for operations or patients not requiring specialists must, of course, be properly trained. As well, continuing audit of quality of care (assessed from, for example, mortality, complication and infection rates) should be used as a performance monitor for both generalists and specialists.

Family practice residents will have to choose their practice locations so that appropriate training programs can be arranged. The Canadian Council on Hospital Accreditation<sup>10</sup> has stated that all physicians, other than qualified specialists, applying for clinical privileges in anesthesia should be required to have at least 6 months' training in anesthesia in a hospital that has a residency program approved by the Royal College of Physicians and Surgeons of Canada or its provincial counterpart. The qualifications and skills of physicians trained as specialists (in Canada or elsewhere) but not holding certificates of the Royal College and of general practitioners presently performing anesthetic procedures will have to be assessed individually.

Rates of discretionary surgery vary from province to province and rates for certain operations have changed substantially between 1968 and 1973 in Ontario. The increases and decreases in rates of tonsillectomy and adenoidectomy, cholecystectomy, prostatectomy and hysterectomy cannot be attributed to changes in incidence or prevalence of the underlying disease. Changing treatment styles and methods, universal insurance and relatively unlimited numbers of surgical personnel and beds have all contributed. The lack of change in rates of operations classified as nondiscretionary is further evidence that indications for these operations are more stable and less influenced by style, manpower or facilities. Discretionary surgery, on the other hand, is more subject to resource availability. Recent suggestions by the Ontario task force on health planning<sup>11</sup> to limit authorized positions for physicians in health districts by controlling their eli-

gibility for OHIP insurance payments was met with opposition. Such limitations on a province-wide basis, especially if coupled with reductions in numbers of hospital beds, might be associated with reduced rates for certain discretionary operations. There is no evidence that health outcomes would be unfavourably influenced,<sup>2</sup> although this issue is not settled and would require ongoing assessment.

The case-fatality rates for most of the operations studied were age-related and low; these rates are mainly of use as baseline data. Deaths following operations require case-by-case scrutiny to determine whether they were preventable. Such studies might identify particular regions, hospitals, surgeons, or operative or anesthetic techniques that were regularly associated with preventable fatalities. If patterns were identified, remedial steps could be taken. There were two deaths among 52 938 tonsillectomies; although the case-fatality rate is low the two fatal operations would have to be justified by the seriousness of the illnesses for which they were undertaken.

The data bases of the Ontario hospital and medical service make it possible to identify and monitor trends and patterns of practice. Additional studies are now required to add meaning to these descriptive data. One unique feature of universal health insurance in Canada is the opportunity it provides to combine administrative and financial information with ongoing monitoring of medical practice. Such monitoring answers some questions and, even more important, identifies issues that require further investigation.

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