Distribution of physicians in Ontario

Where are there too few or too many family physicians and general practitioners?

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ABSTRACT

OBJECTIVE To assess the regional distribution of family physicians and general practitioners in Ontario after adjusting for practice intensity and the population's patterns of health care use.

DESIGN Analysis of administrative data.

SETTING Ontario.

MAIN OUTCOME MEASURES Intensity of patient use of GP services, GP practice density, and physician density for each Ontario county (measured as the ratio of practice-intensity equivalent GPs to use-intensity equivalent inhabitants).

RESULTS Despite adjustment for practice intensity and use patterns, wide variations exist in GP densities. χ^2 tests identified counties that consistently reported GP densities significantly different ($P < 0.001$) from the provincial average. Four of the five counties with health science teaching centres had densities significantly higher than the provincial average, while 10 other counties had significantly lower densities.

CONCLUSIONS Results of this study provide useful information for physician resource planning and might inform debate concerning proposals to restrict physician billing numbers and practice locations to rectify perceived maldistribution of physicians.

RÉSUMÉ

OBJECTIF Analyser la répartition régionale des médecins de famille et des omnipraticiens de l'Ontario après rajustement des données en fonction de l'intensité de la pratique et des modes d'utilisation des soins de santé par la population.

CONCEPTION Analyse de données administratives.

CONTEXTE Ontario.

PRINCIPALES MESURES DES RÉSULTATS Intensité de l'utilisation des services des omnipraticiens, densité des omnipraticiens et densité des médecins pour chacun des comtés de l'Ontario (mesurées en termes de ratio intensité de la pratique des équivalents omnipraticiens et intensité d'utilisation des services par les équivalents habitants).

RÉSULTATS Malgré le rajustement en fonction de l'intensité de la pratique et des modes d'utilisation, on constate de grandes variations dans les densités d'omnipraticiens. Les test de χ^2 ont permis d'identifier les comtés qui ont constamment rapporté des densités d'omnipraticiens significativement différentes ($p < 0{,}001$) de la moyenne provinciale. Quatre des cinq comtés où l'on retrouve des centres d'enseignement des sciences de la santé avaient des densités significativement plus élevées que la moyenne provinciale alors que les densités furent significativement plus faibles dans 10 autres comtés.

CONCLUSIONS Les résultats de cette étude nous procurent des renseignements utiles pour la planification des effectifs médicaux et peuvent éclairer le débat entourant les propositions visant à limiter le nombre des médecins autorisés à facturer et les endroits de pratique dans le but de corriger les perceptions entourant la mauvaise répartition des médecins.

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Physician-to-population ratios have been used traditionally as important factors in health resource planning, but no "ideal" ratio has ever been formulated.[1] Even though such ratios are far from perfect measures of population need and physician supply, they do provide a useful benchmark for comparison, especially in regard to relative access to health care services.[2]

In light of expenditure constraints on physician services, attention has recently been focused on physician resource planning. The Ontario Ministry of Health (MOH) has proposed limits to the schedule of benefits for physician services, restrictions on the availability of billing numbers, and constraints on location of practice. These decisions were based on data acquired in 1980 by the Council of Ontario Faculties of Medicine's Postgraduate Manpower Committee (PMC).[3]

The PMC used three principal steps to construct its assessment of regional imbalances in the distribution of physicians. First, the current stock of physicians was defined as the number of active physicians for whom clinical practice represented more than 50% of their time irrespective of their roles in administration, teaching, and research. Second, unmet need for physicians, at a given point, was defined as the number of physicians required to fill demonstrated vacancies. Third, adjustments were made for population growth, physician stock attrition, prorated allocation of unmet need for additional physicians over the ensuing years, and graduate training requirements.

While measures of relative physician supply devised by the PMC (and other organizations) might inform policy-makers' resource planning strategies, such measures do not account for factors that influence the practice patterns of physicians, such as their age and sex, and do not capture factors that could influence the underlying prevalence of disease, such as the age-sex composition of the population.[4] These factors are important determinants of both physicians' intensity of practice and population use of health care services: the former affects the supply of physician services; the latter the use of such services.

This study aimed to determine county-specific measures of the distribution of family physicians and general practitioners in Ontario that adjust for both the intensity of medical practice and patterns of health care use. This is the first analysis of regional variations in the availability of GPs in Ontario that adjusts for both practice intensity and population use of GP services.

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METHODS

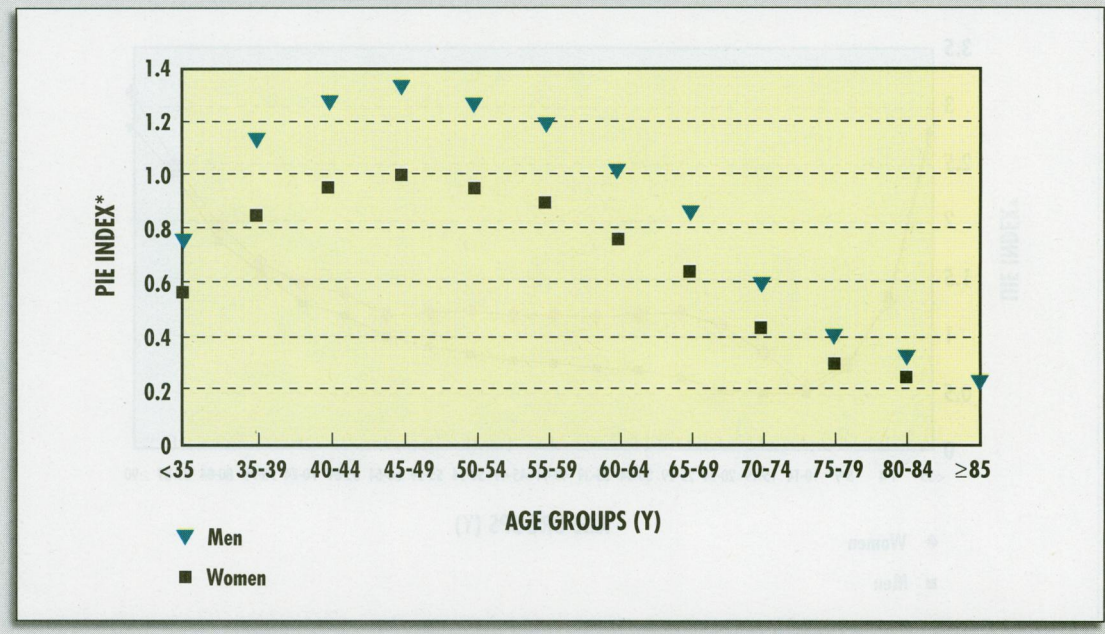
Individual counties were chosen as the unit of geographic analysis for three reasons: they are the next smallest geographic area after the province; the 49 counties of Ontario are large enough to show statistically significant regional variations in resource availability; and an array of demographic, socioeconomic, and health service data are currently available at the county level (such data can be used to adjust the stock of GPs and the number of inhabitants to provide a more accurate measure of access to GP services).

To compute measures of physician density for each county, we used four sources of data: number of GPs, intensity of GP practice, size of the population, and patterns of health care use. All data were obtained from the MOH for fiscal year 1990, except for estimates of each county's population. Population data were based on 1986 and 1991 Statistics Canada censuses augmented by data obtained from the Ministry of Treasury and Economics to account for the undernumeration of First Nations people.

The numbers and geographic distribution of active GPs were acquired from the MOH's Physician/Practitioner/Group Demographic File. All physicians who had active and unrestricted status codes, were residents of Ontario, had a specialty code of general practice (including family medicine), and whose age and sex were known were tabulated for each county for 1990, giving a selection of 10 499 practitioners, of whom 22.2% were women.

Intensity of practice was measured by age-specific Ontario Health Insurance Plan (OHIP) fee service claims in 1990. These claims were used, in conjunction with estimates of the practice intensity of female physicians, to create a GP practice intensity equivalent (PIE) index. (Actual OHIP payments were used to measure GP practice intensity instead of the arbitrary payment thresholds and special functional forms proposed by the Federal/Provincial Working Group, which might have introduced measurement bias.[5])

Figure 1. Practice intensity equivalent (PIE) indices of general practitioners by age and sex (1990)



**PIE index calculated around an average value of 1.0 for all practising GPs in Ontario. Practice intensity for women physicians was set at 75% relative to their male counterparts.*

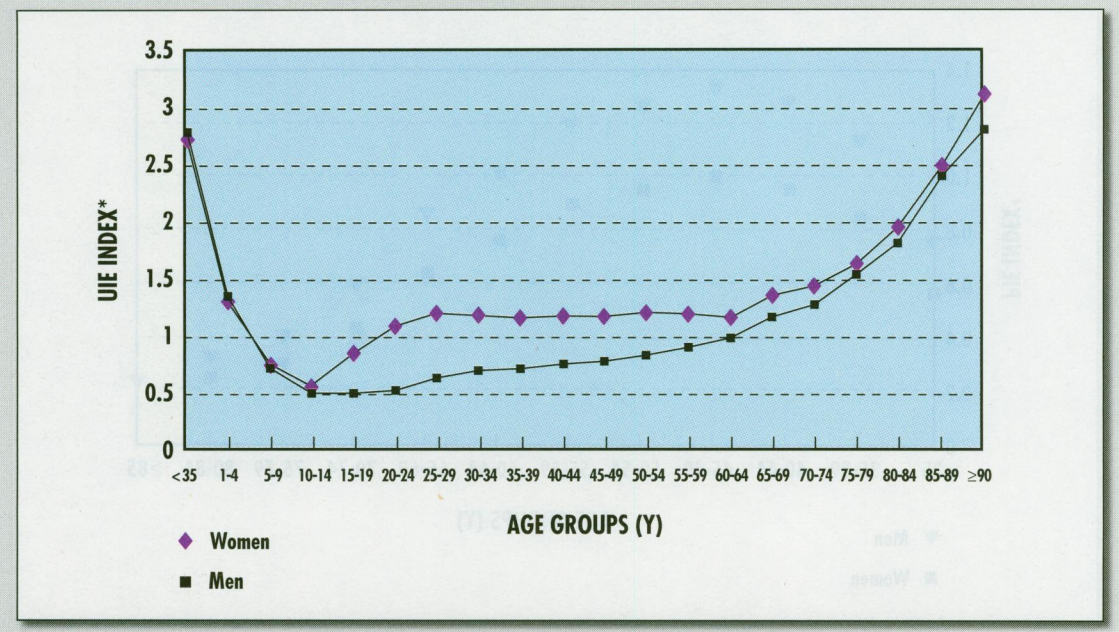
The PIE index used to adjust the number of GPs in each county for practice intensity was constructed in four phases. First, GPs were placed into 5-year age groups from age 35 to age 84 (inclusive). Two other age groups were included, one for GPs younger than 35 and one for GPs older than 84. Second, the number of GPs and average total OHIP fee service claims per GP in each age group were calculated for 1990. Third, average total OHIP fee service claims per GP in each age group was divided by average total OHIP fee service claims per GP for all GPs in Ontario to obtain the intensity of GP practice for each age group relative to all GPs in Ontario. Finally, separate practice intensities for male and female GPs were computed under three scenarios with practice intensity of female GPs defined as 50% of, 75% of, or the same as their male colleagues.

A range of relative practice intensities for female GPs was used to assess how sensitive physician densities were to these assumptions and to reflect current and future uncertainty about estimates of female GPs' practice.[6,7] The few studies addressing the relative practice intensity of female GPs have estimated intensities of 50%,[8,9] 73%,[3] and 78%.[7] Since the GP densities reported in our study were not sensitive to variations in the relative practice intensity of female GPs (because they constituted only 22.2% of all GPs),[8,9] we report results only as though female GPs had an intensity of 75% of their male counterparts.

Figure 1 presents the PIE index for GPs by age and sex based on OHIP fee service claims in 1990. Practice intensity increases after graduation, peaks between 45 and 49 years, and then falls. Male GPs aged 35 to 59 have above average practice intensities, while other GPs, including all female GPs, have practice intensities below average.

While the PIE index provides an opportunity to adjust the supply of GPs to reflect variations in service provision, similar methods were used to adjust the size of the population for patterns of health care use. Specifically, use by age and sex were measured by per capita OHIP fee service claims in 1990 for selected fee service codes. Only codes that accounted for at least 1% of all OHIP payments for each age-sex stratum were included to minimize random variations in use. These codes, which included OHIP-funded services for office and long-term care consultations, counseling, and inpatient and emergency care, accounted for 73.6% of all OHIP payments to GPs. (A list of the selected codes is available from the

Figure 2. Use intensity equivalent (UIE) indices of the population by age and sex (1990)



**The UIE index was calculated around an average value of 1.0 for the total population of Ontario.*

authors.) These claims were used to create a GP use intensity equivalent (UIE) index.

The UIE index was constructed in three steps. First, OHIP beneficiaries, by sex, were placed into 5-year age groups from age 5 to 84 (inclusive). Three other age groups were included: older than 84 years, age 1 to 5 years, and younger than 1 year. Second, per capita OHIP fee service claims for each age-sex stratum were calculated for the selected fee service codes, by dividing total OHIP fee service claims by the provincial population in each stratum. Third, per capita OHIP fee service claims for each age-sex stratum were divided by per capita OHIP fee service claims for all age-sex strata to obtain intensity of patient use for each age-sex stratum relative to that of all OHIP beneficiaries.

Figure 2 presents the UIE index for each age-sex stratum relative to that for all OHIP beneficiaries. Men and women have similar GP use patterns over their life cycles with a steep decline in GP use relative to the OHIP average from birth to 14 years and a steady increase thereafter, particularly after age 64. Until age 14, girls and boys used GPs almost identically, but after that use patterns diverged, with the difference potentially attributable to obstetric and gynecologic services.

Physician densities were measured for each county as the ratio of PIE GPs to UIE county inhabitants. (Specifically, the stratum-specific GP population of each county was multiplied by the stratum-specific PIE index and summed across each age-sex stratum to obtain the number of PIE GPs. The stratum-specific population of each county was multiplied by the stratum-specific UIE index and summed across each age-sex stratum to obtain the number of UIE inhabitants.)

We used χ^2 tests to assess regional variations in physician densities using two-tailed P values.[10-15] County-specific tests of physician density that deviated from provincial density as a whole were conducted at a significance level of $P = 0.05/49 \approx 0.001$ to adjust for multiple comparisons and to achieve an overall significance level of $P = 0.05$.[12,14]

RESULTS

Without adjustment for GP practice intensity and the age-sex composition of the population, GP physician densities in Ontario vary widely. While there was on average one GP per 1000 people in 1990, densities for individual counties ranged from a low of 0.33 in Sudbury District to a high of 1.74 in Frontenac. The five counties in southern Ontario with teaching

health science centres reported the highest GP densities; some remote northern regions and some counties in southern Ontario had the lowest.

The difference in GP densities narrowed by more than 10% after adjusting for both practice intensity and the population's patterns of health use. Revised densities ranged from a low of 0.35 in Sudbury District to 1.61 in Frontenac. Adjusted and unadjusted densities were usually congruent (**Table 1**). Variations in practice intensity of female GPs relative to male GPs (from our baseline estimate of 75%) did not affect results.

Each Ontario county was allocated to one of three groups based on whether their adjusted GP densities were significantly ($P < 0.001$) above, below, or similar to the provincial average for 1990. All counties with teaching centres, except Hamilton-Wentworth, had significantly higher densities than the provincial average. Ten counties (Algoma District, Thunder Bay District, Peel, Waterloo, Niagara, Essex, Durham, Lambton, Oxford, and Haldimand-Norfolk) had densities significantly lower. Only two of these 10 counties were in remote northern regions, and these two counties accounted for only 10% of the population of all lower-density counties (**Figure 3**).

DISCUSSION

Studies have shown wide variation in type and amount of health care provided to similar patient populations.[13-24] If this is due to the uneven distribution of physicians, measures of physician density could assist resource planning by identifying areas that are significantly undersupplied or oversupplied.

To date, measures of the relative supply of physicians have been based on crude ratios of physicians to population.[4] This study looked at county-specific measures of GP density that adjust for intensity of practice and patterns of health care use.

Wide variations in GP densities across Ontario in 1990 narrowed after adjusting for practice intensity and the age-sex composition of the population. Counties with teaching centres consistently reported highest GP densities, while counties with GP densities significantly below the provincial average included two remote northern counties and eight southern counties. No evidence supported the contention that patients in remote regions were seriously underserved. This finding supports recent results from Quebec on the same issue.[25]

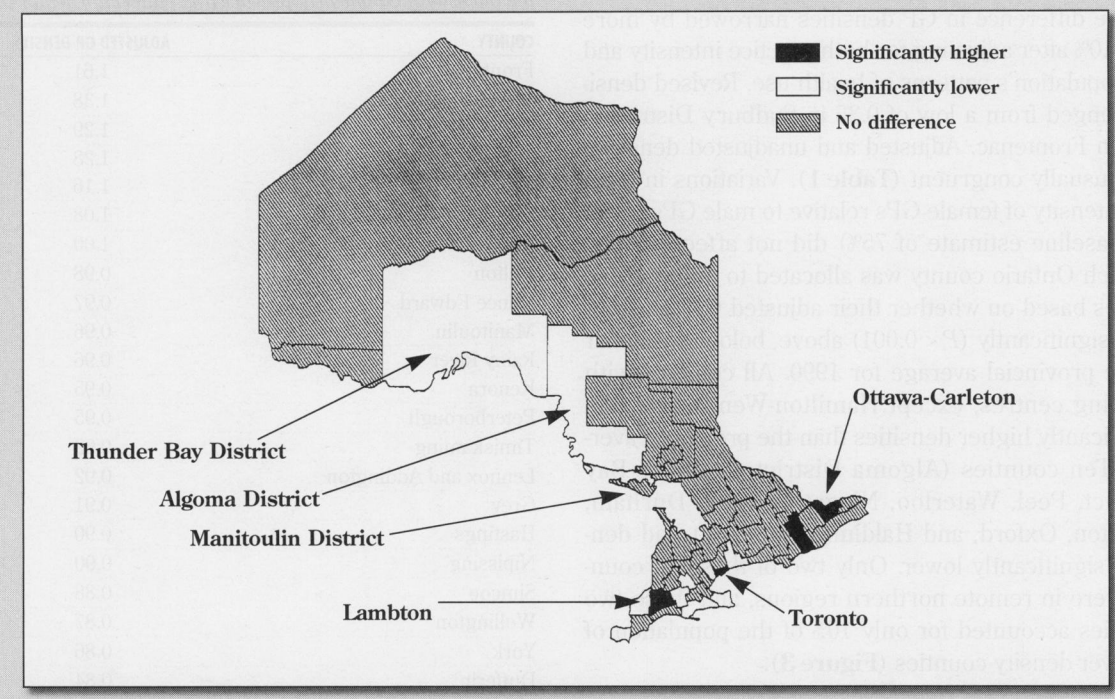
The proportion of female medical graduates has been increasing,[7,26,27] and women seem to select general rather than specialty practice.[7,27-29] In light of this

Table 1. County-specific GP densities per 1000 population in Ontario in 1990: *GP densities were adjusted for the intensity of GP medical practice and patterns of health care use*

COUNTY	ADJUSTED GP DENSITY
Frontenac*	1.61
Toronto*	1.38
Middlesex*	1.29
Ottawa-Carleton*	1.28
Lanark	1.16
Hamilton-Wentworth	1.08
Muskoka	1.00
Halton	0.98
Prince Edward	0.97
Manitoulin	0.96
Rainy River	0.96
Kenora	0.95
Peterborough	0.95
Timiskaming	0.92
Lennox and Addington	0.92
Grey	0.91
Hastings	0.90
Nipissing	0.90
Simcoe	0.88
Wellington	0.87
York	0.86
Dufferin	0.84
Huron	0.83
Perth	0.82
Cochrane	0.82
Renfrew	0.82
Prescott and Russell	0.81
Stormont, Dundas, Glengarry	0.80
Brant	0.80
Waterloo†	0.80
Leeds and Grenville	0.79
Bruce	0.79
Peel†	0.79
Niagara†	0.78
Parry Sound	0.77
Sudbury Regional	0.77
Northumberland	0.75
Haliburton	0.72
Kent	0.71
Victoria	0.70
Essex†	0.69
Algoma†	0.69
Thunder Bay†	0.68
Lambton†	0.68
Oxford†	0.66
Elgin	0.65
Durham†	0.64
Haldiman-Norfolk†	0.58
Sudbury District	0.35
ONTARIO	1.00

**Significantly higher GP density than the provincial average, $P < 0.001$.*
†Significantly lower GP density than the provincial average, $P < 0.001$.

Figure 3. Adjusted densities of GPs compared with average density in Ontario



and research noting differences in the way men and women practise medicine,[30,31] our study adjusted GP densities for differences in the relative practice intensity of female GPs. Our results, however, suggest that density was not sensitive to even wide variations in the relative practice intensity of female GPs.

Limitations

There are five main limitations to report. First, while GP densities were adjusted for the relative practice intensity of female GPs, these relative practice intensities were applied uniformly to all female GPs irrespective of age. While some evidence supports this assumption,[3] recent research suggests that the age–practice intensity profile is different for male and female physicians.[6,7,27,29] (Female physicians working part-time were generally younger than 45, while most male physicians working part-time were older than 54.[27])

Second, to derive the UIE index, only fee codes that accounted for at least 1% of total OHIP payments in 1990 for each specific age-sex population stratum were used. While these codes accounted for 73.6% of all OHIP payments to GPs, some GP services in each stratum were not captured in this data. However, as long as the GP use index reflects the relative use of GP services by people in each age-sex stratum, the UIE index would not be affected by inclusion of the additional OHIP payments to GPs.

Third, the UIE index was based on provincial data and might not reflect patterns of use in all locations. For instance, if GPs in some communities offered more than the usual range of services or if other (non–OHIP-funded) health professionals provided GP-type services, the UIE index would underestimate the demands on GP-type providers and overestimate the adjusted GP density. Conversely, if GPs offered a narrower range of services, the opposite bias would occur.

Fourth, adjustments for GP practice intensity and for the composition of the population, while an improvement over crude measures of relative access to GP services, could be poor measures of access in large and sparsely populated counties.

Finally, the distribution of active GPs was based on information acquired from the MOH's Physician/Practitioner/Group Demographic File. Addresses contained in this file were used to assign each GP to only one of the 49 counties in Ontario, even if patients came from many counties and GPs practised in many locations. No evidence, however, suggested a systematic tendency to assign GPs to counties other than the ones in which they provided services.

Provincial data on GP practice intensity and patterns of use were applied to all counties. However, because each county is not necessarily a microcosm of the province, our inferences could be inaccurate.[32-35] This study provides only an initial step in the identification of regional variations.

The MOH has indicated that GPs are urgently needed in communities in northern and southern Ontario. Our results suggest that fewer than 30% of the communities supposedly in urgent need were in counties with adjusted densities significantly ($P < 0.001$) below the provincial average, though all were below. More than 70% of vacancies were in counties with adjusted densities similar to the provincial average. Either individual counties are at too high a level of aggregation for meaningful discussions of human resource needs or the MOH inaccurately identified communities in urgent need.

Given difficulties in defining the relative availability of GPs, especially with respect to measures of unmet need,[34-36] health policies should be derived with care.[1] The techniques employed in this study, while potentially applicable to other specialties and jurisdictions, should be adopted with caution and should not be construed as a definition of ideal physician density.

Conclusion

This study tested a new method for measuring relative access to GPs in Ontario. The difficulties with physician-to-population ratios have been well documented in the literature. Recent attempts by the MOH to limit physicians' fees, billing numbers, and practice locations were based on crude GP densities. Our study demonstrated that, despite adjustment for GP practice intensity and the age-sex composition of the population, wide variations in GP densities persist. No evidence supported the contention that patients in remote regions were seriously underserved relative to the provincial average. When formulating policies for physician resource planning purposes, physician densities should serve as only a starting point for decision making and should be adjusted for practice intensity and patterns of health care use.

Acknowledgment

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Niche for practical guide to geriatrics

PROTOCOLS IN PRIMARY CARE GERIATRICS, 2ND ED

AUTHOR: John P. Sloan
Springer-Verlag New York, Inc,
175 Fifth Ave, 20th Floor, New York,
NY 10010 USA
1997/208 pp/$36 (US)

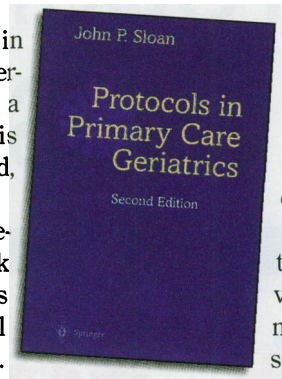
OVERALL RATING Good

STRENGTHS Gives the practical approach of a family physician experienced in providing health care to the elderly

WEAKNESSES Unusual organization, detail sacrificed for conciseness

AUDIENCE Primary care practitioners with little formal education in geriatrics

Dr Sloan has written an interesting book. The intended audience is "busy... primary care physicians." Those who would profit most from this book are indeed busy practitioners with little formal education in geriatrics, dealing with elderly patients, and wanting a "quick read." The book is accurate, short, easy to read, and simple to use.



This book does not pretend to be a reference book or textbook. The author has an informal and colloquial style that is pleasant to read. The book is designed to accommodate different learning styles. It includes a short prose section, some case studies, and an outline of topics (in the form of notes). The use of mnemonics is clever and useful to those who can learn and remember them. The book is replete with "nuggets" of information. It reflects the practical approach of a family physician experienced in providing health care to the elderly.

The part on alcohol and abuse is very good. Initially I found the organization of the book unfamiliar. The content was generally good, but the section on driving provided little discussion on how to manage the delicate legal obligation (in some provinces) of reporting patients of concern to authorities.

Recognizing that the threshold for consultation varies among physicians, more comment on when to seek consultation might have been helpful.

Finally, more specific references for those seeking detailed information might be helpful, notwithstanding the general bibliography supplied.

Overall, I found the book good. It accomplishes its stated goals. It has its niche.

— J. Michael Szul, MD, CCFP

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RESEARCH

Distribution of physicians in Ontario

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