Emergency department use as a component of total ambulatory care: a population perspective

Evidence

Études

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Abstract

Objectives: (a) To describe the overall proportion of ambulatory care provided in emergency departments for a complete urban population, (b) to describe the variation across small geographic areas in the overall proportion of ambulatory care provided in emergency departments and (c) to identify attributes of small-area populations that are related to the provision of high proportions of total ambulatory care in emergency departments.

Design: Cross-sectional ecologic study combining 4 sources of secondary data on health service utilization and socioeconomic status.

Setting: Winnipeg.

Participants: A total of 657 871 residents of metropolitan Winnipeg in the period April 1991 to March 1992, grouped into 112 neighbourhoods.

Main outcome measure: A proportion calculated, for each neighbourhood population, from the estimated count of emergency department visits divided by the population's use of total ambulatory care for a sample of 55 days in the study period.

Results: The overall proportion of ambulatory care provided in emergency departments was 4.9% (range 2.6% to 10.8%), representing 35.5 emergency department visits per 100 person-years. Neighbourhoods with a higher proportion of total ambulatory care provided in emergency departments were characterized by lower mean household income, a higher proportion of emergency department visits for mental illness and a higher proportion of residents with treaty Indian status. Measures of need for medical care for were not consistently associated with the proportion of ambulatory care received in emergency departments.

Conclusions: In a health care system with an adequate supply of primary care physicians and universal insurance, this study has documented significant variation across small geographic areas in the proportion of total ambulatory care received in emergency departments. In the absence of strong evidence that this variation was associated with underlying need, the results suggest that attention be paid to the accessibility of conventional primary care.

Résumé

Objectifs : a) Décrire la proportion globale des soins ambulatoires prodigués par les services d'urgence pour une entière population urbaine, b) décrire la variation entre des secteurs géographiques peu étendus dans la proportion globale des soins ambulatoires prodigués par les services d'urgence et c) définir les caractéristiques de populations de secteurs peu étendus qui sont liées à la prestation de proportions élevées de soins ambulatoires intégraux par les services d'urgence.

Conception : Étude écologique transversale combinant quatre sources de données secondaires sur l'utilisation des services de santé et la situation socio-économique.

Contexte : Winnipeg.

Participants : Au total, 657 871 résidents de la région métropolitaine de Winnipeg au cours de la période d'avril 1991 à mars 1992, regroupés en 112 quartiers.

Principale mesure de résultats : Une proportion fondée, pour la population de chaque quartier, sur le nombre estimatif de consultations à l'urgence divisé par l'utilisation totale qu'a faite la population des soins ambulatoires pendant l'échantillon de 55 jours au cours de la période d'étude.

Résultats : La proportion globale des soins ambulatoires prodigués par les services d'urgence a atteint 4,9 % (fourchette de 2,6 % à 10,8 %), ce qui représente 35,5 consultations à l'urgence par 100 années-personnes. Dans les quartiers où la proportion totale des soins ambulatoires fournis par les services d'urgence était plus élevée, le revenu moyen des ménages était plus bas, on consultait davantage les services d'urgence pour des maladies mentales et la population comptait une plus grande proportion d'Indiens inscrits. On n'a pas établi de lien clair entre les mesures du besoin de soins médicaux et la proportion des soins ambulatoires reçus aux services d'urgence.

Conclusions : Dans un système de soins de santé où le nombre des médecins de premier recours est suffisant et où il existe un régime d'une assurance universelle, cette étude fait ressortir une variation importante entre des secteurs géographiques restreints quant à la proportion totale des soins ambulatoires reçus dans les services d'urgence. Comme il n'y a pas de données probantes solides pour démontrer un lien entre cette variation et le besoin sous-jacent, les résultats indiquent qu'il faut tenir compte de l'accessibilité des soins primaires ordinaires.

Emergency departments have 2 core functions in an integrated primary care system: the provision of specialized clinical skills focused on the assessment and management of urgent or emergent medical needs, and the provision of continuous 24-hour access to primary care services. These are important primary care roles; recent Canadian estimates suggest that 15% to 25% of urban populations will use emergency department services at least once in a 12-month period.[1,2]

Attention has been focused on aspects of the use of emergency services that appear to be incongruent with the specialized role of emergency departments in the continuum of primary care. A considerable proportion of emergency department contacts, for example, represents nonurgent need for medical care.[3–8] In some settings, especially among uninsured people in populations without universal insurance coverage, hospital emergency departments may function as the regular source of primary care.[9–11] Studies describing the use of emergency departments across small geographic areas have documented relatively strong variation in use rates.[2,6,12,13] These studies, which typically construct rates of emergency department use per unit of population, have shown associations with population characteristics, which suggests that this geographic variation can be attributed in part to the distribution of need across areas.

To improve the information currently available on population use of emergency departments in the Canadian health care system, we carried out a study in a large metropolitan community. Our objectives were (a) to describe the overall proportion of ambulatory care provided in emergency departments for a complete urban population,(b) to describe the variation across small geographic areas in the overall proportion of ambulatory care provided in emergency departments and (c) to identify attributes of small-area populations that are related to the provision of high proportions of total ambulatory care in emergency departments.

The measure of interest in our study, the proportion of total ambulatory care used by a population provided in the emergency department, represents a novel and potentially useful approach to describing the use of emergency departments. Conceptually, the study considers emergency department use to be a component of ambulatory care. The determinants of emergency department use are organized to be consistent with Andersen and Newman's framework of predisposing, enabling and need characteristics.[14] By expressing emergency department use as a proportion of total ambulatory care, we focus on variation in the site of ambulatory care delivery rather than on simple variation in the crude rate of emergency department use.

In designing this study we hypothesized that the proportion of total ambulatory care provided by emergency departments varies across neighbourhoods and that characteristics of these small-area populations associated with this variation include age structure, the underlying need characteristics of the population, measures of socioeconomic status and distance to the emergency department. Although differences across small areas in the supply of physicians in primary care practice may also be relevant, we did not measure this characteristic.

Methods

Population and study period

The population for this study comprised the 657 871 residents of the City of Winnipeg in the period April 1991 to March 1992. This period corresponds to the sample frame used in a previous investigation describing the use of 8 emergency departments in Winnipeg hospitals, which estimated that 230 500 emergency department encounters occurred in this 12-month period.[8] The rate of emergency department use estimated from that study, 35.5 visits per 100 person-years, is generally consistent with estimates from US survey sources.[7] The annual use rate for ambulatory care in this setting, age-adjusted to the provincial population distribution, has been estimated to be 507 physician visits per 100 person-years.[15]

Sources of data

Data for this study were obtained from 4 sources: registration files of the Manitoba Health Services Insurance Plan (MHSIP), computerized records of physician reimbursement claims maintained by MHSIP, information abstracted from a 55-day sample of 8767 emergency department charts, and public use files from the 1991 Canadian census.

The MHSIP registration file contains a record for every person registered to receive insured services in the province and records birthdate, sex and geographic location of residence. We used information from this file to develop population denominators.

All records of physician reimbursement for ambulatory care provided to residents of Winnipeg under fee-for-service arrangement were selected from the MHSIP master file. Ambulatory care was defined as services provided by general practitioners and specialists in physician offices, outpatient hospital settings, emergency departments or the patient's home. By including ambulatory visits to specialists, the study consolidated both primary and consultative care. During the study period physicians in 5 of the 8 emergency departments provided services through a salary agreement; these encounters were therefore not documented in the file of fee-for-service physician reimbursement claims.

To acquire information on emergency department use, we developed a 2-stage stratified systematic sample of emergency department charts. To construct this sample, we obtained emergency department logs recording consecutive visits by patients presenting for care from the 8 urban hospital emergency departments for a sample of 55 days between Apr. 1, 1991, and Mar. 31, 1992. From these logs we selected a systematic sample of every third case for visits between midnight and 8 am, and every fifth case for visits between 8 am and midnight. The charts for these sampled cases were then obtained from the hospital medical record department, abstracted by a group of 4 trained staff and entered in an electronic database. On the basis of the known probability of sampling, we developed sample weights for each record that provided estimates of annual emergency department use for this population. A detailed description of the sampling and abstracting procedures is available elsewhere.[8]

We obtained files describing the social and economic characteristics of each census enumeration area in Winnipeg from public sources. Public use census resources include a conversion file linking postal codes to the census geography. This file contains latitude and longitude measures for each geographic unit, which allows calculation of distances between geographic areas.

Measures

As an ecologic study, the unit of observation was defined as geographically defined populations. Geographic neighbourhoods were formed from clusters of contiguous 6-digit postal codes, based on the first 4 digits of the postal code.[16] This method produced 112 geographically contiguous neighbourhoods, with a mean neighbourhood population of 5900 (standard deviation 734). Postal code clusters that contained fewer than 100 people or fewer than 20 visits to the emergency department were excluded from analysis because of the potential for instability in the estimates of emergency department use. Less than 1% of the population and 1.7% of emergency department visits were excluded on the basis of these criteria.

The dependent variable in this study was calculated as the weighted estimate of emergency department visits for the 55-day sample period obtained from the sample of charts, divided by the population's use of total ambulatory care for the same 55 days. This rate was computed for each of the 112 neighbourhoods. A potential bias arises if emergency department use at the 5 sites where physicians provided services through a salary agreement is omitted from the calculation of the denominator measure of total ambulatory care for each geographic neighbourhood. To incorporate this missing information, we computed estimates of use at these 5 emergency departments, for each of the 112 geographic units, from the sample of emergency department charts and added the estimates to the denominator measure of total ambulatory care.

For each geographic area we calculated the following independent variables, categorized according to Andersen and Newman's model of the determinants of health service use:[14] predisposing factors, enabling factors and need factors.

For the predisposing factors, 4 demographic measures were computed for each of the 112 neighbourhoods: the proportion of the population that was female, the proportion under the age of 15 years, the proportion over the age of 65 years and the proportion with treaty Indian status.

For the enabling factors, we calculated the distance to the emergency department for each geographic area from latitude and longitude coordinates provided on the postal code conversion file of the public use census data.[17] From these data, we computed the weighted average distance travelled per postal code cluster as follows. The distance from the postal code cluster to a given hospital was multiplied by the number of emergency department visits to that site. For each postal code cluster, these results were summed across all emergency departments and divided by the total number of emergency department visits in each cluster, producing a measure of the weighted average distance travelled per postal code cluster.[2] Mean household income for each neighbourhood was calculated from 1991 public use census data.[16,18–20] In addition, we created a measure of temporal access to ambulatory care services by computing the proportion of emergency department visits during normal physician hours, designated as 9 am to 5 pm.[6,12]

Four characteristics of emergency department use were developed as crude indicators of population need for emergency care: the proportion of emergency department visits that were urgent or emergent, as classified by emergency department staff; the proportion of emergency department visits that resulted in admission to hospital; the proportion of total emergency department visits in which an injury diagnosis (ICD-9-CM 800–999[21]) was recorded; and the proportion of total emergency department visits in which a mental illness diagnosis (ICD-9-CM 290–319) was recorded. In addition, we obtained a measure of the extent of use of ambulatory services for mental illness by computing the proportion of all ambulatory visits for mental illnesses.

Statistical analysis

The rate of emergency department visits per 100 ambulatory visits was assumed to be a continuous measure. The distributional characteristics of this measure were verified as satisfying the assumptions of linear regression analysis. We computed Pearson correlation coefficients for variables of interest and conducted collinearity diagnostics in fitting the regression models.

We used univariate and multivariate linear regression models to estimate predictors of variation in the rate of emergency department visits per 100 ambulatory visits. Interactions between household income and other significant variables were tested to assess the influence of socioeconomic status on other factors in predicting emergency department use.

Results

The study population of 657 871 residents of Winnipeg made 677 661 ambulatory visits in the 55 days sampled for this study. In this same period the population had an estimated 33 441 emergency department contacts (35.5 emergency department visits per 100 person-years). The overall proportion of ambulatory care provided by emergency departments was 4.9%; the proportion varied across neighbourhoods, ranging from 2.6% to 10.8% (Fig. 1). Approximately 45% of emergency department visits were urgent or emergent, 13% resulted in hospital admission, 37% were associated with an injury diagnosis, 3% were associated with a diagnosis of mental illness, and 46% occurred during physician office hours.

The demographic characteristics of people residing in the 112 study neighbourhoods were, on average, as follows: 52% female, 20% less than 15 years old, 14% more than 65 years old and 2.2% treaty Indian status (Table 1). The mean neighbourhood income was $44 242. A total of 5.5% of all ambulatory contacts with physicians in these neighbourhoods were for the treatment of mental health disorders.

As expected, neighbourhoods that had high overall rates of ambulatory care use also had high rates of emergency department contact. At the neighbourhood level the correlation of total ambulatory contacts per 1000 population and emergency department contacts per 1000 population was 0.86 ($p < 0.001$). Also as expected, the proportion of total ambulatory care provided in emergency departments and the rate of total ambulatory contacts per 1000 population were not correlated ($r = -0.05$, $p = 0.63$). The correlation among predisposing, enabling and need factors confirmed prior expectations: for example, neighbourhoods with a larger proportion of older people had a higher proportion of female residents and also had a higher proportion of emergency department visits resulting in hospital admission (data not shown).

Table 2 shows the associations between neighbourhood characteristics and emergency department use per 100 ambulatory visits estimated from univariate and multivariate regressions. In the univariate analysis a higher proportion of ambulatory care was provided by emergency departments in neighbourhoods with a larger proportion of female residents ($p = 0.038$) or a greater proportion of residents with treaty Indian status ($p < 0.001$). Neighbourhood age characteristics were not associated with variation in the proportion of total ambulatory care provided in the emergency department. Distance to the emergency department and mean neighbourhood household income were inversely related to the proportion of total ambulatory care provided in emergency departments ($p < 0.001$). Finally, neighbourhoods with a higher proportion of ur-

gent emergency department visits ($p < 0.001$) or a larger proportion of visits for mental illness ($p < 0.001$) were significantly more likely to have a higher proportion of total ambulatory care in emergency departments.

In the multivariate model 4 factors explained 52% of the variation in the proportion of total ambulatory care provided in emergency departments: the proportion of the population with treaty Indian status, the mean neighbourhood household income, the proportion of emergency department visits for mental illness and the proportion of total ambulatory visits for mental illness (Table 2). Neighbourhood sex distribution, the proportion of emergency department visits classified as urgent or emergent, and distance to the emergency department were not significant predictors of emergency department use.

Discussion

The estimated rate of emergency department visits observed in our study, 35.5 per 100 person-years, is in agreement with estimates from typical urban North American settings.[1,7] The emergency department visits were also similar to other descriptive accounts in the proportion of visits that were urgent, that resulted in hospital admission and that were related to injury or mental illness.[7]

Two different explanations can be considered for the observed variation across neighbourhoods in the proportion of total ambulatory care provided by emergency departments. The first hypothesis would propose that populations differ in the proportion of total need for ambulatory care that presents as urgent or emergent acute medical events. Populations experiencing a higher proportion of urgent medical needs relative to their total need for ambulatory care would be expected to receive a higher proportion of total ambulatory care in emergency departments.

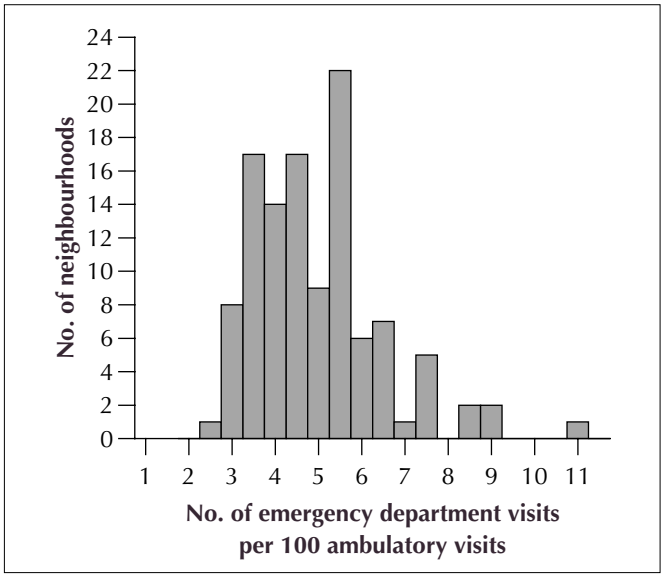

Fig. 1: Distribution of emergency department visits per 100 ambulatory visits across the 112 Winnipeg neighbourhoods between April 1991 and March 1992.

We did not identify evidence in support of this hypothesis. For example, populations with a larger proportion of elderly residents, which might be expected to have a higher incidence of urgent or emergent medical events as a proportion of total need for ambulatory care, were not found to receive a higher proportion of total ambulatory care in emergency departments. Similarly, the proportion of a population's emergency department visits that resulted in hospital admission and the proportion of visits classified as urgent or emergent were not associated with the proportion of total ambulatory care provided in emergency departments. Although differences in need across populations are clearly expected to influence the rate of emergency department visits when measured on a population denominator, in our study measures of need were not associated with variation in the proportion of total ambulatory care provided in emergency departments.

An alternative set of explanations may rest with hypotheses concerning the structural features of the distribution of primary health care providers and, separately, patients' attitudes and preferences regarding primary care.

Table 1: Measures of use of emergency departments for 112 neighbourhoods in Winnipeg between April 1991 and March 1992

Measure	Sample mean (and standard deviation)	
Population	5 874	(734)
No. of emergency department visits per 1000 population*	52.1	(17.2)
No. of ambulatory visits per 100 population*	104.3	(9.9)
No. of emergency department visits per 100 ambulatory visits	4.9	(1.4)
Predisposing factors		
% of population female	51.5	(3.1)
% of population aged < 15 yr	20.0	(5.5)
% of population aged > 65 yr	13.8	(8.9)
% of population with treaty Indian status	2.2	(3.6)
Enabling factors		
Distance to emergency department, km†	12.7	(3.6)
Household income, $	44 242	(14 690)
% of emergency department visits made during physician office hours	46.2	(8.7)
Need factors		
% of emergency department visits		
Urgent or emergent	44.9	(13.9)
Resulting in hospital admission	13.3	(7.0)
Associated with injury diagnosis	36.9	(8.9)
Associated with mental illness diagnosis	2.8	(2.9)
% of ambulatory visits associated with mental illness diagnosis	5.5	(1.7)

*Mean number of visits in a 55-day sample period.
†Mean weighted distance to emergency department. See Methods section.

In our study mean neighbourhood household income was strongly and inversely related to the proportion of total ambulatory care received in the emergency department, and this association was independent of the available indicators of need for medical care. This finding is consistent with the results of several other studies.[1,2,6] Time constraints imposed by occupational conditions or number of parents in the home may limit the ability of socioeconomically disadvantaged households to use conventional primary care. For example, in results reported from the Ontario Health Survey, children in single-parent households were 1.4 times more likely to visit the emergency department than those in 2-parent households.[1] In another study, from Manitoba, children in lower income neighbourhoods had poorer continuity of primary care than those in median and upper income neighbourhoods.[22]

Although not measured in our study, it may be useful to consider the role of patients' attitudes and preferences regarding primary care. Households that select emergency departments as the regular source of primary care may be expressing preferences that, although discordant with clinical perspectives on the role of the emergency department, may be congruent with their cultural and social experience. In an ecologic study Shah-Canning and colleagues[23] found that neighbourhoods with a higher proportion of aboriginal residents received a greater proportion of total ambulatory care in emergency departments.

In addition, the geographic distribution of primary care providers is a potentially important structural feature of primary care that may be expected to influence the use of emergency departments. There are substantial conceptual challenges to implementing a simple measure of physician density at the small neighbourhood level of aggregation described in our study. It would be appropriate to address these issues in more detail in future research.

It is also important to acknowledge the substantial potential for analytic and inferential error arising from ecologic study designs.[24] Further research at the individual level is required to confirm the magnitude and direction of associations observed at the neighbourhood level in this study.

Our study has presented a description of emergency department use as a component of a population's total use of ambulatory care. We have argued that the variation across neighbourhoods in the proportion of total ambulatory care provided in the emergency department does not appear to be strongly related to underlying differences in populations' need for urgent and emergent acute medical care. Instead, our findings indicate that it may be appropriate to focus on constraints associated with the organization and delivery of primary care in socioeconomically disadvantaged communities. Large reductions in emergency department use have been reported in Medicaid demonstration programs of primary care management in the US.[9] Similar innovative approaches may be indicated in Canadian urban settings.

Table 2: Association of neighbourhood predisposing, enabling and need factors with the rate of emergency department contact per 100 ambulatory visits

	Univariate linear regression				Multivariate linear regression			
Measure	r^2	β	SE*	*p* value†	r^2	β	SE*	*p* value
Predisposing factors								
% of population female	0.039	–0.092	0.044	0.038	–			
% of population aged < 15 yr	0.007	0.022	0.025	NS	–			
% of population aged > 65 yr	0.008	0.014	0.015	NS	–			
% of population with treaty Indian status	0.412	0.258	0.029	< 0.001	0.188	0.171	0.034	< 0.001
Enabling factors								
Distance to emergency department, km‡	0.238	–0.194	0.033	< 0.001	–			
Mean household income ($10 000)	0.363	–0.595	0.075	< 0.001	0.112	–0.314	0.086	< 0.001
% of emergency department visits made during physician office hours	0.003	0.009	0.016	NS	–			
Need factors								
% of emergency department visits								
Urgent or emergent	0.116	0.036	0.009	< 0.001	–			
Resulting in hospital admission	0.002	–0.009	0.020	NS	–			
Associated with injury diagnosis	0.031	0.029	0.015	NS	–			
Associated with mental illness diagnosis	0.125	0.174	0.044	< 0.001	0.038	0.080	0.039	0.043
% of ambulatory visits associated with mental illness diagnosis	0.001	0.029	0.084	NS	0.052	–0.158	0.065	0.018
Model R^2					0.52			

*SE = standard error.
†NS = not significant.
‡Mean weighted distance to emergency department. See Methods section.

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