RESEARCH PAPER

Primary Care Organization and Outcomes of an Emergency Visit among Seniors

Organisation des soins primaires et résultats pour les aînés qui se rendent dans les services des urgences pour consultation

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Abstract

This study explored whether organizational characteristics of primary care services provided by area of residence in two Quebec regions are related to outcomes of an emergency department (ED) visit among seniors discharged home. Provincial administrative databases on a sample of seniors who made an ED visit and their 30-day outcomes were linked by area of residence to data from a survey of key informants from primary care clinics. Measures of organizational characteristics included three scales derived from principal components analysis and one theoretically derived global score that measured the degree of conformity to characteristics of ideal emerging primary care models. In multivariate analyses, adjusting for patient characteristics, patients living in areas in the lowest quartile for the global score had higher rates of return ED visits without hospitalization. Emerging primary care organizational models along the lines currently being pursued in Quebec may help to reduce the growing burden of ED care of seniors.

Résumé

Cette étude avait comme objectif de voir si les caractéristiques de l'organisation des soins primaires offerts selon les zones de résidence, dans deux régions du Québec, sont liées aux résultats obtenus dans les services des urgences (SU) pour les aînés qui

y ont reçu un congé après une consultation. Les données administratives provinciales portant sur un échantillon d'aînés qui se sont rendus aux SU pour consultation, ainsi que les résultats obtenus au cours de 30 jours suivant la consultation, ont été mises en relation (en fonction des zones de résidence) avec les données d'un sondage mené auprès d'informateurs clés provenant des cliniques de soins primaires. Les mesures des caractéristiques de l'organisation comprenaient trois échelles dérivées de l'analyse en composantes principales ainsi qu'une note globale, dérivée théoriquement, qui a servi à mesurer le degré de conformité face aux caractéristiques des modèles idéaux émergeants pour les soins primaires. Selon les analyses multivariables, ajustées en fonction des caractéristiques des patients, les résidents des zones qui ont obtenu le plus faible quartile pour la note globale avaient de plus haut taux de retour aux SU sans hospitalisation. Les modèles émergeants pour l'organisation des soins primaires qui sont conformes aux lignes directrices actuellement favorisées au Québec peuvent contribuer à réduire le fardeau grandissant des soins pour les aînés dans les SU.

Reform of healthcare services in many countries focuses on improving the accessibility and continuity of primary care. One of the effects of a more functional primary care system may be a reduction in visits to the emergency department (ED). Indeed, surveys in seven industrialized countries have found that Canadians report the longest waiting times to get a doctor's appointment, the highest rate of ED visits for conditions that could have been treated by a regular doctor if available and the longest waiting time in the ED before being treated (Schoen et al. 2005, 2007). Furthermore, ED visits have been linked to such characteristics of primary care as continuity, accessibility and comprehensiveness (Hansagi et al. 1991; Gill et al. 2000; Lowe et al. 2005; Haggerty et al. 2007).

These issues are critically important for seniors (defined here as ages 65 and over), whose higher levels of co-morbidity, physical and cognitive impairment, and polypharmacy make them particularly vulnerable to poor outcomes (McCusker et al. 1999). As in younger populations, there is evidence that indicators of reduced accessibility or continuity of primary care are associated with increased ED utilization (McCusker, Karp et al. 2003; Ionescu-Ittu et al. 2007). These studies used either self-reported measures of the type of primary care received, or derived such measures from administrative databases.

An alternative approach to identifying the relationships between characteristics of primary care and ED utilization is to compare different organizational models of primary care and their effect on ED visits. Such studies provide a more direct view of the organization of services, and have the potential to identify specific characteristics of the structure and process of care that are linked to ED visits. Intervention studies sug-

gest that geriatric assessment and management interventions conducted in ambulatory or home care settings result in a reduction in ED visits (McCusker and Verdon 2006). This research suggests that the integration into primary care of case management and use of multidisciplinary teams may be effective in reducing ED utilization among seniors. However, to date there is little empirical evidence to support this hypothesis.

A survey of the organization of primary care services in two regions of the province of Quebec – Montreal and Monteregie (Pineault et al. 2008) – presented the opportunity to investigate this question by linking survey data with a population-based administrative database assembled for a study of the safety of discharge of seniors from EDs (McCusker et al. 2008). The study was conducted in the context of the planned reorganization of primary care services in the province of Quebec. Reorganization includes the development of family medicine groups – groups of between six to 10 physicians who provide a basket of services to a registered population, including extended service hours (evenings and weekends), and who employ one or more nurses (Direction des communications du ministère de la santé et des services sociaux 2006; Haggerty et al. 2008). In large urban areas, network clinics have also been developed to complement family medicine groups. These clinics, generally larger than family medicine groups, aim to improve access to specialized care and services for other primary care clinics, particularly for vulnerable patients. Thus, the objective of the study was to explore whether organizational characteristics of primary care services provided in the patients' area of residence were related to outcomes of an ED visit (death, hospitalization, return ED visit without hospitalization, visit to the primary physician) among seniors discharged home. We hypothesized that, after adjustment for patient variables, certain characteristics of primary care (e.g., extended hours, use of nurses, case management) would be associated with fewer return ED visits and with more primary physician visits during the 30 days after an index ED visit.

Methods

The study used two levels of measurement, the individual patient and the community, respectively. At the individual level, we obtained individually linked administrative data for the two-year period from April 1, 2003 to March 31, 2005, from the provincial hospital discharge database (MedEcho) and from the physician billings, medication prescription and demographic databases (Régie de l'assurance maladie du Québec – RAMQ). At the community level, we used data from a survey of primary care clinics in 44 community health centre service areas, each with at least five participating clinics (Pineault et al. 2008). The area-based community measures were linked to the individual measures by area of residence. The study protocol was approved by the Commission d'accès à l'information and the Research Ethics Committee of St. Mary's Hospital.

Sample

The study sample comprised all patients aged 65 and over on April 1, 2003 who made an index ED visit (see "ED utilization measures," below) during the period February 1, 2004 to January 31, 2005. This period was selected for the main study in order to have 12 months of ED visits and a minimum of two months of follow-up after an index visit. Additional eligibility criteria for this study included residence in the Montreal or Monteregie regions of Quebec, non-residence in a long-term care facility and discharge home after the index ED visit.

ED utilization measures

The physician billing database contains billings from several types of ED, located in general hospitals, specialized hospitals and non-hospital settings (including stabilization centres). Because the billing database does not distinguish discrete ED visits, we used a validated measure of an ED visit as a sequence of up to three consecutive days with ED billings (Dendukuri et al. 2005; McCusker et al. 2007). The index visit was defined as an ED visit with no ED visit in the previous 30 days. Patients discharged home from the ED were defined as those with only a single day of ED billings and no hospital admission at the visit (McCusker et al. 2007).

Outcomes

We used a 30-day timeframe for the measurement of outcomes: death, emergency hospital admission, return ED visit without hospitalization and visit to the primary physician. The primary physician was identified with a previously validated algorithm (McCusker, Dendukuri et al. 2003) based on physician visits during the 12 months before the index ED visit. If no primary physician was identified, any visit to a general practitioner after the ED visit was considered a primary physician visit. We wished to distinguish among those outcomes that were more serious and less likely to be preventable by primary care (death or hospital admission), less serious and more likely to substitute for primary care (return ED visit with hospital admission) and those that were desirable (primary physician visit). Thus, a four-category outcome variable was defined whereby each patient was classified into the first level of the hierarchy that occurred: (a) death or hospital admission, (b) return to the ED without hospital admission, (c) visit to the primary physician and (d) none of these outcomes.

Patient characteristics

Social and demographic characteristics of patients included age, sex and socio-economic status (based on the patient's six-digit postal code, grouped into four categories,

from 1 [most deprived] to 4 [least deprived]) (Pampalon and Raymond 2000). Two measures of multi-morbidity were used, the Charlson Co-morbidity Index for administrative data, based on hospital discharge and ambulatory diagnoses during the 12 months before initial ED visit (D'Hoore et al. 1996), and the Chronic Disease Score, based on medication prescriptions (Von Korff et al. 1992), respectively. Diagnosis at index visit was classified as follows: injury, circulatory, respiratory, digestive, cancer, mental/nervous, other disease and symptoms or signs but no diagnosis. All diagnoses were based on codes from the International Classification of Disease (9th rev.). Prior health services utilization measures were based on the 12 months before the index visit: hospital days, ED visits not resulting in hospital admission, physician office visits. For patients whose index visit was in February or March 2004 and therefore had less than 12 months of prior data, these utilization measures were prorated to 12 months.

Primary care characteristics

The survey questionnaire (Hamel et al. 2007) was developed to measure significant organizational aspects of primary care, including dimensions of vision, structure, resources and practices, described in previous work (Lamarche et al. 2003; Haggerty et al. 2004; Hamel et al. 2007). The questionnaire was sent by mail to 665 primary care clinic directors (including solo practitioners), of whom 473 responded (response rate, 71%). Several strategies were used to attain this response rate: telephone follow-up, personal contacts by the investigators, certificate of participation for physicians. Response rates varied by study area, from 47%–85% in Montreal and 70%–100% in Monteregie, with a tendency to better participation in areas with fewer clinics. The key informant was either the manager or the most knowledgeable physician from the clinic. The following seven measures were abstracted from the questionnaire (please see Appendix for the original questions):

1. availability of walk-in services during weekends and weekday evenings
2. availability of services at night
3. proportion of consultations for walk-in clinics
4. availability of medical or nursing care at home
5. availability of case management for chronic disease
6. availability of a nurse in the clinic
7. whether continuity or accessibility is prioritized in the clinic

In addition, the number of general practitioners estimated to be working full-time at the clinic (at least 26 hours per week, the median number of hours of clinical activities reported for physicians at the clinics) was abstracted and used to weight the clinic results in the area-based measures.

A separate measure was obtained of the ratio of the total number of full-time general practitioners to the population of each of the 44 study areas. The numerator, number of worked hours by physicians, was derived from the survey, and the population denominator from the population census (Institut de la statistique du Québec 2005).

We used a global score that measured the degree to which each clinic conformed to the criteria for the two emerging primary care models, family medicine group and network clinic (see Appendix) (Pineault et al. 2007). The global score is based on 15 organizational characteristics that correspond to the ideal type of these models, grouped into four dimensions (Lamarche et al. 2003). These include: vision (e.g., priority given to accessibility and continuity), resources (e.g., number of information technologies), structure (e.g., participation in a subregional on-call system) and practices (e.g., proportion of consultations without an appointment). The total score is the sum of the 15 characteristics, with a possible score range from 0 to 15.

Statistical methods

Basic descriptive statistics were calculated for univariate analyses and for assessing the relationships between pairs of variables. Principal component analysis was used for multivariate description of the primary care characteristics (Khattree and Naik 2000). We retained components with eigenvalues greater than or equal to one. In order to improve the interpretation of results, we applied the varimax rotation to the original components. From the standardized rotated components, we defined scores by taking the average of the original variables with loadings with an absolute value of 0.40 or more.

The impact of risk factors and potential confounders on the outcome variables was modelled using multinomial logistic regression (Snijders and Bosker 1999). We used two-level models with area of residence defining the higher level and with a random intercept for taking into account the area of residence. All calculations were carried out in SAS 9.1 (PROC FACTOR for PCA and PROC NLMIXED for multinomial regression).

Results

Study sample characteristics

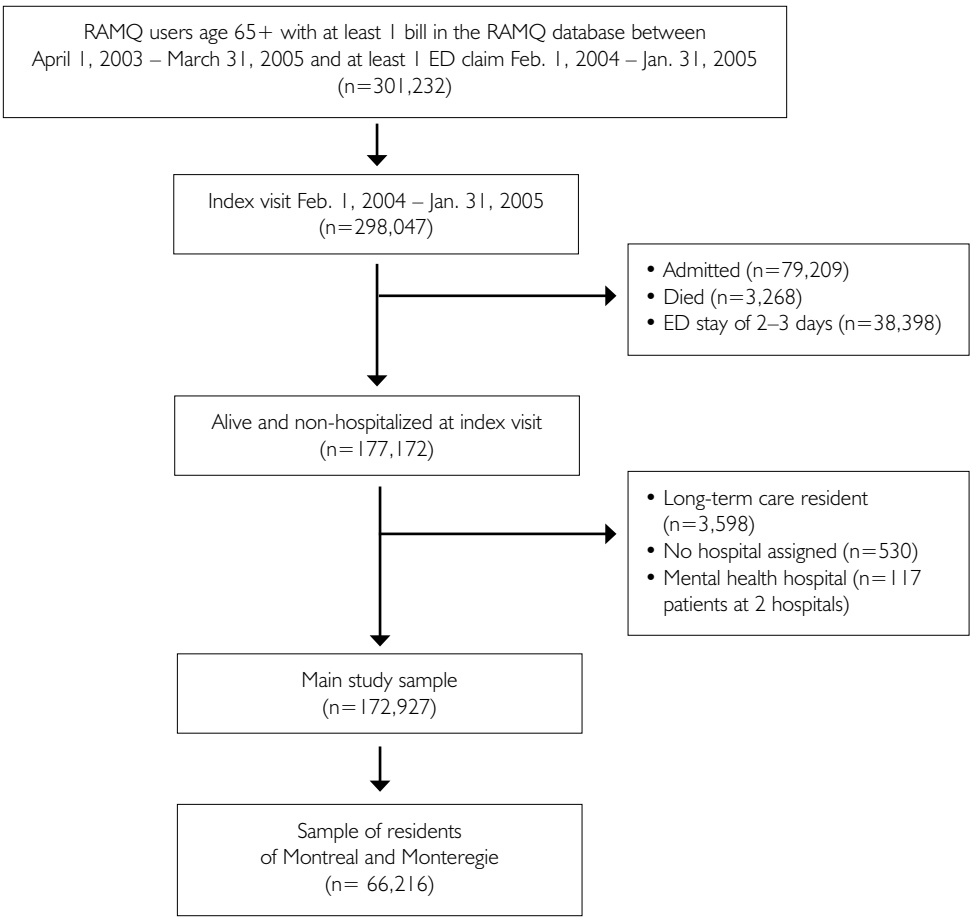
The study sample comprised 66,216 non-institutionalized residents of the Montreal and Monteregie regions aged 65 or over who made an ED index visit during a 12-month period (February 1, 2004 to January 31, 2005) to any Quebec adult, non-psychiatric ED and were discharged home (Figure 1). Selected characteristics of the sample are shown in Table 1.

TABLE 1. Characteristics of the study sample (n=66,216)

Variables	%
Age	42.8
65–74	42.8
75–84	42.5
85 and over	14.7
Female	59.2
Socio-economic status	
1 (lowest)	20.8
2	36.5
3	25.1
4 (highest)	11.1
missing	6.5
Charlson Co-morbidity Index	
0	51.0
1-2	32.0
3+	17.0
Chronic disease score	
0	23.8
1-5	29.5
6-9	24.8
10-27	21.9
Physician ambulatory visits*	
0	4.2
1-5	26.2
6-9	23.8
10-14	21.4
15+	24.5
Hospital days*	
0	84.8
1-5	6.2
6+	9.0
Emergency department visits*	
0	68.2
1	13.1
2+	18.7

* In the 12 months before the index visit, prorated for patients with less than 12 months of data.

FIGURE 1. Study flow chart



ED: Emergency department RAMQ: Régie de l'assurance maladie du Québec

Organizational characteristics factors

The principal components analysis found three factors (Table 2). Factor 1 had the strongest loadings on presence of a nurse, night services, home services and evening/weekend walk-in clinics. Factor 2 had the strongest loadings on chronic disease management and continuity. Factor 3 had the strongest loadings on proportion of walk-ins, evening/weekend walk-in clinics and accessibility. We named the factors: scope of services, continuity and accessibility. Pearson correlation coefficients among the three factors, the family medicine group score and the general practitioner-to-population ratio were mostly below 0.3. However, there were moderate correlations between the following pairs of variables: scope of services and family medicine group score (0.70), scope of services and accessibility (0.37) and a negative correlation between continuity and accessibility (–0.55). The general practitioner-to-population ratio was not correlated with the four primary care scores.

TABLE 2. Principal components analysis of seven area-based primary care characteristics (n=44)

Characteristic	Factor #1 loading* (Scope of services)	Factor #2 loading* (Continuity)	Factor #3 loading* (Accessibility)
1. Evening and weekend walk-in clinics	0.55	–0.05	0.60
2. Night services	0.62	–0.11	0.18
3. Proportion of walk-in consultations	–0.06	–0.04	0.91
4. Homecare (medical or nursing)	0.57	0.29	–0.10
5. Chronic disease management	–0.12	0.89	0.16
6. Clinic-based nurses	0.89	–0.09	–0.07
7. Accessibility prioritized over continuity	–0.12	–0.78	0.44
% of variance explained:	26.4%	21.6%	20.9%

* After varimax rotation.

Association of organizational factors with study outcomes

Overall, during the 30 days after the index ED visit, 6.1% of the sample died or were admitted to hospital, 12.7% returned to the ED but were not admitted and 17.5% did not return to the ED but visited their primary physician (Table 3). Table 3 shows the 30-day outcomes according to quartiles of the primary care area-based scores. In multivariate analyses, adjusting for patient characteristics and the general practitioner-to-population ratio, significant relationships with patient outcomes were found for three scales: the scope of services, continuity and global scales, when patients living in areas with the lowest quartile of scores on each scale were used as the comparison group (Table 4). Patients living in the highest quartile of scope of services were significantly less likely to visit their primary care physician. Those living in areas with the second- and fourth-highest quartile of continuity of services were significantly less likely to die or be admitted to hospital, and those in the third-highest quartile were less likely to visit their primary physician. Finally, patients living in areas with global scores in the second to fourth quartiles were significantly less likely to return to the ED. (The results of the univariate relationship between the four scales and the three outcomes were similar to the multivariate ones shown in Table 4.)

TABLE 3. Thirty-day outcomes by primary care scale quartiles

Scale and quartile	Number of areas	Number of patients	Death or hospital admission	ED return visit without hospital admission	Primary physician visit	None of these
OVERALL	44	66,216	6.1%	12.3%	27.5%	54.0%
Scope of services						
Very low	11	17,028	6.0%	12.7%	28.4%	53.0%
Low	11	17,695	6.2%	12.1%	28.8%	52.8%
High	11	16,791	5.9%	11.6%	28.6%	54.0%
Very high	11	14,702	6.5%	13.1%	23.7%	56.8%
Continuity						
Very low	11	19,222	6.4%	12.1%	28.8%	52.6%
Low	11	14,894	6.1%	12.1%	27.3%	54.5%
High	12	17,765	6.2%	12.7%	25.8%	55.3%
Very high	10	14,335	5.6%	12.5%	28.1%	53.8%
Accessibility						
Very low	11	15,081	5.4%	12.5%	28.0%	54.0%
Low	11	14,664	6.7%	12.2%	27.4%	53.6%
High	11	21,161	6.3%	12.3%	27.1%	54.4%
Very high	11	15,310	6.1%	12.4%	27.6%	53.9%
Global						
Very low	7	8,429	5.5%	14.8%	27.1%	52.6%
Low	18	29,410	6.3%	12.0%	28.6%	53.1%
High	10	17,382	6.3%	11.5%	28.5%	53.7%
Very high	9	10,995	6.0%	12.6%	23.3%	58.1%

ED: Emergency department

TABLE 4. Result of the multilevel, multinomial logistic regression models*

Scale and quartile	Death or hospital admission			ED visit without hospital admission			Primary physician visit		
	OR	95% CI	*p*-value	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Scope of services									
Very low	1.00			1.00			1.00		
Low	1.10	[0.90; 1.34]	0.381	0.93	[0.78; 1.10]	0.402	1.01	[0.86; 1.18]	0.911
High	0.95	[0.77; 1.17]	0.643	0.89	[0.74; 1.06]	0.203	1.08	[0.91; 1.27]	0.383
Very high	1.08	[0.89; 1.31]	0.45	0.93	[0.78; 1.10]	0.381	0.81	[0.70; 0.95]	0.012
Continuity									
Very low	1.00			1.00			1.00		
Low	0.81	[0.68; 0.98]	0.033	0.98	[0.82; 1.16]	0.795	0.85	[0.71; 1.00]	0.056
High	0.86	[0.72; 1.02]	0.092	0.97	[0.82; 1.14]	0.699	0.80	[0.68; 0.94]	0.009
Very high	0.80	[0.67; 0.97]	0.028	1.02	[0.85; 1.22]	0.853	0.94	[0.79; 1.12]	0.488
Accessibility									
Very low	1.00			1.00			1.00		
Low	1.22	[1.00; 1.49]	0.054	1.02	[0.85; 1.23]	0.794	1.06	[0.88; 1.27]	0.570
High	1.14	[0.95; 1.37]	0.178	0.97	[0.81; 1.15]	0.695	0.98	[0.82; 1.17]	0.790
Very high	1.16	[0.96; 1.40]	0.131	0.99	[0.83; 1.18]	0.917	1.02	[0.85; 1.22]	0.836
Global									
Very low	1.00			1.00			1.00		
Low	1.15	[0.93; 1.42]	0.202	0.79	[0.64; 0.97]	0.029	1.07	[0.89; 1.27]	0.483
High	1.16	[0.92; 1.46]	0.218	0.76	[0.61; 0.96]	0.026	1.07	[0.88; 1.30]	0.513
Very high	1.01	[0.79; 1.30]	0.911	0.77	[0.60; 0.97]	0.028	0.85	[0.69; 1.05]	0.135

* The outcome reference group is group with none of the specific outcomes. Random intercept is set for the area of residence. The models are adjusted for age, gender, socio-economic status, co-morbidity and ratio of general practitioners to population.

ED: Emergency department

OR: Odds ratio

Discussion

This study linked data from a survey of primary care clinics in two regions of the province of Quebec with administrative data on the 30-day outcomes of an ED visit among seniors discharged home. Four area-based measures of primary care characteristics were developed, three derived empirically from principal components analysis (measuring scope of services, continuity and accessibility, respectively) and one theoretically derived measure of conformity to characteristics of ideal emerging primary care models (the global score). With regard to return visits to the ED without hospitalization, patients living in areas with low global scores were more likely to return to the ED than those living in all other areas, even after adjustment for patient character-

istics and the availability of general practitioners. The other three primary care scores were unrelated to this outcome despite the fact that aspects of accessibility, continuity and scope of services were included in the global score, suggesting that it is the combination of services rather than individual components that may protect against ED utilization.

Relationships between primary care characteristics and the other two outcomes (death or hospital admission, and primary physician visit) were less consistent than the one between the global score and ED return visits. Patients living in the areas with the lowest continuity-of-care scores had worse outcomes (death or hospital admission) than those in two of the three higher quartiles, even after adjustment for patient characteristics and general practitioner availability. The continuity score was based on use of chronic disease management and the prioritization of continuity over accessibility. Lower continuity of care has previously been associated with higher rates of hospitalization (Gill and Mainous 1998). Only the continuity and scope-of-service scores were associated with visits to the primary physician. In both cases, areas with a higher score had reduced rates of this outcome in comparison to areas in the lowest quartile, but the effect was restricted to the highest quartile of scope of services and the third-highest quartile of continuity. These results were unexpected, as we had hypothesized that patients with better primary care would be more likely to follow up with their primary physician after an ED visit. Possibly, the 30-day time period was too short to capture this follow-up, as delays in getting an appointment may be even longer (Levesque et al. 2007). Also, the scope-of-services scale took into account whether nurses were used in primary care clinics and the provision of home care services. Possibly, in areas with better access to these latter services, patients may have followed up with a nurse rather than visit their physician.

This study contributes to the evidence base informing primary care reform. Although research from the perspective of the patient suggests that patients who experience better accessibility to and continuity of primary care are less likely to use EDs (Ionescu-Ittu et al. 2007), the evidence from studies that compare the relationships between different primary care models and ED utilization is limited and conflicting. For example, while some studies suggest that primary care clinics with extended hours have lower ED visit rates than those with limited hours (Lowe et al. 2005), other research has found that extended evening hours and increased availability of walk-in clinics do not reduce ED utilization (Coleman et al. 2001). This study suggests that increased availability alone does not reduce ED visits unless it is offered within a comprehensive framework (comprising such factors as shared vision, emphasis on continuity and innovative role of nurses) exemplified by the proposed primary care models and the global conformity scores used in this study.

Limitations

There are several limitations to this study. First, the primary care organizational variables were measured at the ecological (i.e., area-based) rather than at the individual level. Thus, patients might not receive primary care services in their area of residence, particularly those living in urban areas where they are close to other sources of care. The bias introduced by this approach is likely to be towards the null, perhaps accounting for the weak associations between some of the organizational factors and the outcome. Second, although the overall participation rate in the survey was 71%, very good for this type of survey, it is possible that lower participation rates in some regions gave biased estimates of the organizational characteristics of care in that region. Third, the use of administrative databases limited the ability to control for confounding variables (e.g., patient severity of illness at the index ED visit and whether the return ED visit was planned or not). Fourth, it was not possible to adjust for the particular ED used in this multilevel analysis, as these two levels are not nested. Finally, although the sample of patients was large, the sample of areas was modest (n=44), limiting the power of the study.

Conclusion

This study suggests that the development of primary care organizational models that offer a balance of desired attributes (e.g., comprehensiveness, continuity, accessibility) may help to reduce the growing burden of ED care of seniors; policies that favour single aspects (e.g., accessibility rather than continuity) may not have this effect. Further research is clearly warranted, particularly studies that examine health services utilization among people enrolled in these new models compared to those receiving other types of primary care.

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APPENDIX: QUESTIONS USED IN THE ANALYSIS OF PRIMARY CARE CHARACTERISTICS

(Response options are shown in italics)

1. Availability of walk-in services during weekends and weekday evenings
   (At your clinic):
   Do you offer walk-in services during weekends (*Saturday or Sunday*)? (*yes, no*)
   Do you offer walk-in services during weekday evenings? (*yes, no*)

2. Availability of services at night
   (At your clinic):
   Do you offer services at night? (*yes, no*)

3. Proportion of consultations for walk-in clinics
   Among all consultations at the clinic, what is the percentage for walk-in clinics? (*0%, 1%–25%, 26%–50%, 51%–75%, 76%–100%*)

4. Availability of medical or nursing care at home
   At your clinic, to what extent are the following services available:
   Medical or nursing care and services at a patient's home? (*Very, moderately, a little, not at all*)

5. Availability of case management for chronic disease
   At your clinic, do you offer specific case management and systematic approaches to care for people with chronic diseases (COPD, diabetes, etc.)? (*Always, often, sometimes, never*)

6. Availability of a nurse in the clinic
   What are the roles of the nurses on your medical team? (*There is no nurse on our team vs. any specific role checked or described*)

7. Whether continuity or accessibility is prioritized in the clinic
   Choose the one statement that corresponds best to your clinic's priorities regarding service organization (*Service accessibility is a higher priority; continuity of care for patients is a higher priority*)