Are Primary Healthcare Organizational Attributes Associated with Patient Self-Efficacy for Managing Chronic Disease?

Les caractéristiques organisationnelles des établissements de première ligne sont-elles associées aux autosoins chez les patients atteints de maladies chroniques?

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Abstract

Our objective was to explore how individual and primary healthcare (PHC) organizational attributes influence patients' ability in chronic illness self-management. We conducted a cohort study, recruiting 776 adults with chronic disease from 33 PHC settings in the province of Quebec. Organizational data on the PHC clinics were obtained from a prior study. Participants were interviewed at baseline, 6 and 12 months, responding to questionnaires on self-efficacy, health status, socio-demographics, healthcare use and experience of care. Multilevel modelling showed that 52.5% of the variance in self-efficacy occurs at the level of

the individual and 4.0% at the organizational level. Controlling for diagnosis, patient factors associated with self-efficacy were self-rated health (B coeff 0.76: CI 0.60; 0.92), concurrent depression (B coeff −1.41: CI 1.96; −0.86) and satisfaction with care (B coeff 0.27: CI 0.15; 0.39). None of the organizational attributes was significantly associated with self-efficacy after adjusting for lower-level variables. Patients generally reported receiving little self-management teaching across organizations.

Résumé

L'objectif était d'explorer l'influence des facteurs individuels et des caractéristiques organisation-nelles des établissements de première ligne sur les autosoins de maladies chroniques. L'étude portait sur 776 patients adultes atteints de maladie chronique et suivis dans 33 établissements de première ligne dans la province de Québec. Les données organisationnelles des cliniques de première ligne provenaient d'une étude antérieure. Les participants ont été interrogés au début de l'étude, puis après 6 et 12 mois, au moyen d'un questionnaire portant sur les autosoins, l'état de santé, les données sociodémographiques, l'utilisation des services et leur expérience en matière de services de santé. Une modélisation multiniveaux montre que 52,5 % de la variance d'autosoins se situe au niveau de l'individu et 4,0 % au niveau des cliniques. En contrôlant pour le diagnostic principal, les autres facteurs influents sont le niveau de santé perçu (coeff. 0,76: CI 0,60; 0,92), la co-occurrence d'une dépression (coeff. −1,41: CI 1,96; −0,86) et la satisfaction envers la source de soins (coeff. 0,27: CI 0,15; 0,39). Après avoir ajusté le modèle, aucune caractéristique organi-sationnelle n'apparaît significativement associée aux autosoins. Les patients indiquent générale-ment qu'ils reçoivent peu de formation en autosoins de la part des organisations.

CHRONIC ILLNESS HAS BECOME THE FIRST CAUSE OF PREMATURE DEATH AND accounts for 50% to 80% of all healthcare expenditures in some countries (WHO 2008; Yach et al. 2004). While the nature of chronic conditions implies continuous management, our healthcare systems provide only a fraction of the care needed by persons with these health problems (Commissaire à la santé et au bien-être 2010). Increasing patients' self-management competencies has thus become paramount in chronic care (Kreindler 2009).

Self-management program participants generally report positive results (Chodosh et al. 2005; Effing et al. 2007; Warsi et al. 2004), and a reduction in healthcare utilization has been observed (DeWalt et al. 2006; Lorig et al. 2001). There is, however, little evidence of sustained results over time, although recent findings suggest that certain gains could be maintained up to eight years post-intervention (Barlow et al. 2009). An ongoing support mechanism may be necessary to ensure long-term adherence to self-management guidelines and to keep patients motivated. Yet, most self-management interventions remain concentrated in episodic programs and are seldom integrated into mainstream primary healthcare (PHC) (Kreindler 2009). Because PHC organizations are responsible for care and follow-up of patients with chronic

conditions, they represent an ideal setting for the provision of timely and tailored self-management education and support.

Strategies to incorporate self-management into PHC, such as written information, meetings with a nurse or health educator, follow-up calls, telemonitoring or newsletters, have not had consistent results on health outcomes, although improvements in self-management knowledge and techniques have been reported (Eakin et al. 2007; Jordan and Osborne 2007; McGeoch et al. 2006; Trappenburg et al. 2008; Wood-Baker et al. 2006). Integration of self-management support into existing care appears more effective if combined with organizational strategies such as reimbursement policies, a multidisciplinary approach and appropriate training for clinicians (Blakeman et al. 2006; Commissaire à la santé et au bien-être 2010; Dennis et al. 2008; Harris et al. 2008). Evidence also suggests that organizational characteristics such as a higher practice volume, multidisciplinary care teams and use of information technology (reminder systems, patient registries) have a positive impact on the delivery of preventive services and self-management interventions (Crespo and Shrewsberry 2007; Hung et al. 2006; O'Connor et al. 2008). However, research is scarce in this area, and is needed to guide changes in organizational structures and resources that can foster patient self-management.

The main goal of this observational study was to explore the links between PHC organizational characteristics and patients' confidence in their capacity to manage a chronic illness. Secondary objectives were to identify individual variables that influence confidence for self-management and to document the variations in perceived ability for self-management over a 12-month period.

## Methods

Research design and theoretical background

The theoretical model for this study hypothesizes that self-efficacy for managing chronic disease is influenced by organizational factors or attributes, as well as individual factors and health services utilization. Organizational attributes comprised four core dimensions that are thought to define an organization and its activities: shared values, available resources, organizational structures and common practices (Pineault et al. 2008). Based on combinations of these attributes, Quebec PHC organizations can be classified into four models of PHC practice: (1) community practice, (2) family medicine group, (3) private group practice or (4) solo provider. A thorough definition of each of these models is included in Appendix A.

Data source and sample

This longitudinal study used data collected in two previous studies, the Accessibility Survey and the MaChro Study. The former is a survey conducted in 2005 that targeted all PHC practices in two healthcare administrative regions of the province of Quebec in order to document their organizational attributes (Pineault et al. 2008). Of the surveyed organizations, 90 clinics providing chronic care and representing the different types of PHC practices were selected to participate in the MaChro Study, a research project on PHC organization and chronic disease

management. Patients (n=776) 18 years of age or older were recruited in 33 PHC settings. All were recruited in clinical settings, had a primary diagnosis of chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), diabetes or chronic arthritis, and were being followed in their clinic for at least six months. A definition of the inclusion diagnoses and the distribution of participants' characteristics across the various models of PHC clinics are given in Appendix B. Participants were interviewed three times: at inception, in a face-to-face interview (T0) and subsequently in two telephone interviews at six (T1) and 12 months (T2). Figure 1 displays the study design. In both the Accessibility and MaChro studies, participants gave informed consent. The present study protocol was approved by the University of Montreal's Research and Ethics Committee.

FIGURE 1. Data structure
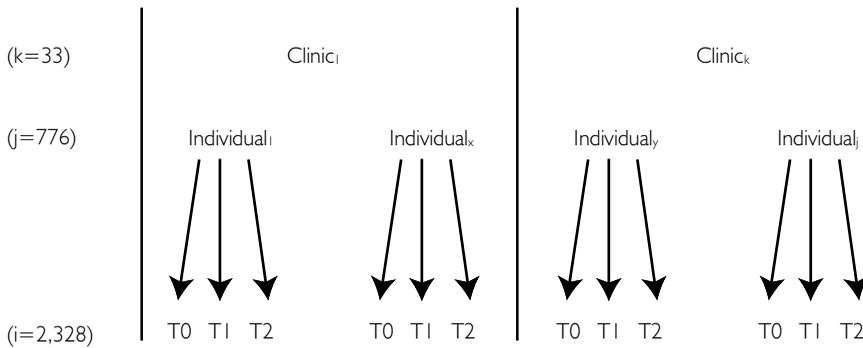
Measures
Each of the three interviews included questionnaires on self-efficacy, health-related factors, socio-demographics, healthcare utilization and experience.

SELF-EFFICACY FOR CHRONIC ILLNESS SELF-MANAGEMENT
Self-Efficacy for Managing Chronic Disease scales (Lorig et al. 1996) were used to assess patients' perceived ability for self-management. On a scale from 1 (not at all confident) to 10 (totally confident), participants were asked how confident they are in managing various aspects of their condition such as fatigue, discomfort and emotional distress. Two scales were administered: the Self-Efficacy for Managing Chronic Disease Six-Item Scale (general self-efficacy) and the Self-Efficacy to Control/Manage Depression Scale (mental self-efficacy). Both have shown strong internal consistency (Lorig et al. 1996).

PHC ORGANIZATIONAL ATTRIBUTES
Organizational attributes for the 33 recruiting clinics were obtained from the Accessibility organizational survey database. We selected variables that reflected each of the core organiza-

tional dimensions as defined by the study framework (Hung et al. 2006; Pineault et al. 2008). Selection was also guided by the Chronic Care Model (CCM) to identify organizational elements that could enhance successful implementation of patients' self-management support (Hung et al. 2006). The CCM is based on six coordinated dimensions of effective chronic care: system delivery design, clinical information systems, healthcare organization, decision support, community links and self-management support, which emphasizes patient involvement and encompasses various strategies such as patient teaching, systematic follow-ups and greater linkage with community resources (Wagner et al. 2001). Whenever possible, organizational variables were dichotomized based on achieving or not achieving established benchmarks to create one binary variable. When this was not feasible, composite scores were created to provide a summary measure of related organizational items. For example, questions on walk-in service hours, schedules, telephone services and emergency line access were aggregated to provide a three-category measure of accessibility—accommodation, a composite variable described by Haggerty and colleagues (2007).

INDIVIDUAL VARIABLES

Socio-demographic data were collected from the study questionnaire. Baseline health-related information consisted of PHC affiliation model (solo provider, family medicine group, community practice, group practice) and main diagnosis. Number of co-morbidities, including concurrent depression, was also recorded at baseline by providing a list of conditions and asking participants if they currently had the given condition.

Self-rated health was measured on a scale from 1 (bad) to 5 (excellent). Number of medical visits in the preceding year and overall satisfaction with provider were also recorded at baseline.

DATA ANALYSIS

First-stage data analyses were done using SPSS 12 (SPSS 2003). Because of the hierarchical nature of the data (Figure 1), a tri-level model was constructed for each self-efficacy outcome (general and mental) to examine key relationships with repeated measures (T0, T1 or T2) at level one, individual characteristics at level two and organizational factors at level three. All multilevel analyses were conducted using HLM 6 (Raudenbush et al. 2004). Variance components were first examined in an intercept-only model to determine the amount of total variation in the outcome that is attributable to each level of predictors. Next, in a random intercept model, selected predictors were entered in sequence. To keep models parsimonious, only covariates that were judged conceptually or clinically important were chosen from those that appeared as significant correlates of self-efficacy in earlier bivariate analyses. Continuous predictors were centred on their mean. Final models included a random slope (allowed to vary across patients) and a cross-level interaction between slopes and self-rated health (i.e., slopes allowed to vary differently across levels of self-rated health). All models controlled for age, sex and inclusion diagnosis.

Results

Patients' self-efficacy was generally high, with frequency distributions positively skewed (baseline mental self-efficacy mean=7.65, SD=2.00; general self-efficacy mean=6.78, SD=2.09). Table 1 describes baseline individual characteristics. The study sample included a broad age range (22–97, with mean=67.13) and was distributed across all socio-demographic categories.

TABLE 1. Sample characteristics (n=776)

Characteristics	%
Male	44.7
Inclusion diagnosis	
Arthritis	27.2
CHF	19.3
Diabetes	33.2
COPD	20.2
Co-morbidity: ≥6 illnesses at baseline	25.1
Depression	9.7
Education level	
6 years or less	23.2
7–11 years	52.5
12 years or more	24.4
Yearly income	
Less than $15,000	19.4
$15–35,000	43.4
$35–75,000	28.0
More than $75,000	9.1
Self-rated health	
Bad	7.2
Fair	25.8
Good	40.3
Very good	19.8
Excellent	6.3
≥4 medical visits in the preceding year	72.7
Satisfaction with care	
Highly satisfied	83.8
Moderately satisfied	13.4
Neutral or dissatisfied	2.8

Five hundred and ninety-eight participants (77.1%) responded to all of the three study phases. Non-respondents did not significantly differ from respondents with regard to health status, diagnosis, healthcare utilization, type of PHC clinic and baseline levels of self-efficacy, but were more likely to have a greater number of co-morbidities at baseline (*p*=0.034).

Table 2 describes attributes of the clinics that are consistent with chronic illness self-management support based on the CCM, along with associated group self-efficacy mean scores. These unadjusted bivariate results revealed that several of the characteristics that are viewed as valuable tools for self-management support were in fact negatively associated with self-efficacy for managing chronic illness. Clinics reporting a multidisciplinary practice had lower mean patient self-efficacy scores than clinics operating with GPs only ($p=0.012$ and 0.006). The use of clinical information systems such as electronic medical records, patient registries or the Quebec health communication network (RTSS) also translated into lower levels of self-efficacy among patients ($p<0.005$). A fee-for-service GP remuneration model was linked with higher self-efficacy scores than salary-based models ($p<0.005$).

TABLE 2. Bivariate relationships between PHC clinics' attributes according to CCM and patient confidence for chronic illness self-management

CCM dimensions	PHC attributes	General self-efficacy	Mental self-efficacy	Clinics (%)
Healthcare organization	Practice size (number of full-time equivalent GPs)			
	Solo	6.98	8.13	15.2
	2–5	6.83	7.72	30.3
	<5	6.71	7.54	54.5
	GP payment model			
	Salary-based or mixed	6.47**	7.33**	34.5
	Fee-for-service	6.93	7.82	65.6
System delivery design	Multidisciplinary practice			
	Yes	6.62**	7.48**	59.4
	No	7.01	7.89	40.6
	Number of nurses working in the clinic			
	None	7.01**	7.8**	40.6
	1	6.85	7.73	28.1
	2–5	6.68	7.67	12.5
	>5	6.24	6.99	18.8
	Nurses play an expanded role[1]			
	Yes	6.26**	7.28**	31.6
	No	6.86	7.71	68.4
	Clinical coordination mechanisms[2]			
	Formal	7.02	7.56	43.8
	Informal or none	7.72	8.08	56.3
Clinical information system	Use of clinical information systems[3]			
	Yes	6.71**	7.54**	58.0
	No	6.95	7.83	42.0

TABLE 2. Continued

Self-management support	Preventive practices integration in routine care			
	Fully integrated	6.86	7.68	84.4
	Not fully integrated	6.76	7.82	15.6
	Available written information on disease management / health habits			
	Yes	6.85	7.72	84.4
	No	6.85	7.57	15.6
Community links	Vulnerable patients are referred to specific networks			
	Yes	6.87	7.73	68.8
	No	6.59	7.49	31.3
Decision support	Clinical guidelines adherence			
	Greatest importance	6.66	7.58	28.1
	Other	6.79	7.66	71.9
	Formal mechanism of quality control at the organization level			
	Yes	6.64	7.52	61.8
	No	6.82	7.66	39.2

[1] Expanded role includes systematic follow-up of clienteles, coordination of care, involvement in clinical decisions and patient teaching.
[2] All items addressing clinical coordination mechanisms were used to create one binary variable scored 0 (no formal coordination system) or 1 (at least one formal mode of clinical coordination in the clinic).
[3] Clinics that used at least 2 of the following (electronic medical records, patient registries, access to the Quebec health system electronic network) were considered to meet the requirements.

General self-efficacy for managing chronic disease

The final multilevel model for self-efficacy is presented in Table 3. Results from the intercept-only model (not shown) indicated that the largest variance component was at the level of the individual, with an intra-class correlation (ICC) of 0.536. This means that variations among individuals accounted for 53.6% of the total variance in general self-efficacy for managing chronic illness. Repeated measures and clinics accounted for 43.6% and 3.7%, respectively, of this variance.

For final estimates of the fixed effects, the slope coefficient represents the mean rate of change in self-efficacy that is associated with repeated measures. Results suggest a modest but significant average growth in self-efficacy over time (B=0.096; 95% CI [0.088; 0.174]).

Individual and organizational coefficients describe the mean difference in self-efficacy general scores that is associated with a unit change in patient or clinic characteristics. Adjusting for time, and controlling for diagnosis, age and sex, a high satisfaction with care was found to be positively associated with general self-efficacy (B=0.27 [0.15; 0.39]). On the other hand, six or more co-morbidities as well as a greater number of consultations with providers in the preceding year were associated with lower self-efficacy scores (B=−0.74 [−1.03; −0.45]) and B=−0.21 [−0.33; −0.09], respectively). The single most important predictor of general self-efficacy was self-rated health (B=0.76 [0.60; 0.92]), which also explained 45% of the clinic-level self-efficacy variance, suggesting that patients differed considerably from clinic to clinic in terms of personal and health factors. Self-rated health was also found to interact with the time

variable (repeated measures) in a negative way (B=−0.15; [−0.23; −0.08]), meaning that the contrast between patients with good and poor health tends to fade over time.

After adjustment for lower-level variables, none of the organizational attributes was shown to significantly influence levels of self-efficacy or to modify its rate of change.

For the random effects, variance estimates for self-efficacy random slopes were significant among individuals (*p*=0.009), meaning that rates of change in self-efficacy vary from person to person. The full model accounted for an overall 36% of variance in self-efficacy.

Self-efficacy for managing depression in chronic disease (mental self-efficacy)

For mental self-efficacy (Table 3), the largest variance component was also observed at the individual level with an ICC of 0.581. Occasions and clinics accounted for 38.3% and 3.5%, respectively, of this variance.

Final estimates of the fixed effects indicated no direct effect of time on average growth or decline in mental self-efficacy. Again, none of the organizational variables was shown to influence mental self-efficacy after adjusting for lower-level factors.

The individual-level predictors of self-rated health, satisfaction with care and number of consultations with provider in the preceding year were significantly associated with mental self-efficacy after adjusting for time and controlling for age, sex and primary diagnosis. The presence of a co-occurring depression had the strongest direct effect, with an average reduction of 1.41 points on a 10-point scale in mental self-efficacy scores when patients reported suffering from depression or burnout (B=−1.41 [−1.96; −0.86]). The interaction term of repeated measures with self-rated health also appeared significant (B=−0.13 [−0.19; −0.07]). Partition of the variance in the full model indicates that individual factors explained about 28% of mental self-efficacy differences across patients and nearly 45% of the differences between clinics, again suggesting that clienteles differ considerably from clinic to clinic in terms of personal and health characteristics.

For the random part, the residual variance indicates that predictors, covariates and random effects included in the full model explained approximately 20% of mental self-efficacy levels and changes over time. As for general self-efficacy, the random slope coefficient was significant among individuals (*p*=0.008) but not among clinics.

Regression diagnostic measures did not indicate any significant concerns over multicollinearity, influential observations and heteroscedasticity (not shown).

Discussion

This study examined the associations that exist between PHC organizations' attributes and patients' perceived ability in chronic disease self-management. To our knowledge, this is the first study to explore the link between self-management and PHC affiliation by means of a longitudinal design in natural settings. Our results provide empirical evidence that characteristics of PHC organizations explain a small, albeit significant, portion of observed variation in patient self-efficacy for managing chronic disease, but exert little effect compared to individual factors.

TABLE 3. Multilevel analysis of self-efficacy for managing chronic illness

	Fixed part	Full model with interaction General self-efficacy score coeff [95% CI]	Full model with interaction Mental self-efficacy score coeff [95% CI]
	intercept	6.62 [6.25; 6.99]	7.88 [7.59; 8.17]
Level 3	Multidisciplinary practice (REF=no) – yes	0.04 [–0.19; 0.27]	–0.05 [–0.25; 0.15]
	GP remuneration model (REF=fee-for-service) – salary-based	–0.10 [–0.24; 0.04]	–0.12 [–0.26; 0.02]
	Use of clinical information systems (REF=no) – yes	–0.19 [–0.44; 0.06]	–0.17 [–0.43; 0.09]
Level 2	Satisfaction with care	**0.27 [0.15; 0.39]**	**0.31 [0.13; 0.49]**
	Number of GP visits	**–0.21 [–0.33; –0.09]**	**–0.18 [–0.32; –0.04]**
	Self-rated health	**0.76 [0.60; 0.92]**	**0.60 [0.48; 0.72]**
	Co-morbidities (REF=1 or 2) 3 to 5 6 and more	–0.16 [–0.38; 0.06] **–0.74 [–1.03; –0.45]**	—
	Co-occurring depression (REF=no) – yes	—	**–1.41 [–1.96; –0.86]**
	Age	0.01 [0.002; 0.018]	–0.002 [–0.009; 0.006]
	Sex	0.08 [–0.09; 0.25]	–0.04 [0.256; 0.176]
	Diagnosis (REF=arthritis) – Diabetes – CHF – COPD	**1.09 [0.87; 1.31]** **0.77 [0.48; 1.06]** **0.43 [0.14; 0.72]**	**0.38 [0.05; 0.71]** **0.44 [0.19; 0.69]** 0.18 [–0.11; 0.47]
Level 1	Time	**0.096 [0.088; 0.174]**	0.05 [–0.01; 0.11]
	Time X self-rated health	**–0.15 [–0.23; –0.08]**	**–0.13 [–0.19; –0.07]**
Random part (partition of variance)			
Between organizations		0.04	0.036
Between individuals		1.35	1.804
Random effects		0.09	0.184
Between repeated measures		1.55	1.217

p-value < 0.05

Time factor

Little variation in self-efficacy was recorded over study phases, consistent with previous studies showing that the expected mean change for such outcome measures varies between 0.2 to 0.4 times its standard deviation (Lorig et al. 1996; Mazzuca 1982). Although statistically significant, the upward trend found for the general self-efficacy scores remains very modest, and its clinical implication appears tenuous. Complementary analyses on the interaction term showed that people reporting poor health at baseline tended to have more positive changes in self-efficacy than people reporting good to excellent health. This finding likely reflects a ceiling effect; better health associated with higher self-efficacy left little room for further improvement. Although the overall trend was positive, intra-individual self-efficacy scores were found to vary greatly over the study phases. This variance may lead to regression towards the mean and illustrates the value of longitudinal designs to explore how self-efficacy evolves from person to person based on personal history and course of the disease.

Individual factors

No socio-demographic factor was associated with the outcome. Patients who rated their health above average reported significantly higher general as well as mental self-efficacy. Inversely, patients presenting with several co-morbid conditions generally reported lower ability in self-management. Indeed, multi-morbidity results in complex self-management needs; patients having to deal with the compound effects of multiple conditions also face issues of polypharmacy, adherence to numerous (potentially contradictory) treatment plans and overlapping symptoms. Patients who report having the confidence to cope with disease-specific regimens are often overwhelmed by the competing demands of seemingly incompatible multi-morbid self-management tasks (Bayliss et al. 2007, 2003). While our results suggest that a majority of individuals who have a diagnosis of chronic illness also present with two to three co-morbid conditions, efforts should be directed at developing self-management approaches that consider the needs of patients facing multiple illnesses. In particular, we found that 42% of persons with chronic disease developed depression at some point over the course of their disease, and depression is associated with decreased self-management ability (Wells et al. 1988). This finding was echoed in our results. It illustrates the need to address the issue of multi-morbidity, and implies that interventions aimed at promoting self-management should not be standardized; rather, they should be easily adaptable to varying levels of morbidity and the resulting differences in self-management support needs (Commissaire à la santé et au bien-être 2010).

Organizational factors

Given that patients spend, on average, 0.1% of their time in the presence of healthcare professionals (Radcliff-Branch 2009), 4% of explained variance can be regarded as non-negligible and provide valuable insight into how factors that make up an organization's skeleton may help maximize patient–provider encounters to reinforce self-management.

Although there is evidence that organizational attributes affect processes of care and influence patient outcomes (Hogg et al. 2008; Hung et al. 2006, 2007), none of the fixed parameters for the organizational attributes under study was significantly different from zero. Removing the most influential covariates from the models did not change this pattern. This finding may be due to the small organizational sample size (n=33), coupled with a lack of variability between participating clinics: all were approached on the basis of their involvement in chronic illness care and are therefore more geared towards chronic care than the average PHC clinic.

Another likely explanation is that an "in-between level" is missing, that of the provider. Indeed, organizational attributes may not exert a direct influence on patient behaviours but rather modulate providers' behaviours, patient–provider interactions or both. Factors such as availability of allied health professionals, reimbursement policies and practice volume have been shown to influence the ability of clinicians to carry out supportive interventions for self-management (Blakeman et al. 2006). Effective patient–provider communication and a satisfactory relationship were shown to have positive impacts on patients' confidence to manage a chronic condition (Greene and Yedidia 2005). In our study, a measure of satisfaction with care was included, and our data also indicate that high satisfaction is associated with greater perceived ability for self-management, highlighting that the patient–provider relationship must not be lost in broad system redesigns. Although novel modelling approaches are being developed for this purpose, separating the effect of provider behaviours from the effect of the practice environment on patient outcomes remains an important issue for future research.

While regression models did not yield significant results for organizational attributes, significant associations were observed in unadjusted bivariate analyses (Table 2). Moreover, these associations seemed counter-intuitive: specific self-management support mechanisms, such as making educational materials available and implementing preventive care practices (e.g., counselling), did not influence patient self-efficacy for chronic disease self-management. This finding may be attributed to the fact that these interventions are insufficient, and self-management support needs to be integrated into all care processes and practices. This finding underlines the utility of reinforcing linkages with community organizations that promote self-management and the need to develop an ongoing support network for patients living with chronic conditions.

Other counter-intuitive results in unadjusted analyses indicated that multidisciplinary practice, an expanded role for nurses, greater use of clinical information systems, and salary-based GP remuneration models translated into lower levels of patient self-efficacy. This finding may stem from patient self-selection around specific organizational characteristics; clinics that have developed these characteristics are the ones that cater to heavier patient caseloads. For example, multidisciplinary practice and salary-based GP remuneration are mostly encountered in community practices; these practices typically cater to a more complex clientele that generally reports lower self-rated health, tends to be slightly older and presents with more co-morbidities. Inversely, unidisciplinary practice (GP only), weak linkage with health system information networks and exclusive fee-for-service GP remuneration were generally found in private group or solo practices, which tended to follow patients with better self-rated health

and fewer co-morbid conditions. Family medicine groups, an emerging group practice model offering services to a registered clientele, are characterized by high reliance on expanded nurse roles. Possibly, these new nursing roles were still not well implemented when the organizational survey was conducted (2005), and therefore may not have yielded the expected results in terms of self-management support. Further, patient self-selection may have masked the true effect of the organizational attributes under study and may also reflect the varying capacity of PHC models for managing complex chronic cases. Finally, self-efficacy may not be influenced only by PHC affiliation but also plays a role in determining this affiliation: patients with poorer health status and poorer associated self-efficacy may cluster around PHC organizations exhibiting attributes that better address their needs.

Study limitations

Because this was an observational study, we could not control for all potential confounders. However, when attempting to create practical knowledge to guide healthcare improvement, this approach reflects real-life situations that may offer greater generalizability for policy makers than highly controlled trials (Perrin and Mitchell 1997).

Self-efficacy scales employed for this study were developed to measure change pre– and post–self-management training programs. Given the small expected variations in self-efficacy over time and the absence of a specific self-management intervention, they may have lacked the sensitivity required to capture natural self-efficacy variations over time. Another potential bias may exist because of losses to follow-up. Co-morbidity differences identified in participants who did not complete all three study phases may have modified group compositions: more vulnerable patients may be underrepresented, partly masking the effect of organizational factors on patients facing multi-morbidity or frailty issues. Finally, self-management support appears low in all PHC in Quebec; a majority of participants reported not being actively involved in care decisions (Lévesque et al. 2010), making it difficult to detect significant differences across organizations for patient outcomes relating to self-management.

Conclusion

Despite methodological challenges, the findings of this longitudinal study suggest that the strongest predictors of self-efficacy for managing chronic disease stem from health and life circumstances. Transient events, such as an acute illness or other adverse event, may considerably alter one's confidence in managing ill health, making it crucial that healthcare providers pay extra attention to patients' health and personal history when designing self-management interventions.

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Appendix A

PHC models – types (proportion of affiliated patients)	Definition and main characteristics
Solo provider (8%)	• Most often, one physician per organization, no on-site nurse or technical support centre. Occasionally, two or three physicians share the space but their practices remain separate and little integrated • A vision based on the principles of family medicine with a fairly limited service offer • Private professional governance and fee-for-service payment • Mostly focused on continuity of services and follow-up of regular clienteles • Little information technology to support clinical activities
Group practice (34%)	• Small- and medium-sized medical teams of varying sizes with little formalized professional group work and usually no interdisciplinarity • Organizational priorities that converge towards accessibility of services and responding to short-term medical needs, mostly walk-in visits • Private professional governance and fee-for-service payment
Family medicine groups (FMGs) (22%)	• Medium-sized medical teams of six to 10 physicians catering to a registered clientele • Organizational structure that fosters cohesion among professionals as well as greater systemic integration, formalized group work and developed interdisciplinarity (mostly with nurses) • A vision based on the principles of family medicine, with organizational priorities being continuity of services and follow-up of regular patients • Greater coverage time (evenings and weekends), broader range of services supplemented (ex: emergency lines) • Private professional governance and fee-for-service payment
Community practice (36%)	• Integrated into public healthcare network institutions • Teams of caregivers consisting of several physicians (more than six), nurses and other health professionals (dietitians, rehabilitation professionals, etc.) • Public governance and fee-for-service as well as time-based remuneration • A vision that focuses on accountability for the health of the population • Formalized professional group work and interdisciplinarity that has been developed • Broad range of services including public health activities

Appendix B

Inclusion diagnoses

The four inclusion diagnoses are chronic conditions, acknowledged as requiring close primary care monitoring and for which good self-management is necessary, including: heart failure, chronic obstructive pulmonary disease, arthritis and diabetes (17).

"Chronic" was defined as lasting for over three months and/or susceptible to lasting over three months.

Conditions that were considered for each inclusion diagnosis were:

• *Arthritis:* All inflammatory and chronic non-inflammatory arthritis except juvenile arthritis and infectious arthritis. This included rhumatoid arthritis, ankylosing spondylitis, pso-

riatic arthritis, inflammatory polyarthropathies, arthrosis or chronic osteochronic.

*   *Diabetes:* Both types of insulinodependent or non-insulinodependent diabetes (type 1 / type 2) with as well as without diabetes-related complications, but excluding juvenile diabetes.
*   *Heart Failure:* Diagnoses of congestive, left or right heart failure, systolic or diastolic dysfunction, pulmonary oedema and cardiac asthma, with or without atherosclerosis.
*   *Chronic Obstructive Pulmonary Disease (COPD):* This included chronic bronchitis, emphysema and chronic bronchial asthma.

Distribution of patients' characteristics across PHC models

	Proportion of primary healthcare patients (%)			
	Solo provider	Group practice	Family medicine group	Community practice
Characteristics linked to a higher burden of care				
Aged 75 years and older	28.3	32.7	15.2	34.9
6 co-morbidities or more	16.7	20.3	23.4	33.0
Home care user	9.6	6.6	13.0	23.2
Fair to bad perceived health	35.1	24.0	35.1	25.6
Characteristics having an impact on health				
Woman	51.5	50.8	52.7	62.1
Living alone	50.0	52.0	72.7	59.9
Non-Caucasian	0.0	7.9	0.0	9.4
Education 7 years or less (primary school)	30.5	25.8	24.4	14.7
Yearly income under $15,000 CAD	24.1	24.6	7.4	16.3