Impact of PRISMA, a Coordination-Type Integrated Service Delivery System for Frail Older People in Quebec (Canada): A Quasi-experimental Study

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Objectives. To evaluate the impact of a coordination-type integrated service delivery (ISD) model on health, satisfaction, empowerment, and services utilization of frail older people.

Methods. Program of Research to Integrate Services for the Maintenance of Autonomy (PRISMA) is a population-based, quasi-experimental study with three experimental and three comparison areas. From a random selection of people 75 years or older, 1,501 persons identified at risk of functional decline were recruited (728 experimental and 773 comparison). Participants were measured over 4 years for disabilities (Functional Autonomy Measurement System), unmet needs, satisfaction with services, and empowerment. Information on utilization of health and social services was collected by bimonthly telephone questionnaires.

Results. Over the last 2 years (when the implementation rate was over 70%), there were 62 fewer cases of functional decline per 1,000 individuals in the experimental group. In the fourth year of the study, the annual incidence of functional decline was lower by 137 cases per 1,000 in the experimental group, whereas the prevalence of unmet needs in the comparison region was nearly double the prevalence observed in the experimental region. Satisfaction and empowerment were significantly higher in the experimental group. For health services utilization, a lower number of visits to emergency rooms and hospitalizations than expected was observed in the experimental cohort.

Conclusion. The PRISMA model improves the efficacy of the health care system for frail older people.

Key Words: Aged—Case-management—Disability—Frailty—Health services—Integrated service delivery systems.
**Description and Implementation of the PRISMA Model**

The PRISMA model comprises six components: (a) coordination between decision makers and managers at the regional and local levels; (b) single entry point; (c) single assessment instrument coupled with case-mix management system; (d) case management; (e) individualized service plans; and (f) computerized clinical chart.

“Coordination” between institutions is at the core of the PRISMA model. Coordination must be established at every level of the organizations. First, at the strategic level (governance), by creating a Joint Governing Board (JGB) of all health care and social services organizations and community agencies (public, private, and voluntary). On this board, the decision makers agree on policies and orientations and what resources to allocate to the integrated system. Second, at the tactical level (management), a service coordination committee, mandated by the JGB and comprising public and community service representatives together with older people, monitors the service coordination mechanism and facilitates adaptation of the service continuum. Finally, at the operational level (clinical), a multidisciplinary team of practitioners around the case manager evaluates patient needs and delivers the required care and services.

The “single entry point” is the mechanism for accessing the services in the area for a frail senior with complex needs. These services include Home Care, Rehabilitation Services, Hospital Services, Voluntary Agencies, and Social Economy Agencies. It serves as a unique portal that older people, family caregivers, and professionals can access by telephone or written referral. A link is established with the Health Info Line available to the general public in Québec 7 days a week and 24 hours a day. Callers are screened using a brief 7-item questionnaire (PRISMA-7) (Raîche, Hébert, & Dubois, 2008) that evidences good levels of sensitivity and specificity in identifying significantly disabled older people. A detailed assessment of disabilities is then undertaken for those screened positive; individuals deemed eligible for ISD are then referred to a case manager. The eligibility criteria are to be over 65 years old, to present significant disabilities (as defined by an SMAF [French acronym for Functional Autonomy Measurement System] score over 15 or an Iso-SMAF Profile over 4; see the next paragraph and Table 1 for details about these tools), and to need more than three different services.

The “single assessment instrument” allows for evaluating the needs of clients in all organizations and by all the professionals working either in home care organizations or in hospitals and institutions. The instrument implemented in the PRISMA model is the SMAF, a 29-item scale developed according to the World Health Organization classification of disabilities (Hébert, Guilbeault, Desrosiers, & Dubuc, 2001). A case-mix classification system based on the SMAF has been developed (Dubuc, Hébert, Desrosiers, Buteau, & Trottier, 2006). Fourteen Iso-SMAF profiles were generated using cluster analysis techniques in order to define groups that are homogeneous in regard to profile. These profiles are used to establish the eligibility criteria for the different services and to calculate the required budget of the organizations, based on the disabilities of their patient groups (Tousignant, Dubuc, Hébert, & Coulombe, 2007; Tousignant, Hébert, Dubuc, Simoneau, & Dieleman, 2003).

The “case manager” (CM) model included in PRISMA draws directly from those described as clinical CM (Scharlach, Giunta, & Mills-Dick, 2001), neighborhood team (Eggert, Friedman, & Zimmerman, 1990), or basic CM (Phillips, Kemper, & Applebaum, 1988). The CM is responsible for conducting a thorough assessment of the patient’s needs, planning the required services, arranging patient admission to these services, organizing and coordinating support, directing the multidisciplinary team of practitioners involved in the case, and advocating, monitoring, and reassessing the patient as frequently as necessary according to the needs (minimally twice a year). The CM works for the Local JGB and is legitimate for work in all institutions and services of the area. The CM can be a nurse, a social worker, or another health professional and should be specifically trained. An ideal caseload is around 40 patients per CM. The CM works closely with the Primary Care Physician (PCP), and the relationship between the CM and PCP has been evaluated as part of the implementation study (Milette, Hébert, & Veil, 2005).

The “individualized service plan” (ISP) results from the patient’s overall assessment and summarizes the prescribed services and target objectives (Somme, Hébert, Bravo, Blanchard, & Saint-Jean, 2007). The ISP is led by the CM and established at a meeting of the multidisciplinary team including all the professionals involved in the care and services for the older person. PCPs unable to attend these meetings usually discuss the case with the CM before and after the meeting. The ISP should be validated with the patient and the informal caregivers, so that they are empowered in the decision-making process.

Finally, the PRISMA model includes a “computerized clinical chart” to facilitate communication between organizations and professionals. The SIGG (French acronym for Geronto-Geriatric Information System) was developed and implemented in a pilot project in the Bois Francs region (Victoriaville, Québec, Canada) (Morin et al., 2005). This shareable clinical chart uses the Québec Ministry of Health and Social Services Internet network and was developed on a Lotus Notes platform.

After having been prepared in the Bois-Francs region with promising results (Touigny, Durand, Bonin, Hébert, & Rochette, 2004), the PRISMA model was implemented in July 2001 in three areas of the Eastern Townships region in the Province of Québec, Canada. The City of Sherbrooke is an urban area (population: 144,000; 18,500 over 65 years) with many institutions (a university regional hospital, a university geriatric institute, a regional rehabilitation institution,
<table>
<thead>
<tr>
<th>Variable</th>
<th>Tool</th>
<th>Reference</th>
<th>Description</th>
<th>Properties</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Disability and unmet needs</td>
<td>SMAF</td>
<td>Hébert et al. (2001)</td>
<td>Functional ability in five areas: activities of daily living (seven items); mobility (six items); communication (three items); mental functions (five items); instrumental activities of daily living (eight items)</td>
<td>Very good reliability and validity</td>
<td>Desrosiers, Bravo, Hébert, and Dubuc (1995)</td>
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<td>Each item scored on a 5-point scale from 0 (independent) and 0.5 (with difficulty) to 1 (needs supervision), 2 (needs help), and 3 (dependent)</td>
<td>Difference of 5 points on the SMAF disability score has been established to be the minimum metrically and clinically significant difference</td>
<td>Hébert, Spiegelhalter, and Brayne (1997)</td>
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<td>Total disability score (maximum value of 87) obtained by summing the scores for the items; an increase in score represents an increase in disability Resources to compensate for the disabilities also assessed for each item generating a second score: the handicap score Score is 0 if the resources fully compensate the disability or are equal to the disability rating (0.5–3) if not (unmet needs)</td>
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<td>Disability profile</td>
<td>Iso-SMAF profiles</td>
<td>Dubuc et al. (2006)</td>
<td>14 Iso-SMAF profiles generated: Profiles 1, 2, and 3 (disabilities in instrumental activities of daily living mainly) Profiles 4, 6, and 9 (motor disabilities) Profiles 5, 7, 8, and 10 (mental disabilities) Profiles 11, 12, 13, and 14 (impaired mobility and activities of daily living dependency or with cognitive deficits and almost total communicative disabilities)</td>
<td>Good stability and reproducibility</td>
<td>Good predictive validity for nursing care time and the costs</td>
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<td>Functional decline</td>
<td>Health Care Satisfaction</td>
<td>Gagnon, Hébert, Dubé, and Dubois (2006a)</td>
<td>Consists of 26 statements, each answered on two four-grade scales, one for perception and the other one for importance. Combining the two scales results in scores ranging from −8 to 16 for each statement. Total score is obtained by averaging scores over all statements.</td>
<td>Good reliability</td>
<td>Gagnon et al. (2006a)</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Health Care Empowerment</td>
<td>Gagnon, Hébert, Dubé, and Dubois (2006b)</td>
<td>Has 10 statements with response scales mirroring those of the satisfaction questionnaire Total score varies from 1 to 16</td>
<td>Good reliability</td>
<td>Gagnon et al. (2006b)</td>
</tr>
<tr>
<td>Caregiver’s burden</td>
<td>Zarit Burden Interview</td>
<td>Zarit, Orr, and Zarit (1985)</td>
<td>22-item scale measuring the subjective load experienced by the informal caregiver</td>
<td>Reference values generated based on a representative sample of caregivers of community-dwelling people with dementia</td>
<td>Hébert, Bravo, and Girouard (1993)</td>
</tr>
<tr>
<td>Caregiver’s desire to</td>
<td>Questionnaire adapted from</td>
<td>Morycz (1985)</td>
<td>Four-item questionnaire Used and translated in the Canadian Study on Health and Aging</td>
<td></td>
<td>Canadian Study on Health and Aging Working Group (1994)</td>
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<td>institutionalize</td>
<td>Morycz</td>
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</table>

**Note:** PRISMA = Program of Research to Integrate Services for the Maintenance of Autonomy; SMAF = Functional Autonomy Measurement System.
METHODS

Participants

Subjects 75 years or older were randomly selected from the Quebec Medicare list in 2001 within the six areas to receive the 6-item Sherbrooke Postal Questionnaire (SPQ), a tool screening individuals at risks of functional decline (Hébert, Bravo, Kornier-Bitensky, & Voyer, 1996). Those screening positive were invited to participate. For the SPQ, positive screening is defined as either not responding to the postal questionnaire or presenting three risk factors or more (Hébert et al., 1996). People screening positive are at significant risk of functional decline within a year (48% incidence) and therefore to become an eligible patient under the PRISMA model. The study was initially planned to run 2 years but, given that implementation occurred slower than expected, we extended it for 2 years and added an additional wave in 2003 in order to achieve the targeted sample size at the end of 4 years. After 4 years of implementation, the rate reached 85% in Sherbrooke, 78% in Granit, and 69% in Coaticook.

Intervention

Because they lived in a region where the PRISMA model was implemented, all subjects from the experimental group could benefit from three components: (a) coordination between decision makers and managers at the regional and local levels, (b) single entry point, and (c) single assessment instrument coupled with case-mix management system. Moreover, subjects who fulfilled the eligibility criteria for the model (an SMAF score over 15 or an iso-SMAF profile over 4) were also exposed to the other three components: (d) case management, (e) individualized service plans, and (f) computerized clinical chart.

Measures

Participants were interviewed face-to-face at pretest and yearly for 4 years. A principal informal caregiver was identified, and a self-administered questionnaire was given to him/her to send back to the research office. Data on health and social services utilization were collected every 2 months by telephone. The main outcome measures were functional decline and hospital utilization (emergency room [ER] and hospitalization). Other outcome variables were disability, unmet needs, satisfaction with services received, patient empowerment, caregiver burden, and utilization of health services and social services (see Table 1 for details). In order to describe the sample, sociodemographic data included age, sex, years of schooling, and type of housing; cognitive status was measured with the Mini-Mental State Examination (M. F. Folstein, S. E. Folstein, & McHugh, 1975).

Bimonthly telephone calls yielded data on use of health and social services. Every participant or his/her caregiver was given a calendar with guidelines and was trained to adequately collect the information required. This type of data collection was successfully used in another study led by our team (Hébert, Robichaud, Roy, Bravo, & Voyer, 2001), and a reliability study was performed and showed good to excellent stability for the different measures of use (Dubois, Raîche, Hébert, & Gueye, 2007). Public, private, and voluntary services were collected. We recorded the number of visits to the ER, the percentage followed by a hospitalization or by return to the ER within 10 days, the number of hospitalizations, length of stay, and rehospitalization within different time frames (10, 30, and 90 days), and the number of day surgeries and visits to health professionals (general practitioners, medical specialists, nurses, social workers,
Physiotherapists, occupational therapists, speech therapists, etc.). Data about specialized geriatric care was specifically collected as well as acute care geriatric assessment and visits to intensive functional rehabilitation units. Community services included visits to day hospitals and day centers and use of help for personal care and home maintenance. Finally, voluntary services included data on meals-on-wheels, respite care, community transportation, and care taking.

Statistical Analysis
For baseline data, groups were compared using chi-square, Student’s t, or Wilcoxon’s rank sum test according to variable type and distribution. Survival analyses were used to compare groups for mortality and institutionalization. Prevalence and incidence rates for functional decline were compared using chi-square tests. The evolution of continuous outcome variables over time was studied using growth modeling, which takes into account participants with incomplete follow-up (Singer & Willett, 2003). Growth models, also called multilevel models for change, address within-person and between-persons questions about change simultaneously with a pair of submodels. At the first level, we modeled how each person changed over time; at the second level, we studied the effect of the experimental versus the comparison group on this change. Time was scaled with the number of years since January 1, 2001. For each outcome, a quadratic relationship with time was first investigated. If the quadratic term was not significant, a linear relationship was modeled since parsimony was sought. Therefore, \( \text{OUTCOME}_{ij} = \pi_{0i} + \pi_{1i}T_{ij} + \pi_{2i}T_{ij}^2 + \epsilon_{ij} \), where \( \text{OUTCOME}_{ij} \), \( T_{ij} \), and \( \epsilon_{ij} \) are, respectively, the outcome measure, the number of years since January 1, 2001, and the measurement error for participant \( i \) at time \( j \). The \( \pi \) coefficients are modeled at level 2 in the following way: \( \pi_{ki} = \gamma_{k0} + \gamma_{k1}\text{GROUP}_{i} + \epsilon_{ki} \) for \( k = 0, 1, \text{and } 2 \).

For dichotomous outcome variables (e.g., being hospitalized), generalized estimating equation (Liang & Zeger, 1986) models were used. These models are an extension of generalized linear models (GLMs) to a regression setting with correlated observations within participants. Analyses were performed with SAS PROC MIXED AND PROC GENMOD (SAS Institute, Inc., Cary, NC), version 8.02.

Ethical Approval
The study has been approved by the Sherbrooke Geriatric University Institute Ethics Review Board and all subjects signed a consent form.

RESULTS
From the 19,981 people 75 years or older living in one of the six areas (three experimental and three comparison), 4,881 were randomly selected in the first wave and sent a postal questionnaire. From these, 2,308 were not at risk of functional decline and 554 were not eligible (e.g., institutionalized, dead, living ≥ 2 months outside the country) or had a wrong address, leaving 2,019 persons identified at risk and invited to participate in the study. Of these 2,019 persons, 346 were declared ineligible upon personal contact (leaving 1,673 eligible subjects), whereas 753 refused to participate (refusal rate: 45%), mainly because of lack of interest or time. The subjects refusing to participate were compared with study participants with respect to the few available variables. They were not different in age, sex, level of education, self-perceived health, or health care services received during the previous year. Participants reported more hospitalizations during the previous year than those refusing and a greater number were “extremely satisfied” with the health services received (data not shown).

A total of 920 persons (501 experimental and 419 comparison) agreed to take part and were evaluated at baseline. Their principal informal caregiver was also invited to participate in the study. The participant mean age was 83 years, two thirds were women, 44% were married, and the average level of education was 6.5 years. The characteristics of participants from both groups and each area at baseline are detailed elsewhere (Hébert et al., 2008). Although participants from the experimental group were slightly but significantly \( (p = .016) \) older than those from the comparison group, there was no significant difference in the mean SMAF scores at baseline. Significantly more participants from the comparison group were homeowners or tenants \( (p = .001) \) and had received home care during the previous year \( (p = .001) \). They were also significantly more satisfied with services \( (p = .014) \). There was no statistically significant difference between the two groups on all other variables. Overall, 33.1% of participants from both groups presented functional decline over the first year \( (7.3\% \text{dead, } 4.7\% \text{ institutionalized, } 21.1\% \text{ increased by more than 5 points on the SMAF score}) \). There was no significant difference between the two groups in functional decline. Because the decision to implement an ISD system was based on the knowledge that the pattern of health and social services utilization was far from optimal in the experimental areas and because we chose the comparison areas with a technique optimizing comparability (Matsuiza), we did not expect the pattern to be different between the groups over the first year. However, more participants from the experimental group visited the ER during the year \( (46\% \text{ vs. } 32\%, \ p < .001) \), and their visits were less likely to be followed by hospital admission \( (41.8\% \text{ vs. } 56.6\%, \ p < .001) \). This is probably an indicator of an inappropriate use of the emergency department in the experimental region for minor conditions. In both groups, 30% of the participants were hospitalized during the first year. Participants from the experimental areas made more frequent use of health professionals, voluntary services, home help for personal care, and day care.

From the unselected people for postal questionnaire in the first wave, 2,909 persons aged 77 years or older were
randomly selected in the second wave and sent the questionnaire. From these, 1,264 were not at risk of functional decline and 274 were not eligible or had a wrong address, leaving 1,371 identified at risk and invited to participate in the study. Of these people, 322 cases were deemed ineligible upon personal contact (leaving 1,049 eligible subjects), whereas 468 refused to participate (refusal rate: 45%), mainly for the same reasons as in Wave 1. The 581 persons (227 experimental and 354 comparison) recruited in Wave 2 were 83 years old on average and had a mean SMAF score of 20 (no difference between groups). Other characteristics were very similar to Wave 1, except for type of housing, where no difference was found between the groups, and satisfaction, for which the experimental group was significantly more satisfied with services ($p < .001$). Subjects from the first and second waves were not different with respect to all measured variables (data not shown).

Figure 1 shows the flow of the participants through the study. Overall, out of the 1,501 people agreeing to participate, 177 (12%) moved to long-term care over the 4-year period, 285 (19%) died, and 210 others (14%) were dropouts or losses to follow-up or moved out of the area. Survival analysis showed that there was no significant difference in mortality between the two groups. The probability of living at home was also similar between the two groups, as illustrated in Figure 2. In the first 2 years (when the implementation rate was not significant), both groups presented a prevalence of functional decline of around 54%. As shown in Table 2, over the last 2 years (when the implementation rate was over 70%), prevalence of functional decline was lower by 62 cases per 1,000 (95% confidence interval [CI]: 6% – 119% lower in the study group (663‰ vs. 601‰; $p < .05$).

Whereas the annual incidence of functional decline (new cases, excluding those who declined the previous year) in both groups was not significantly different over the first 3 years, it was lower by 137 cases per 1,000 (95% CI: 57% – 216% lower in the study group in the fourth year (254‰ vs. 391‰; $p < .001$). Regarding participants with unmet needs, that is, disabilities not compensated by adequate resources, prevalence was lower by 314 cases per 1,000 (95% CI: 282‰ – 348‰ lower in the study group in the fourth year as opposed to the comparison group (353‰ vs. 667‰; $p < .001$). These proportions were not significantly different
between groups at $T_2$ and $T_3$, and the prevalence of unmet needs was even significantly higher in the experimental group (675% vs. 596%) at $T_1$ ($p = .026$).

Table 3 shows participant evolution in terms of secondary outcomes. There were no significant differences between the groups in the evolution of the SMAF disability scores. The mean SMAF scores rose from 17 at baseline to 26 at the end of the study. Over the 4 years, satisfaction with services improved in the experimental areas by 13.9% (=$([8.54/24] − [7.50/24])/[7.50/24]$), whereas it did not change significantly in the comparison group (−3%). The slope was positive and significantly steeper in the study group ($p < .001$). The two subscales relevant to the PRISMA intervention (satisfaction with the delivery of care and services and organization of care and services) showed also significant positive change over time ($p < .001$). Empowerment was also better in the study group because it was preserved (−1% change), whereas it declined in the comparison group (−11.7%). The patterns were statistically different ($p < .001$); this was attributable to the two subscales relevant to the PRISMA intervention (patient’s degree of control and patient’s involvement in the decisional process). The increase in caregiver’s burden in the experimental group was statistically significant (26%, $p < .001$), whereas the increase was near significant in the comparison group (7.7%, $p = .098$); the difference of pattern in the two groups was significant ($p = .013$). The burden was significantly higher in the comparison group at the beginning of the study, but both groups were similar at the end. The change in desire to institutionalize was not different between the two groups ($p = .944$; data not shown).

Table 4 shows the proportion of participants with at least one ER visit in each of the 4 years. This was significantly higher in the study group during the first year (46% vs. 32%, $p < .001$). Given the aging of the cohort and the increase in morbidity and disability over time, the proportion of participants in the comparison group shows the expected increase from 32% to 54% ($p < .001$). The proportion plateaus around 50% ($p = .300$) in the study group, and the difference between the two patterns is highly significant ($p < .001$). There was no difference between the groups in the proportion returning to the ER within 10 days, but there was a significant difference in the change in the proportion of visits that ended in a hospital admission ($p = .043$). This proportion rose in the experimental group but declined in the comparison group. In Year 1, there was a slightly higher proportion of participants admitted to the hospital in the study group (31% vs. 28%, $p = .281$). The proportion in the comparison group increased as expected from 28% to 37% over the 4 years ($p = .006$), whereas it remained stable in the

| Table 2. Prevalence of Functional Decline in Both Groups Over the First 2 Years Compared With the Last 2 Years |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| First 2 years                                   | Last 2 years                                    |
|                                                 | Study group ($n = 465$)                          | Comparison group ($n = 365$)                      | Study group ($n = 541$)                          | Comparison group ($n = 579$)                      |
| Institutionalization                            | 35 (0.075)*                                     | 19 (0.052)                                       | 36 (0.067)                                      | 47 (0.081)                                       |
| Death                                           | 51 (0.110)                                      | 47 (0.129)                                       | 68 (0.125)                                      | 68 (0.117)                                       |
| Loss of 5 points on SMAF score                   | 169 (0.363)                                     | 129 (0.353)                                     | 221 (0.408)                                     | 269 (0.465)*                                     |
| Total                                           | 255 (0.548)                                     | 195 (0.534)                                     | 325 (0.601)                                     | 384 (0.663)*                                     |

Notes: SMAF = Functional Autonomy Measurement System.

*a $n$ (prevalence).

*p < .05.
Table 3. Mean Estimated a Score of Participants in the Study and Comparison Groups for the Secondary Outcomes on Baseline (T0 to T4)

<table>
<thead>
<tr>
<th></th>
<th>Participants</th>
<th>SMAF</th>
<th>Satisfaction</th>
<th>Empowerment</th>
<th>Burden</th>
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<tbody>
<tr>
<td></td>
<td>501</td>
<td>419</td>
<td>420</td>
<td>327</td>
<td>588</td>
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<td>419</td>
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Notes:
- S = Study group; C = Comparison group; SMAF = Functional Autonomy Measurement System; 95% confidence intervals are reported in parentheses.
- a From growth model analysis using a quadratic model for SMAF score and empowerment and a linear model for satisfaction and caregiver burden.
- b Significance of the evolution over time within group.
- c Comparison of the evolution over time between groups.
- d Fit statistic for SMAF score = 1547; df = 47; p < .001.
- e Fit statistic for satisfaction = 172; df = 39; p < .001.
- f Fit statistic for empowerment = 198; df = 39; p < .001.
- g At baseline, 50% of caregivers were the spouse, 35% were a child, and 15%, different others.
- h * p < .05; ** p < .01; *** p < .001 when comparing comparison with study group.
- Notes: S = Study group; C = Comparison group; SMAF = Functional Autonomy Measurement System; 95% confidence intervals are reported in parentheses.

**DISCUSSION**

This study is the first published so far about the effectiveness of a coordination-type model of ISD (Leutz, 2005). The objective was to look at the impact of this model at a population level in a real-life situation instead of at the theoretical level on only those actually receiving the intervention (as it is for efficacy studies). Our study demonstrated that, compared with the usual care model, the PRISMA model results in prevalence and annual incidence rates of functional decline that are lower by 62 and 137 cases per 1,000, respectively. The proportion of people with unmet needs is almost half in the study areas, whereas patient satisfaction with services improved and patient empowerment was higher in the experimental group. The pattern of ER use was also significantly different. Over the 4 years, ER use stabilized in the study areas (no significant increase) and the rate of visits followed by hospitalization coincides with the level of the comparison areas by the end of the study. This indicates a more appropriate ER use: Minor conditions are treated elsewhere. A similar stability was observed for hospitalization in the study areas, while hospital stays increase in the comparison group. Fewer contacts with nurses were observed in the experimental group, but physician visits were unchanged. No other significant effects on health and social services utilization were observed.

This study used a 4-year longitudinal quasi-experimental design with a regular assessment of participants. Although most studies published on integrated delivery systems also used quasi-experimental designs (Branch et al., 1995;
Challis et al., 1991; Eng, Pedulla, Eleazer, McCann, & Fox, 1997; Landi et al., 2001; Manton, Newcomer, Lowrimore, Vertrees, & Harrington, 1993; Yordi & Waldman, 1985), two used randomized controlled trial (RCT) designs (Béland et al., 2006; Bernabei et al., 1998). All these studies tested the full integration model, where it is feasible to randomize subjects to the experimental or control (usual care) group. Because the PRISMA model implies a systemic change of the health and social services system as a whole, an RCT was not feasible. Thus, the selected design was the most internally valid, given the context. The fact that our study was carried out as a natural experiment and that its refusal rate was relatively low (45%) when compared with rates observed in RCTs supports the external validity and the generalizability of the results. A systematic method has been used to identify comparison areas with characteristics similar to the experimental ones. To ensure cohort comparability, we took mean disability scores into account in the sampling strategy. Although we have no cues on a concurrent intervention, we cannot, however, be sure that the observed effects are solely attributable to the tested intervention and not to a confounding factor.

The population living in the studied areas is quite heterogeneous and includes people with high and low socioeconomic status, people living in individual homes and others living in apartments, people speaking French or English, immigrants, etc. There is not, however, much ethnic variation in these regions (like elsewhere in Québec, except Montreal), and we acknowledge this as a limit.

The participants were chosen from a random sample of the older population with a scientifically sound way of identifying those at risk of functional decline. The participants were not those who benefited from the system but those who should benefit from it. Such a population-based approach allows for the evaluation of the real effectiveness of the PRISMA model as opposed to a previous study that evaluated its efficacy (Tourigny et al., 2004). This population approach implies that a small proportion of participants (in this case 18%) has effectively benefited from the full intervention, that is, being assessed and managed by a case manager.

The degree of implementation in the experimental group was closely monitored during the study. Although never reaching 100%, it passed the 70% threshold that was set a priori as being the minimum degree of implementation for showing an effect. Satisfaction improved and empowerment was higher as degree of implementation increased, leading us to suppose these variables have no thresholds. Although we planned to do so at the beginning, we have never been able to exactly measure the degree of implementation in the comparison areas. We estimate that it was consistently less than 20% over the 4 years of the study. The contamination of the comparison group was, thus, low but not null. Also, the Québec health and social service system is already integrated with a universal publicly funded regime, health and

<table>
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<tr>
<th>Year 1</th>
<th>Person-year based 440.7</th>
<th>356.0</th>
<th>382.3</th>
<th>302.8</th>
<th>541.3</th>
<th>p = 0.001</th>
<th>S vs. C</th>
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<tr>
<td>Year 2</td>
<td>Emergency               0.46*** (0.42 – 0.50)</td>
<td>0.318 (0.28 – 0.36)</td>
<td>0.47*** (0.44 – 0.50)</td>
<td>0.388 (0.36 – 0.42)</td>
<td>0.48 (0.45 – 0.51)</td>
<td>0.46 (0.43 – 0.49)</td>
<td>0.49 (0.45 – 0.53)</td>
<td>0.54 (0.50 – 0.58)</td>
<td>.300 &lt;.001 &lt;.001</td>
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<td>Year 3</td>
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Notes: S = Study group; C = Comparison group; 95% confidence intervals are reported in parentheses.

a From generalized estimating equation model.
b Significance of the evolution over time within group.
c Comparison of the evolution over time between groups.
d Fit statistic = 21.6; p fit < .001, where Fit statistic = Deviance 0 − Deviance C = −2 (LL 0 − LL C ), where 0 refers to the intercept-only model, C to the current model, and LL is the log-likelihood value; p fit = p value associated with the fit statistic.

*** p < .001 when comparing comparison with study group.
social services already included within the same ministry, regional authorities, and institutions, and home care provided by the CLSCs (French acronym for Local Community Health Centers). These two factors decrease our capacity to demonstrate the PRISMA model’s added value. In other contexts, with lower baseline integration, the model could show much more effectiveness.

Well-validated instruments were administered in face-to-face interviews to measure outcomes. Instead of using administrative (often incomplete) data for health and social services use, bimonthly telephone calls with recall incentives were used. This method is more expensive, but more exhaustive, especially for collecting information about private and voluntary services. Its test–retest and interrater reliability has been demonstrated in a substudy (Dubois et al., 2007). The close follow-up of participants by annual face-to-face interviews and bimonthly telephone calls accounts for the low dropout rate (14%) from the study over the 4-year period.

The model’s slower-than-expected implementation forced us to expand the sample with a second recruitment wave. Sophisticated methods of analysis (growth models) allowed us to use all the participants and all the data for the analysis. Although the sampling method was identical to the original (with a 2-year lag in minimum age), we cannot exclude that a selection bias may have been introduced with this second wave.

Comparison with the other evaluative studies about integrated services published so far could be made, although the outcome variables were often different. None of these studies showed any effect on mortality, and only the Darlington (Challis et al., 1991) and Rovereto (Bernabei et al., 1998) projects showed any reduction in institutionalization rates. Functional decline was never used as an outcome in other studies, except for the Bois-Francs pilot study for the PRISMA model, where it also yielded a significant result (Tourigny et al., 2004). Our study showed a significant effect not only on prevalence as it was hypothesized but also on incidence of functional decline. We believe that this result is related to the case-finding procedure incorporated into the PRISMA model (Raîche et al., 2008), allowing for early identification of frail older people, reference to a CM, and early intervention. When disability was considered as a continuous variable, our study did not show any significant effect over time, although the Bois-Francs pilot study (Tourigny et al., 2004) for PRISMA was promising as well as On Lok (Yordi & Waldman, 1985) and the two Italian studies (Bernabei et al., 1998; Landi et al., 2001). Satisfaction was clearly improved, as was also observed in the Darlington project (Challis et al., 1991). None of the previous studies measured empowerment, but, given the highly significant result we get, this outcome should be tested and confirmed in subsequent studies. Our study returned much lower unmet needs and higher caregiver burden in the experimental group. It seems that caregivers fulfilled needs, which is consistent with the very limited availability of home care services during the experiment. Although there was no impact on the desire to institutionalize their relatives, this higher burden should be taken seriously and home care resources should be increased to support informal caregivers.

Impact on health services use was measured in most studies on ISD. Reduction in ER visits was also observed in the Rovereto study (Bernabei et al., 1998). Although our study was not powerful enough to bring out a statistically significant impact of ISD on hospital admission, such was demonstrated in the On Lok project (Yordi & Waldman, 1985) and the two Italian studies (Bernabei et al., 1998; Landi et al., 2001). The Evercare project (Gravelle et al., 2007), which focuses on case management only, failed to show any reduction in ER visits and hospital admissions. It seems that managing cases by itself is not sufficient to show effects on hospital use; other ISD components are critical to show effects on this outcome. The SIPA (Bèland et al., 2006) study showed a very clear shift from institutional services to home care service use. Our study did not show such transfer, but the PRISMA implementation was not accompanied by an increase in home care services in the experimental areas as in the SIPA project.

This study adds evidence in support of the benefits of ISD to health care use and the functional decline process. As suggested by Kodner (Kodner, 2006), more research is needed to document the impact of ISD on users and caregivers, not only on health care use. Our results on patient satisfaction and empowerment and on caregiver burden should be confirmed. It would be interesting to implement and test the PRISMA model in other regions and countries with no or low prior integration in order to measure its full impact.

Based on the positive PRISMA experiment, the Québec Ministry of Health and Social Services decided to generalize the model to the entire province. This is a good illustration of evidence-based decision making. Other provinces in Canada are interested in implementing the model, as in countries like France. Because the PRISMA model is embedded within the health care system and implies a modification and reorganization of the health care and social services system, it could be more appropriate for universal Beveridgian-type systems, as in Canada, the United Kingdom, and Scandinavian countries. Experimental implementation is currently under way in France, where the numerous actors in financing and delivering care to older people present a challenge in coordination (Somme et al., 2008). It would be interesting to also test its feasibility within the United States health care system.

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