

Evaluation of a changed model of care delivery in a Canadian province using outcome mapping

Gail Tomblin Murphy^{1*}, Adrian MacKenzie¹, Rob Alder^{1,2} and Cindy Cruickshank³

¹*Dalhousie University—WHO Collaborating Centre on Health Workforce Planning & Research, Halifax, Nova Scotia, Canada*

²*University of Western Ontario—Epidemiology & Biostatistics, London, Ontario, Canada*

³*Nova Scotia Department of Health and Wellness, Health System Workforce Branch, Halifax, Nova Scotia, Canada*

SUMMARY

Background Collaboration between the Nova Scotia Department of Health and Wellness, the province's District Health Authorities (DHAs) and the Izaak Walton Killam (IWK) Health Center led to the development and implementation of a new collaborative model of patient-centered care delivery in the province.

Objective The objective was to determine the effectiveness of the initiative in arriving at the envisioned care model by investigating its impacts (if any) on patient, system, and providers outcomes.

Methods A repeated surveys study design with mixed methods in an outcome mapping framework was used to measure process and outcome indicators for patients and families, providers, and the system.

Results Almost all outcomes at the patient and family, provider, and system level improved following the implementation of the model, and these effects were stronger on units where the model was more fully implemented.

Conclusions The efforts of the province, DHAs and IWK to improve patient care through the new care model have been successful. This evaluation is unique in the broad range of indicators it incorporates. Comprehensive monitoring and evaluation of health system changes is critical to system effectiveness. Copyright © 2012 John Wiley & Sons, Ltd.

KEY WORDS: model of care; outcome mapping; health system evaluation; health system transformation

*Correspondence to: Gail Tomblin Murphy, Dalhousie University, WHO Collaborating Centre on Health Workforce Planning & Research, 5869 University Avenue, Halifax, Nova Scotia, B3H 4R2, Canada. E-mail: gail.tomblin.murphy@dal.ca

BACKGROUND

The Model of Care Initiative in Nova Scotia (MOCINS) was launched in March 2008 as a partnership of the Department of Health and Wellness, District Health Authorities (DHAs), and the Izaak Walton Killam (IWK) Health Center and continues as such today. The impetus for MOCINS was to achieve sustainability surrounding the growing expenditures associated with health care delivery and health human resources challenges experienced in the province, across Canada, and internationally. The mandate of MOCINS was to design, implement, and evaluate a viable provincial model of care for acute care in-patient services that was to be patient centered, high quality, safe, and cost-effective.

A new model of care, referred to as the Collaborative Care Model (Figure 1), was designed early in the Initiative by a provincial interprofessional design team. The model guided local implementation of the new care delivery model in acute care in-patient units and more recently in other sectors such as maternal–child care. The goal of the model is to ensure more efficient, high quality patient care in health care organizations, by making the best use of staff competencies (knowledge, skills, and judgment), improving processes, and better supporting access to information and modern technology. The model is designed to align the care delivery system with the health needs of Nova Scotian, and orients providers to work to their optimal scope of practice collaboratively within interprofessional teams.

The Collaborative Care Model was designed as a conceptual framework with four key components to use as change levers:

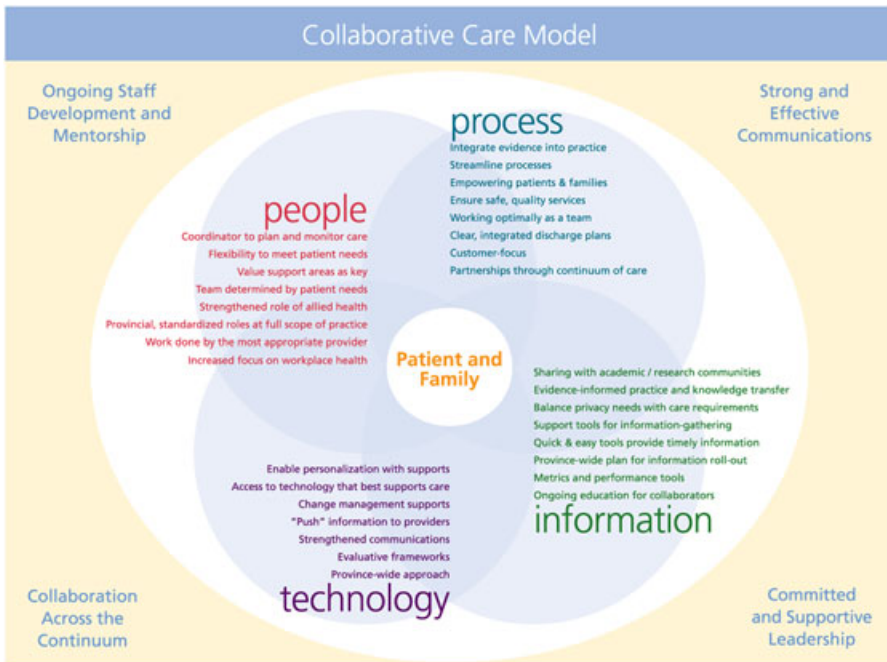


Figure 1. MOCINS Collaborative Care Model (Province of Nova Scotia Health Transformation, 2008)

- People—having the right people do the right work, collaboratively within inter-professional teams in which the roles of the health care providers are optimized to meet the needs of patients and their families;
- Process—redesigning processes to eliminate waste, prevent duplication of effort by the health care team, and enable patient and family self care;
- Information—ensuring timely access to information that supports care delivery, research, and academic mandates; and
- Technology—utilizing modern technology to provide safe and timely care.

The provincial model was not intended to be prescriptive about specific processes and practices; rather, it was expected that each unit would take the components of the model as desired attributes and make changes specific to the unit's unique context and patient needs so as to more fully embody those attributes.

Guided by a Senior Advisory Committee, a Provincial Leadership Team made up of local DHA/IWK Leads and Provincial Project Leaders at the Department of Health & Wellness facilitated the phased implementation of this model, beginning with 14 “showcase” units—that is, those units where the model of care was implemented.

Implementation of the Collaborative Care Model included a variety of activities aimed at understanding patient care needs and aligning staffing and care processes accordingly. Implementation varied between units according to their different patient and staff complements, but several overarching activities were undertaken. A template for capturing patient health needs was developed, as well as provincially standardized role descriptions reflective of current education and legislation to help guide staffing mix changes to meet those needs. In many cases, licensed practical nurses (LPNs) were supported to undertake education where necessary to support full-scope practice. On some units, managers' spans of control were reduced to enhance their ability to support MOCINS implementation. In addition, assistive personnel were introduced in some areas to perform basic supportive care within their scope of employment. In addition to the “people” changes described, the model saw process changes instituted to reduce inefficiencies, improve accessibility to information and equipment to support care delivery, and increased support for the use of modern technology (e.g. automated medication delivery system and a new call bell system).

It was anticipated that successful implementation of the Collaborative Care Model would result in an overall higher quality experience for the patient and families, with better resource utilization in a health care environment that is safe and satisfactory for both patients and providers. As a result of an improved care delivery model, it was hoped that acute care costs could be stabilized, contributing to greater system sustainability. Cost reduction was therefore viewed as a possible result of the Initiative as opposed to an explicit objective; hence, cost analysis was not part of this evaluation.

While new treatment protocols and health care interventions are implemented and tested often around the world (e.g. Nielsen *et al.*, 1972; Skellie *et al.*, 1982; Baldwin *et al.*, 1993; Bolam *et al.*, 1998; O'Loughlin *et al.*, 1999; Unützer *et al.*, 2001; Abbema *et al.*, 2004; Stringer *et al.*, 2006; Cox *et al.*, 2008; Gupta and Gupta, 2011) and collaborative approaches to health care provision specifically have been developed and evaluated in a variety of settings (e.g. Jacobsson *et al.*, 1998; Katon *et al.*, 1999; Sommers *et al.*, 2000; Chen *et al.*, 2010; Harris *et al.*, 2010; Vera *et al.*, 2010;

Bauer *et al.*, 2011; Schmid *et al.*, 2011), such a broad intervention as MOCINS in which staffing methods and patient care processes are changed and new technology is integrated simultaneously is rare, and rigorous evaluations of them even more so. Further, evaluations of health care initiatives to date have tended to focus on a few patient-level and/or system-level outcomes (e.g. Hughes *et al.*, 1984; Rich *et al.*, 1995; Marciniak *et al.*, 1998; Stewart *et al.*, 1999; Kasper *et al.*, 2002; Katon *et al.*, 2004; Zatzik *et al.*, 2004; Dwight-Johnson *et al.*, 2005; Ell *et al.*, 2008; Bosy *et al.*, 2010; Basinga *et al.*, 2011), whereas others (e.g. Hall *et al.*, 2007; Calache and Hopcraft, 2011) have only considered the impact of changes on provider outcomes. Few evaluations (e.g. Zimmer *et al.*, 1985; Cummings *et al.*, 1990) of new care delivery methods have simultaneously investigated their impacts on patient-level, provider-level and system-level outcomes.

OBJECTIVE

The objective of the evaluation was to determine the effectiveness of MOCINS in arriving at the envisioned care model by investigating its impacts (if any) on patient, system, and provider outcomes. The key questions guiding the evaluation were as follows:

1. To what degree is implementation of the new model of care associated with changes in patient, provider, and system outcomes?
2. Will observed changes in these outcomes assist in reducing provincial health human resources (HHR) shortages?

Question #1 was addressed using outcome mapping (Earl *et al.*, 2001). This approach involves the identification of “target” stakeholders to be affected by the new model of care, the process indicators to measure its implementation, and the outcome indicators to measure its effects.

Question #2 was addressed using simulation modeling (Tomblin Murphy *et al.*, 2009). In the interests of brevity, only the pursuit of the first objective—that is, the outcome mapping component—is discussed in this paper.

METHODS

A repeated survey design using mixed methods was used and involved concurrent measurement of process and outcomes indicators at baseline and follow-up at each showcase unit. The indicators to be included in the evaluation were identified in collaboration with the MOCINS provincial implementation team, consisting of dozens of staff (representing allied health, medicine, and nursing) and managers from each of the showcase units.

Instrument Development

Evaluation instruments were developed following the outcome mapping approach (Earl *et al.*, 2001) to gather information on each of the evaluation indicators from the key stakeholders to be impacted by MOCINS. These included showcase unit patients and their families, health care providers working on the showcase units, showcase unit managers,

district senior administrators, or some combination of these, depending on the nature of the indicator. These instruments included

- A paper-based or electronic Administrative Process Record (APR) for unit managers;
- A paper-based questionnaire for patients and their families;
- A web-based questionnaire for health care providers; and
- Focus group reporting templates called Performance Journals.

The APRs prompted the unit managers to provide a variety of administrative data on the evaluation indicators at the unit level. In addition to snapshots of the current number of patients and number and type of staff on the unit, these data included information (over the most recent 6-month period) on

- The unit's readmission¹ and repeat admission² rates;
- The number of falls, medical errors,³ adverse events,⁴ hospital-acquired infections, "failure to rescue" incidents,⁵ and in-patient deaths on the unit;
- The average length of stay on the unit and in the hospital overall by the units' patients;
- The number of resource intensity weighted⁶ cases discharged on the unit;
- The number of occupational health and safety incidents on the unit;
- The number of staff who left the unit (turnover);
- The number of incidents of violence on the unit;
- The total number of worked hours and overtime hours by each type of unit staff; and
- The total number of shifts missed by each type of unit staff due to illness or injury.

Each of these items was identified as an evaluation indicator. In addition to this administrative data, the APRs also requested the perspectives of the unit managers on a variety of aspects of the care, planning, and change management associated with MOCINS activities happening on their units. These included questions on

- Identifying change management resources (if any) the unit received to implement MOCINS;
- The adequacy of the resources and internal and external supports (including in-kind support) available to the unit to implement MOCINS;
- The consultation of unit staff about MOCINS development and implementation;

¹Proportion of patients with an unplanned readmission within 28 days of discharge with readmission diagnosis that is the same/related to the previous admission.

²Proportion of patients being re-admitted to hospital multiple times within 28 days for *any* condition.

³Refers to the failure to complete a planned action as intended or the use of a wrong plan to achieve an aim in the context of the provision of health care.

⁴Refers to an injury related to health care management rather than to an underlying disease process.

⁵The death of a patient with one or more of the following life-threatening complications—UTI, shock, pneumonia, post-operative infection, GI bleeds, or cardiac/respiratory arrests—for which early identification by health providers and medical and nursing interventions can influence the risk of death.

⁶The resource intensity weight of each in-patient discharge is calculated by the Canadian Institute for Health Information to estimate the relative resource requirements associated with that patient's stay in the hospital on the basis of their expected length of stay, case mix, and other factors.

- The status of care coordination on the unit;
- The role of assistive personnel such as continuing care assistants on the unit;
- The availability of, and engagement of unit staff in, professional development (PD) activities, including those related to MOCINS; and
- The degree to which patient care, care planning, and discharge planning on the unit were patient centered, team based, and evidence informed (i.e. in keeping with the vision of MOCINS).

The bulk of the survey for patients and families consisted of questions from the Picker Patient Experience (PPE-15) questionnaire (Jenkinson *et al.*, 2002), which was used to measure patient and family satisfaction with the care they received on the showcase units. Other questions were developed specifically for this evaluation on the basis of the remaining indicators identified. For example, patients were asked whether goals for their care and treatment were developed and achieved and whether they came to know the members of their care teams and understand their respective roles; these were all goals of MOCINS. Other questions asked of the patients related to their lengths of stay, whether they had any unplanned readmissions or emergency room visits within a month of discharge, and how they rated their health on a five-point ordinal scale from “excellent” to “poor”. Demographic information such as sex and age group was also requested.

The survey for the roughly 800 health care providers attached to the showcase units asked a variety of questions grouped under specific themes. These themes included care coordination, care planning, discharge planning, role of assistive personnel, team climate, role ambiguity and role conflict, technology use, staff development, job satisfaction, and satisfaction with the quality of care on their units. Questions on the role of assistive personnel were adapted from the provincial guidelines and principles for continuing care assistants in acute care (Nova Scotia Department of Health, 2006). Team climate questions were adapted from the short version (Kivimäki *et al.*, 2007) of the Team Climate Inventory (Anderson and West, 1998). Questions on discharge planning were adapted from those described by Lowenstein and Hoff (1994). Role ambiguity and role conflict questions were adapted from those used by Rizzo *et al.* (1970). Questions about the respondents’ level of satisfaction with the quality of care being delivered on their unit, their intentions to leave their jobs (if any), the number of shifts they had missed, and the amount of overtime they worked were adapted from those used by O’Brien-Pallas *et al.* (2010). Additional questions assessed the number of shifts respondents had missed because of illness or injury, the amount of overtime they had worked, their intentions to leave their jobs (if any), and profiling information such as their profession, sex, and age group.

The Performance Journals organized responses to focus group discussions about various aspects of MOCINS under a number of headings, including

- Components of the initiative that should continue, stop, or be added;
- Transferability and sustainability of the initiative;
- Collaboration among stakeholders through the initiative; and
- Emerging issues requiring further attention.

Once the instruments were drafted, stakeholders from the Department of Health and Wellness, the District Health Authorities, and IWK reviewed them in a content

validation process; revisions were made accordingly. Ethics approval was then obtained and a privacy impact assessment performed. Following the first round of data collection, the subscales used in each of the surveys were examined for construct validity and internal consistency reliability with the Cronbach's Alpha.

Data Collection

A repeated survey design using mixed methods was used for the outcome mapping portion of the evaluation. This design involved concurrent measurement of process and outcome indicators—through application of each of the instruments described previously—as early as possible in 2009 (MOCINS initiatives in most showcase units were to start in 2009) and then again approximately 1 year later at each showcase unit.

The primary study populations included all showcase unit staff and a sample of patients discharged from each showcase unit, in addition to the vice presidents of clinical services from each DHA and the IWK. On the basis of an estimated response rate of 40% and desiring to be 95% confident in detecting a 10 percentage point shift in patient satisfaction (assuming a baseline prevalence of 70%,⁷) a sample of approximately 950 patients was selected from across the 14 showcase units in 2009 and 2010 (Colton, 1974). This meant randomly selecting approximately 70 patients discharged from each show case unit in the 4-month period between approximately March and June 2009, with follow up in 2010. All (approximately 800) unit staff were invited to complete the survey at both points in time.

Focus groups were conducted with a purposive sample of key stakeholders, including the staff of all 14 showcase units (ranging from 4 to 15 participants per unit in both 2009 and 2010) as well as the vice presidents of patient care from each DHA and the IWK, at the beginning and the end of the evaluation period.

Data Analysis

Given that some of the showcase units had begun implementing components of the Collaborative Care Model (e.g., changes to staffing mix) before the first round (2009) of evaluation data collection, the focus of the data analyses was to examine associations between process variables that reflected the extent to which MOCINS activities were implemented and outcome variables that reflected provider, patient, and system impacts. This analysis was performed on both the baseline (2009) and follow-up (2010) data.

Provider workplace indices were derived from several series of related but independent variables in the providers' questionnaire. These indices reflect the effects of key MOCINS activities, and in this sense, they are provider outcome variables but also measures of the degree to which units are exhibiting the characteristics described by the Collaborative Care Model. Examples include care coordination, care planning, assistive personnel integration, team climate, role clarity and role conflict, and overall job satisfaction. Statistical associations between the providers' attendance at PD sessions and their score on these workplace indices were examined. Associations

⁷Statistics Canada (2005) estimates patient satisfaction in Nova Scotia to be around 86%. For this study, a more conservative estimate of 70% was used, which requires a larger sample size.

between provider workplace indices and patient outcomes were also examined at the unit level. In this way, these workplace indices function as either process or outcome indicators, depending on whether one is attempting to understand the effectiveness of MOCINS activities or the impact of workplace characteristics on patients, staff, and the health care system overall.

For provider and patient outcomes, the difference between 2009 and 2010 was tested using *t*-tests⁸ and chi-square tests with adjustment for showcase unit. For unit-level system outcomes, the 2009–2010 difference was tested with paired *t*-tests and chi-square tests. Multivariate statistical techniques used were multiple linear regression when the outcome variable was continuous (e.g., the workplace indices) and logistic regression analysis when the outcome variable was categorical (e.g., emergency room visits or general health status). Adjustment for stratified sampling method (using SAS PROC SURVEY) as well as for showcase unit, provider age, sex, occupation and years in the unit (for the provider survey), and patient age and sex (for the patient and family survey) was carried out (Aday and Cornelius, 2006). The multiple-testing environment was accounted for with Bonferroni adjustment (Bland and Altman, 1995).

Following the second and last rounds of data collection, the data from the initial and follow-up provider data collection tools were linked by respondent identification number. This allowed for the calculation of change in the outcome indicators between initial to follow-up assessments, and the estimation of association between process indicators (e.g. engagement in MOCINS activities) and these changes after adjustment for potential confounders. Regression coefficients were estimated by maximum likelihood using generalized models.

Data in the APR were analyzed to generate unit-level variables (e.g. staff turnover rate) and then linked with the patient and provider data via the respondent's showcase unit. The association between individual provider workplace indices, which reflect the implementation of MOCINS initiatives (e.g. care coordination and team climate), and unit-level system outcomes (e.g. provider productivity) was tested using multilevel models. The association between the unit mean provider workplace indices and the unit mean system outcomes was tested using ordinary least squares regression (OLS).

Focus group facilitators directed the discussions around four broad areas: successes, challenges, transferability, and sustainability; the discussions were audio recorded, transcribed, and analyzed to identify key themes.

The purpose of these analyses was to understand, first, the degree to which the showcase units grew to more closely exhibit the workplace characteristics described in the Collaborative Care Model during the course of the study; second, the degree to which any such changes were associated with participation by unit staff in MOCINS activities; third, the degree to which outcomes at the patient (e.g. satisfaction with care), provider (e.g. job satisfaction) and system (e.g. overtime use) levels improved during the study period; and fourth, the degree to which workplace characteristics were associated with improvements in those outcomes.

⁸Out of about 250 provider respondents in each survey, 55 were the same individuals in both (about 20%). Given that about 80% of the samples were independent, and the total samples provide more power, and the *t*-test is robust with respect to violation of assumptions, independent *t*-tests were used in these analyses unless otherwise stated.

RESULTS

The results of the outcome mapping portion of the evaluation are presented as follows. Described first are the perspectives of the showcase unit managers on implementation of the MOCINS initiatives, followed by results from the provider survey, the patient and family survey, and the APR. The results of linking the data from different sources are then presented. Finally, themes emerging from the focus group discussions are described.

MOCINS Implementation

Completed APRs were obtained for 13 of 14 showcase units in 2009 and all 14 in 2010. As few as nine and as many as 13 of the showcase unit managers (two of the units share the same manager) responded to individual questions on the APRs, with response rates to individual questions improving in 2010.

Few of the managers indicated that the showcase units had been allocated additional resources—financial or otherwise—to implement MOCINS. This is consistent with the vision of MOCINS being a largely “cost neutral” initiative; the differing responses may reflect a difference in what individual managers considered to be “resources”. Fewer than half of the managers agreed that the unit had sufficient resources to implement MOCINS; however, most reported receiving adequate support to implement MOCINS from government and their health authority in both 2009 and 2010.

Administrative Process Record data indicated that all 14 units provided clinical skills development and mentorship activities before both the first and second data collection periods. In addition, all units provided role optimization activities after the first and before the second data collection period, and the majority provided other types of PD opportunities for staff between the two data collection periods. The majority of unit managers also reported hiring assistive personnel as part of MOCINS and that various patient care review processes—such as interprofessional care planning, documentation, and discharge planning—had been reviewed before either period. Less than a third of managers reported that clinical pathways had been reviewed prior to the first evaluation period, but more than half reported that they had prior to the second.

MOCINS Patient and Family Survey

To administer the patient and family survey, questionnaires were mailed through the provincial health care insurance provider to 971 patients discharged from any of the 14 showcase units between 1 March and 30 June 2009 (for the first round of data collection) and 1 January to 30 April 2010 (for the second round of data collection). Completed questionnaires were received from 294 (30% response rate) in 2009 and 311 in 2010 (32%). The 2009 sample was 69% female with an average age of 57, whereas the 2010 sample was 60% female with an average age of 67. Although there were some differences in these characteristics between the samples and the corresponding patient populations, analyses of the patient and family survey data were weighted to adjust for these differences.

Figure 2 presents the proportion of patients reporting each of the Picker Patient Experience items on the 2009 and 2010 surveys. All experience items showed improvement

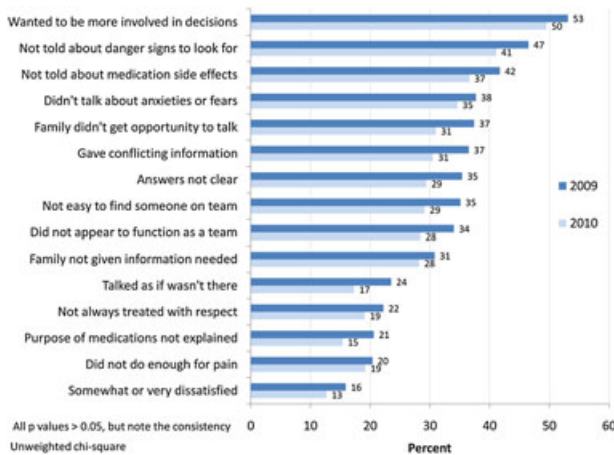


Figure 2. Patient/family-reported hospital experience on Model of Care Initiative in Nova Scotia showcase units, 2009/2010

during this period of time, although none of the improvements was found to be statistically significant.⁹ The item experienced by the highest proportion of patients at both points in time was “Not sufficiently involved in decisions”—53% of patients and families surveyed reported feeling this way in 2009, with 49% reporting as much in 2010.

Lengths of stay reported by showcase unit patients in both the showcase units themselves ($p=0.040$) and in the hospital overall ($p=0.083$) were lower in 2010 than in 2009. Patients in 2010 also reported fewer emergency room visits, readmissions, and better health within a month of discharge compared with those in 2009, although these differences were not found to be statistically significant by chi-squared analysis.

MOCINS Provider Survey

Invitations to complete the first and second questionnaires were sent to all providers across the 14 showcase units during the first data collection period. A total of 231 out of about 800 responded to the first questionnaire (29% response rate) and 264 of 755 to the second (35%). Analysis was weighted by age and sex of the respondents to adjust for nonresponse. Descriptive statistics on the respondents to both samples are provided in Table 1.

All provider workplace indices were found to have a high level of internal consistency reliability when tested following their first administration, with Cronbach's alphas of 0.75 or higher. The descriptive statistics for these and other provider outcomes as measured in both surveys are provided in Table 2.

The overall “scores” of the showcase units on care coordination, assistive personnel, team climate, discharge planning, and job satisfaction scales all increased statistically significantly from 2009 to 2010 (Table 2). Providers also reported working

⁹This study was powered to detect a 10 percentage point shift at $p < 0.05$. Most shifts were less than 10 percentage points. A sample powered to detect a five percentage point shift would have been prohibitively large.

Table 1. Distribution of provider survey respondents, Nova Scotia Department of Health, 2009/2010

Descriptor	2009 distribution (<i>n</i> = 231)	2010 distribution (<i>n</i> = 264)
Profession		
Registered nurse	50%	37%
Licensed practical nurse	28%	22%
Unit clerk	7%	3%
Physician	2%	<1%
Other (e.g. physician, occupational therapist, physiotherapist, pharmacist, and assistive personnel)	14%	29%
Gender		
Female	96%	93%
Male	5%	7%
Age		
20–29	31%	23%
30–39	21%	23%
40–49	27%	24%
50–59	18%	18%
60–69	2%	3%

substantially less overtime in 2010 compared with that in 2009 ($p=0.045$). Although not statistically significant, it is noteworthy that role clarity increased and role conflict (an opposite construct) decreased from 2009 to 2010. These analyses were adjusted for the showcase unit so that any pre-existing differences did not influence the results.

Although showcase units started the MOCINS initiatives at different times, the provider workplace indices did not appear to vary significantly with the length of time between their respective start dates and the first set of data collection in the evaluation. The exception was the assistive personnel index, which increased with length of time since the unit started the MOCINS project ($p=0.0004$). This may indicate that the workplace characteristics reflected by this index required the most time to influence; it may also indicate that many of the showcase units had a pre-existing capacity for adapting to change quickly.

The association between the workplace indices and provider attendance at MOCINS PD sessions is reported in Table 3. Only those associations found to be at or close to the conventional level of statistical significance are shown.

According to the 2009 provider survey, attendance at various types of PD sessions was associated with higher scores on several workplace indices. Results from the 2010 survey show similar associations, although fewer of them (reasons for which are discussed in the succeeding paragraphs).

Although not shown, provider attendance at technology skills development opportunities was associated with shorter patient lengths of stay in the showcase unit and a higher level of patient self-assessed health after discharge.

The associations between provider attendance at PD and changes in provider outcomes from 2009 to 2010 were also investigated. Of the roughly 500 individuals who completed either the 2009 or 2010 provider survey, 55 completed both and could thus be included in this analysis, which was carried out using generalized models. Because of the smaller *N*, making it less likely that an association would be found to be significant because of chance alone, Bonferroni adjustment (Bland and Altman, 1995) was not

Table 2. Descriptive statistics for Model of Care Initiative in Nova Scotia provider outcomes, 2009 and 2010

Provider outcome	First survey			Second survey			Ratio of means (2nd/1st)	Ratio [^] p-value
	N	Mean or %	Standard error of mean	N	Mean or %	Standard error of Mean		
Care coordination	225	14.6	0.296	257	15.6	0.272	1.068	0.017*
Assistive personnel	177	23.0	0.370	247	24.0	0.313	1.043	0.031*
Team climate	211	50.9	0.831	261	53.4	0.687	1.049	0.021*
Care planning	220	8.2	0.126	254	8.4	0.123	1.024	0.545
Discharge planning	210	41.7	0.823	248	44.7	0.772	1.072	0.010*
Role clarity	219	31.3	0.442	257	32.0	0.338	1.022	0.214
Role conflict	218	31.6	0.626	256	31.1	0.490	0.984	0.503
Job satisfaction	207	82.7	1.440	238	87.5	1.347	1.058	0.016*
Intention to leave	233	11.2%	—	264	12.9%	—	1.154	0.168
WCB ¹² absence	233	4.2%	—	264	3.8%	—	0.883	0.805
Shifts missed	212	3.2	0.320	224	2.8	0.247	0.875	0.346
Overtime hours	180	21.2	3.996	179	12.3	1.891	0.58	0.045*

[^]Weighted multiple regression analysis adjusted for showcase unit.

*Significant at $\alpha=0.05$.

¹²Shift missed because of an injury or condition severe enough to justify the involvement of the provincial Workers' Compensation Board.

Table 3. Associations between professional development and provider workplace indices, Nova Scotia Department of Health, 2006

Professional development opportunities attended	Associated workplace indices	Regression coefficient [^]	<i>p</i> -value
2009 provider survey (<i>N</i> = 231)			
Technology skills	Discharge planning	4.664	0.009
Team effectiveness	Care coordination	1.760	0.004*
	Assistive personnel	2.556	0.002*
	Team climate	4.000	0.023
Role optimization	Team climate	6.334	0.004*
Other staff development	Role clarity	3.688	0.002*
	Care coordination	2.019	0.005*
	Job satisfaction	10.587	0.003*
2010 provider survey (<i>N</i> = 264)			
Leadership skills	Care planning	1.483	0.039
	Job satisfaction	6.212	0.023
Technology skills	Job satisfaction	6.926	0.014

[^]Weighted regression analysis; adjusted for age, sex, occupation, years on unit and showcase unit.

*Statistically significant after Bonferroni adjustment.

carried out in this analysis. Table 4 shows the types of PD activities found to be associated with changes in specific workplace indices at a level of significance of less than 0.1.

Providers who attended PD sessions focusing on leadership skills reported higher levels of care planning, care coordination, and role clarity on their units in 2010 compared with 2009. Similarly, those who attended sessions aimed at mentorship reported improved discharge planning and higher job satisfaction scores in 2010 compared with 2009. In addition, providers who attended role optimization sessions reported reduced role conflict in 2010 compared with 2009.

MOCINS System Outcomes

The mean and median changes in the system outcome measures reported on the APRs from 2009 to 2010 were calculated and compared using paired *t*-tests. Whereas the total

Table 4. Associations between professional development and changes in workplace indices, Model of Care Initiative in Nova Scotia 2009–2010

Attended professional development opportunities [^]	Associated changes in workplace indices (<i>N</i> = 55)	Regression coefficient ^{^^}	<i>p</i> -value
Leadership skills	Care planning	1.541	0.043
	Care coordination	2.091	0.099
	Role clarity	1.934	0.081
Mentorship	Discharge planning	6.269	0.046
	Job satisfaction	11.733	0.018
Role optimization	Role conflict	−6.485	0.015

[^]Attendance treated as a class variable (0 = no attendance in 2009 or 2010; 1 = attendance in 2009 or 2010; 2 = attendance in 2009 and 2010) with reference level coding.

^{^^}Estimated by maximum likelihood using generalized models procedure.

number of showcase units in this study was 11 (units within the same hospital were combined), the number that provided administrative data in both 2009 and 2010 was very small, ranging from two to six, depending on the variable. The result was that all of the temporal changes in these variables were highly likely to be due to chance; no statistically significant differences in these unit-level outcomes between 2009 and 2010 were detected.

Analyses Combining Patient, Provider and System Outcomes

Unit-level data from the APRs and surveys were linked by showcase unit to allow for additional analysis of associations between provider workplace indices and patient and system outcomes. To minimize the probability of declaring an association significant statistically when in this multiple-tested environment (six outcomes for every explanatory variable) it is not, the alpha was adjusted (0.05/6) as per the Bonferroni method (Bland and Altman, 1995) such that the conventional level of statistical significance ($\alpha=0.05$) is met if the p -value is equal to or less than 0.008.

The associations found between provider workplace indices and patient outcomes were similar in 2009 and 2010. At both points in time, a higher care planning index—that is, patients and their families being more involved in planning with the care team and a more prevalent use of evidence in care planning—was found to be associated with significantly lower lengths of stay in hospital ($p=0.005$ and $p<0.0001$, respectively) as well as better self-reported patient health following discharge ($p<0.001$ in both years). A higher role clarity index was also associated with significantly lower lengths of stay in hospital ($p=0.005$ in 2009 and $p=0.008$ in 2010). Conversely, a higher assistive personnel index—that is, assistive personnel being more valued, supported and supervised by registered nurses (RNs) and LPNs—was found to be associated with significantly higher lengths of stay in the hospital ($p=0.001$ in 2009 and $p=0.005$ in 2010); this may be a reflection of greater use of assistive personal on units with low-acuity, long-term care patients awaiting alternative placement in the community.

In comparing the mean provider outcomes by showcase unit with the unit-level system outcomes from the APR, OLS models were used. The association of individual provider scores with the unit-level system outcomes was also assessed using multilevel models. Because these statistical techniques tended to yield comparable results, the conceptually simpler OLS models are reported here. Only the statistically significant ($p<0.05$) associations are reported here. Because the n in these analyses is small (effectively equal to the number of showcase units without missing data), the risk of a type 1 error (declaring an association significant when in fact it is not) is also small. For this reason, Bonferroni adjustment for multiple testing was not carried out. The results of this analysis are shown in Table 5.

Results of this analysis indicate that in 2009, units with higher care coordination scores had significantly higher LPN productivity. Units with a higher assistive personnel index had significantly fewer infections per patient. Units with better team climate had significantly fewer repeat admissions and medical errors. On units with higher care planning indexes, there were lower lengths of stay, fewer repeat admissions, fewer

Table 5. Associations between Model of Care Initiative in Nova Scotia provider workplace indices and system outcomes, Nova Scotia Department of Health, 2009/2010

Provider workplace index	Associated system outcomes	Regression coefficient [^]	<i>p</i> -value
2009 provider survey (<i>N</i> = 231)			
Care coordination	LPN productivity ^a	0.023	0.012
Assistive personnel	Infections per 100 patients ^a	-0.380	0.010
Team climate	Repeat admissions ^a	-21.31	0.025
	Medical errors per 100 patients ^a	-0.178	0.025
Care planning	LPN productivity ^a	0.098	0.024
	Length of stay in unit ^a	-0.087	0.008
	Repeat admissions ^a	-2.149	0.034
	Deaths per RIW cases ^{a*}	-24.43	0.010
	Shifts missed because of injury per RN ^a	-0.114	0.028
Discharge planning	Shifts missed because of injury per LPN ^a	-0.027	0.019
	Repeat admissions ^a	-14.11	0.043
	Deaths per RIW case ^a	-174.2	0.002
Role clarity	Shifts missed because of injury per RN ^a	-0.1445	0.049
	Repeat admissions ^a	-9.695	0.035
Role conflict	Shifts missed because of injury per RN ^a	0.281	0.043
	Repeat admissions ^a	10.469	0.007
Job satisfaction	Repeat admissions ^a	-44.59	0.010
	Medical errors per 100 patients ^a	-0.407	0.009
2010 provider survey (<i>N</i> = 264)			
Assistive personnel	Infections per 100 patients ^a	-0.38	0.010
	Job satisfaction [#]	6.212	0.023
Care planning	OH&S incidents ^a	-0.029	0.011
	RN productivity ^a	-0.026	0.005
Role conflict	Total overtime per staff [#]	-0.119	0.018

LPN, licensed practical nurse; RN, registered nurse.

[^]Weighted least squares regression analysis.

^aOutcomes measured using administrative data.

[#]Self-reported from provider survey.

*RIW refers to resources intensity weighted, or acuity-adjusted, cases.

deaths,¹⁰ and fewer shifts missed because of injury per RN and LPN. Units with a higher discharge planning index had fewer repeat admissions, deaths, and shifts missed because of injury per RN. Units with a higher role clarity index had fewer repeat admissions, whereas on units where the role conflict index was higher, repeat admissions were higher. Finally, in 2009, units with a higher job satisfaction index had significantly fewer repeat admissions and medical errors per patient.

As noted previously, in 2010 there were fewer statistically significant associations detected, presumably for reasons discussed in the succeeding texts. Units with a higher assistive personnel index had fewer infections per patient and higher job

¹⁰To account for the varying acuity of patients across the showcase units, the rate of death on each unit was weighted according to the total resource intensity weight on each unit.

satisfaction. Units with a lower role conflict index had lower overtime use per staff. On units with higher care planning scores—that is, units where patient care is reported to be more evidence based and patients and their families are involved in care planning—there were fewer occupational health and safety incidents, and RN productivity¹¹ was lower. This last finding is consistent with RNs shifting their focus from clinical interventions to care planning and coordination.

Inconsistent with every other result in Table 5 is that in 2009, units with a higher role clarity index had more shifts missed because of injury for RNs. It is difficult to explain this finding, particularly in the context of the other results; it is possible it may be an artifact.

Focus Group Analysis

Most of the subject matter in the focus group discussions fell under one of several key themes, with considerable overlap. These themes included pre-existing challenges, team-based patient care, communication, role optimization, leadership, and stakeholder engagement.

In general, MOCINS was viewed by most front line providers as a valuable undertaking; indeed, it was viewed by many as “the way we have to go”, although it was noted that this would require significant adjustments for many providers, particularly RNs and LPNs. Over the evaluation period, most of the showcase units continued to make progress in implementing the collaborative care model, and staff continued to believe it has helped to increase understanding among staff of the respective roles and scopes of practice of the different health providers on the team, and improved communication between staff members and with patients and families. These improvements, in turn, helped to continue to improve working conditions and patient care as staff reported knowing the patients and each other better as a result of MOCINS.

Health care providers and other team members seeking to implement MOCINS reported facing a number of challenges, the most significant of which were not related to MOCINS itself. These included issues such as shortages of staff, equipment and supplies (consistent with reports from unit managers through the APRs), difficulty engaging physicians, and challenges communicating with other districts. These issues were in existence for some time prior to the beginning of MOCINS. Additional challenges encountered during MOCINS implementation unrelated to the initiative itself included the H1N1 outbreak, labor disputes, unit moves, and changes in patient population.

Of the challenges related to MOCINS itself, the most significant appears to be related to communication about the initiative. A number of units reported feeling inadequately informed about MOCINS prior to—and some during—its implementation. Several units also reported that staff members within and outside the showcase units have been attributing problems to MOCINS that are unrelated to the project. Increased and improved communication about the project was identified as being critical to improving awareness and understanding of MOCINS by staff, patients, unions, and other stakeholders. This is particularly important with respect to the nurses involved in the initiative; a number of focus group participants (including nurses) indicated that it

¹¹Number of resource intensity weighted patient days of care per Full Time Equivalent (FTE).

was hard for them to “let go” of the familiar way of doing things and adjust to working under the collaborative care model.

LIMITATIONS

As noted previously, MOCINS implementation was initiated on some units prior to the evaluation commencing, which prohibited a conceptually simpler before-and-after study design (e.g. Harris *et al.*, 2010). In addition, although many evaluations of health care initiatives are able to make use of control trials (e.g. Basinga *et al.*, 2011), such a design was not possible in this study because of the unavailability of sufficiently matched controls. Although no other province-wide health care initiatives were occurring at the same time as MOCINS, the potential of confounding factors impacting results cannot be entirely ruled out. This said, the findings that (a) positive work environments were associated with positive patient, provider, and system outcomes, and (b) improvements in those environments over time were associated with staff involvement in MOCINS activities provide some evidence to support attribution of the positive findings in this study to the MOCINS project. For example, although the finding that most provider workplace indices did not vary according to the length of time between MOCINS implementation beginning and the first set of data collection may indicate that the participating units had some pre-existing capacity to adapt quickly to change, the findings that attendance at MOCINS PD activities was associated with improvements in these indices suggests that these activities were significant contributors to these improvements.

The evaluation was limited by the lack of availability of some administrative data to measure outcomes that may have been affected by MOCINS. Sustained, intensive efforts by managers of the showcase units yielded improved data collection in 2010 compared with that in 2009, but several important gaps in the desired data remained. This meant that potential changes in several indicators over time could not be detected and multiple measures of the same indicator could not be triangulated; for example, the reductions in overtime reported by respondents to the provider survey, and the reductions in lengths of stay reported by respondents to the patient and family survey could not be confirmed with administrative data. The unavailability of this data would also preclude the analysis of trends in it prior to MOCINS beginning—for example, to see if certain outcomes were on an improvement trajectory anyway. The main challenge managers reported encountering in completing the APRs was in obtaining administrative data from particular sources at the level of individual units; it seems some of these have been designed to collect and report data the facility or district level but not the unit level.

The scale of the initiative also limited the power of the evaluation analysis. For example, in 2010, there were fewer associations between the workplace indices and system outcomes as well as provider attendance at PD sessions. This may be due, at least in part, to the reduced variation in each of the workplace index “scores” across the showcase units in 2010 compared with that in 2009. This reduced variation in 2010 is evinced by the lower Standard Errors of the Means in Table 2. Although a larger pool of patient, provider, and system data would have allowed for greater power in detecting such associations, this could only be achieved through an increased number

of showcase units or through improved response rates as all providers and a large sample of patients were already invited to participate in the study.

CONCLUSIONS

Findings of the evaluation indicate that almost all patient and family, provider, and system outcomes were maintained or improved over the course of MOCINS implementation. Further, improved outcomes were associated with greater involvement of unit staff in specific MOCINS activities, which suggests that MOCINS has been at least partially responsible for these improved outcomes. More specifically, qualitative data from unit staff indicate that MOCINS has contributed to improved understanding of different care team roles and improved planning (as envisioned by the Collaborative Care Model); this belief is consistent with quantitative data showing an association between provider attendance at MOCINS PD activities and improvements in these factors over time. Staff further report feeling that these workplace improvements make for improved patient care; this belief is supported by quantitative data showing that outcomes for staff (e.g. job satisfaction), patients (e.g. satisfaction with care), and the system overall (e.g. overtime use) improved during MOCINS implementation and that these improvements were greater on units that scored higher on these workplace optimization measures—that is, the more units exhibited the desired attributes of the Collaborative Care Model, the better the outcomes produced by that unit.

The evaluation methodology described here allows for the examination of relationships between the implementation of a complex health care initiative and a wide range of patient, provider, and system outcomes. The evaluation tools developed to measure those relationships capture the perspectives of the people most directly impacted by the initiative in question—the patients, families, health care providers, and administrators involved in it—and show congruence between the messages reported from these stakeholders both quantitatively and qualitatively. The incorporation of this range of perspectives, and this range of indicators, into the evaluation of a health care initiative is important to understanding its implementation and impacts. In addition, this study included results of analysis of administrative data for the showcase units consistent with the messages derived from the focus groups and surveys.

Ongoing monitoring and evaluation of health system performance is essential to its efficiency and effectiveness. A rigorous evaluation, however, requires substantial data collection, and whereas evidence-based decision making can be accurately guided by empirical evidence, without essential data, most decisions will remain inefficacious. It is therefore critical that policy makers invest in the collection and accessible storage of data required to guide health system planning. This will facilitate the most effective use of limited resources.

ACKNOWLEDGEMENTS

The authors of this manuscript would like to acknowledge the following for their contribution to the study it describes:

- Patients and families of the showcase units for taking the time to complete and return questionnaires;
- Staff, managers, physicians, MOCINS leads, and Vice Presidents of Patient Care at the Nova Scotia District Health Authorities and the Izaak Walton Killam Health Center for participating in focus group discussions, completing surveys, and gathering data from multiple administrative sources to inform the evaluation;
- Dr. Jennifer Macnab for her assistance with quantitative data analysis;
- The Nova Scotia Department of Health and Wellness' Evaluation Working Group and chairperson Jill Casey for her guidance and leadership in coordinating and implementing the evaluation;
- The MOCINS Provincial Implementation Team and co-chair Katherine Fraser for her insight into the development of the evaluation;
- The MOCINS Senior Advisory Committee and chairperson Liz Millett for her oversight of the evaluation; and
- The evaluation's external advisory panel including Dr. John Gilbert, Dr. Jeanne Besner, Dr. Sandra MacDonald-Rencz, and Dr. Stephen Tomblin for lending its considerable experience to the interpretation of the evaluation findings.

This study was funded by the Nova Scotia Department of Health and Wellness. Ms. Cruickshank is an employee of the Nova Scotia Department of Health and Wellness, one of the architects of the initiative being evaluated. She was directly involved in its design and implementation. We have no other conflicts to declare.

REFERENCES

- Abbema EA, Van Asssema P, Kok GJ, De Leeuw E, De Vries NK. 2004. Effect evaluation of a comprehensive community intervention aimed at reducing socioeconomic health inequalities in the Netherlands. *Health Promot Int* **19**(2): 141–156. DOI:10.1093/heapro/dah202.
- Aday LA, Cornelius LJ. 2006. *Designing and Conducting Health Surveys*. San Francisco: Jossey-Bass.
- Anderson NR, West MA. 1998. Measuring climate for work group innovation: development and validation of the team climate inventory. *J Organ Behav* **19**(3): 235–258.
- Baldwin LM, Inui TS, Stenkamp S. 1993. The effect of coordinated, multidisciplinary ambulatory care on service use, charges, quality of care and patient satisfaction in the elderly. *J Community Health* **18**(2): 95–108.
- Basinga P, Gertler PJ, Binagwaho A, Soucat AL, Sturdy J, Veersmach CM. 2011. Effect on maternal and child health services in Rwanda of payment to primary health-care providers for performance: an impact evaluation. *Lancet* **377** (9775): 1421–1428. DOI: 10.1016/S0140-6736(11)60177-3.
- Bauer AM, Unutzer J, Azzone V, Frank RG, Goldman HH, Alexander L, Coleman-Beattie B. 2011. Implementation of collaborative depression management at community-based primary care clinics: an evaluation. *Psych Serv* **62**(9): 1047–1053. DOI: 10.1176/appi.ps.62.9.1047.
- Bland JM, Altman DG. 1995. Multiple significance tests: the Bonferroni method. *BMJ* **310**(170). DOI: <http://dx.doi.org/10.1136/bmj.310.6973.170>.
- Bolam A, Manandhar DS, Punar Shrestha P, Ellis M, de I Costello AM. 1998. The effects of postnatal health education for mothers on infant care and family planning practices in Nepal: a randomised controlled trial. *BMJ* **316**(7134): 805–811. DOI: 10.1136/bmj.316.7134.805.
- Bosy D, Etlin D, Corey D, Lee JW. 2010. An interdisciplinary pain rehabilitation programme: description and evaluation of outcomes. *Physiother Can* **62**(4): 316–326. DOI: 10.3138/physio.62.4.31.
- Calache H, Hopcraft MS. 2011. Evaluation of a pilot bridging program to enable Australian dental therapists to treat adult patients. *J Dent Educ* **75**(9): 1208–1217.
- Chen EH, Thom DH, Hessler DM, Phengrasamy L, Hammer H, Saba G, Boedenheimer T. 2010. Using the Teamlet Model to improve chronic care in an academic primary care practice. *J Gen Intern Med* **25** (Suppl 4): 610–614. DOI: 10.1007/s11606-010-1390.

- Colton T. 1974. *Statistics in Medicine*. Boston: Little, Brown and Company.
- Cox J, Johnstone D, Nemis-White J, Montague T, ICONS Investigators. 2008. Optimizing healthcare at the population level: results of the improving cardiac outcomes in Nova Scotia Partnership. *Healthc Q* **11**(2): 28–41.
- Cummings JE, Hughes SL, Weaver FM, *et al.* 1990. Cost-effectiveness of Veterans Administration hospital-based home care: a randomized clinical trial. *Arch Intern Med* **150**(6): 1274–1280.
- Dwight-Johnson M, Ell K, Lee PJ. 2005. Can collaborative care address the needs of low-income Latinas with comorbid depression and cancer? Results from a randomized pilot study. *Psychosomatics* **46**(3): 224–232.
- Earl S, Carden F, Smutylo T. 2001. *Outcome Mapping: Building Learning and Reflection into Development Programs*. Ottawa: International Development Research Centre. Retrieved February 14, 2011 from http://www.idrc.ca/booktique/ev-9330-201-1-DO_TOPIC.html.
- Ell K, Xie B, Quon B, Quinn DI, Dwight-Johnson M, Lee PJ. 2008. Randomized controlled trial of collaborative care management of depression among low-income patients with cancer. *J Clin Oncol* **26**(27): 4488–4496. DOI: 10.1200/JCO.2008.16.6371.
- Gupta SN, Gupta N. 2011. Evaluation of revised national tuberculosis control program, district Kangra, Himachal Pradesh, India, 2007. *Lung India* **28**(3): 163–168. DOI: 10.4103/0970-2113.83970.
- Hall P, Weaver L, Gravelle D, Thibault H. 2007. Developing collaborative person-centred practice: a pilot project on a palliative care unit. *J Interprof Care* **21**(1): 69–81. DOI: 10.1080/1356182060090659.
- Harris KM, Strauss CE, Duval S, *et al.* 2010. Multidisciplinary standardized care for acute aortic dissection: design and initial outcomes of a regional care model. *Circ Cardiovasc Qual Outcomes* **3**(4): 424–430. DOI: 10.1161/CIRCOUTCOMES.109.920140.
- Hughes SL, Cordray DS, Spiker VA. 1984. An evaluation of a long term home care program. *Med Care* **22**(5): 460–475.
- Jacobsson LT, Frithiof M, Olofsson Y, Runesson I, Strömbek B, Wikström I. 1998. Evaluation of a structured multidisciplinary day care program in rheumatoid arthritis: a similar effect in newly diagnosed and long-standing disease. *Scand J Rheumatol* **27**(2): 117–124.
- Jenkinson C, Coulter A, Bruster S. 2002. The Picker Patient Experience Questionnaire: development and validation using data from in-patient surveys in five countries. *Int J Qual Health C* **14**(5): 353–358. DOI: 10.1093/intqhc/14.5.353.
- Kasper EK, Gerstenblith G, Hefter G, *et al.* 2002. A randomized trial of the efficacy of multidisciplinary care in heart failure outpatients at high risk of hospital readmission. *J Am Coll Cardiol* **39**(2): 471–480. DOI: 10.1016/S0735-1097(01)01761-2.
- Katon W, Von Korff M, Lin E, *et al.* 1999. Stepped collaborative care for primary care patients with persistent symptoms of depression: a randomized trial. *Arch Gen Psychiatry* **56**(12): 1109–1115.
- Katon WJ, Von Korff M, Lin EH, *et al.* 2004. The Pathways Study: a randomized trial of collaborative care in patients with diabetes and depression. *Arch Gen Psychiatry* **61**(10): 1042–1049.
- Kivimäki M, Vanhala A, Pentti J, *et al.* 2007. Team climate, intention to leave and turnover among hospital employees: prospective cohort study. *BMC Health Serv Res* **7**: 170–178. DOI: 10.1186/1472-6963-7-17.
- Lowenstein A, Hoff P. 1994. Discharge planning: a study of nursing staff involvement. *J Nurs Adm* **24**(4): 45–50.
- Marciniak TA, Ellerbeck EF, Radford MJ, *et al.* 1998. Improving the quality of care for medicare patients with acute myocardial infarction: results from the cooperative cardiovascular project. *J Am Med Assoc* **279**(17): 1351–1357. DOI: 10.1001/jama.279.17.1351.
- Nielsen M, Blenker M, Bloom M, Downs T, Beggs H. 1972. Older persons after hospitalization: a controlled study of home aide services. *Am J Public Health* **62**(8): 1094–1101.
- Nova Scotia Department of Health. 2006. *Principles and Guidelines: A Framework for Continuing Care Assistants in Acute Care*. Halifax: Nova Scotia Department of Health.
- O'Brien-Pallas L, Tomblin Murphy G, Shamian J, Xiaoqiang L, Hayes LJ. 2010. Impact and determinants of nurse turnover: a pan-Canadian study. *J Nurs Manag* **18**(8): 1073–1086. DOI: 10.1111/j.1365-2834.2010.01167.x.
- O'Loughlin JL, Paradis G, Gray-Donald K, Renaud L. 1999. The impact of a community-based heart disease prevention program in a low-income, inner-city neighborhood. *Am J Public Health* **89**(12): 1819–1826.
- Province of Nova Scotia Health Transformation. 2008. *Nova Scotia's New Collaborative Care Model—What It Means for You*. Halifax: Nova Scotia Department of Health. Retrieved January 7th, 2011 from http://www.gov.ns.ca/health/mocins/MOCINS_What_it_Means_For_You.pdf, January 7, 2011.
- Rich MW, Beckham V, Wittenburg C, Leven C, Freedland KM, Carney RM. 1995. A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. *New Engl J Med* **333**(18): 1190–1195.
- Rizzo JR, House RJ, Lirtzman SI. 1970. Role conflict and ambiguity in complex organizations. *Admin Sci Q* **15**(2): 150–163.
- Schmid AA, Kapoor JR, Miech EJ, *et al.* 2011. A multidisciplinary stroke clinic for outpatient care of veterans with cerebrovascular disease. *J Multidiscip Healthc* **2011**(4): 111–118. DOI: 10.2147/JMDH.S17154.
- Skellie FA, Mobley GM, Coan RE. 1982. Cost-effectiveness of community-based long term care: current findings of

- Georgia's alternative health services project. *Am J Public Health* **72**(4): 353–358.
- Sommers LS, Marton KI, Barbaccia JC, Randolph J. 2000. Physician, nurse, and social worker collaboration in primary care for chronically ill seniors. *Arch Intern Med* **160**(12): 1825–1833.
- Stewart S, Marley JE, Horowitz JD. 1999. Effects of a multidisciplinary, home-based intervention on planned readmissions and survival among patients with chronic congestive heart failure: a randomised controlled study. *Lancet* **354**(9184): 1077–1083. DOI: 10.1016/S0140-6736(99)03428-5.
- Stringer JSA, Zulu I, Levy J, et al. 2006. Rapid scale-up of antiretroviral therapy at primary care sites in Zambia: feasibility and early outcomes. *J Am Med Assoc* **296**(7): 782–793. DOI: 10.1001/jama.296.7.782.
- Tomblin Murphy G, MacKenzie A, Alder R, Birch S, Kephart G, O'Brien-Pallas L. 2009. An applied simulation model for estimating the supply of and requirements for registered nurses based on population health needs. *Pol Polit Nurs Pract* **10**(4): 240–251. DOI: 10.1177/1527154409358777.
- Unützer J, Katon W, Williams JW Jr, et al. 2001. Improving primary care for depression in late life: the design of a multicenter randomized trial. *Med Care* **39**(8): 785–799.
- Vera M, Perez-Pedrogo C, Enid Huertas S, Reyes-Rabainillo ML, Reyes-Rodriguez ML, Chaplin W. 2010. Collaborative care for depressed patients with chronic medical conditions: a randomized trial in Puerto Rico. *Psychiatr Serv* **61**(2): 144–150. DOI: 10.1176/appi.ps.61.2.144.
- Zatzik D, Roy-Byrne P, Russo J, et al. 2004. A randomized effectiveness trial of stepped collaborative care for acutely injured trauma survivors. *Arch Gen Psychiatry* **61**(5): 498–506.
- Zimmer JG, Groth-Junker A, McCusker J. 1985. A randomized controlled study of a home health care team. *Am J Public Health* **75**(2): 134–141.