



Model of Care Initiative in Nova Scotia (MOCINS): Final Evaluation Report

Submitted by the
Dalhousie University/World Health Organization Collaborating Centre
on Health Workforce Planning & Research

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October 21, 2010

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ACKNOWLEDGMENTS

The research team would like to acknowledge the leadership of the Evaluation Working Group established by the Department of Health to oversee and facilitate the MOCINS evaluation activities. The insight and support of the EWG has been invaluable to evaluation.

Members of the evaluation's external advisory group, including Dr. Jeanne Besner, Dr. John Gilbert, Dr. Sandra MacDonald-Rencz, and Dr. Stephen Tomblin, provided valuable insight and expert perspectives in interpreting the findings of the evaluation.

Additionally, the managers of each of the MOCINS showcase units, along with the DHA and IWK leads and other team members, devoted considerable time and effort on top of their already busy schedules to gather administrative data from a variety of sources, help to coordinate focus groups, and ensure awareness of the provider survey. The research team is most grateful for these efforts.

Finally, the perspectives of showcase unit patients and their families as well as the front line staff working on these units were central to the evaluation of MOCINS; this report would not have been possible without the contributions of the patients, families and staff who took the time to complete the surveys distributed to them as part of the evaluation.

EXECUTIVE SUMMARY

The main objective of the Model of Care Initiative in Nova Scotia (MOCINS) is to implement a Collaborative Care Model that recognizes that care will be transformed through committed providers (*people*), working optimally as a team through clear and well understood *processes*, by ensuring access to necessary *information* to support care delivery, research and academic mandates, and utilizing *technology* to provide timely and safe care. In seeking to optimize the utilization of the health care workforce, MOCINS is viewed as an essential building block in responding to the growing Health Human Resources (HHR) challenge being experienced worldwide and, ultimately, achieving a sustainable health care system. Currently this Initiative is being implemented on fourteen showcase units across Nova Scotia. The effectiveness of MOCINS in arriving at the envisioned care model has been evaluated by a research team at the Dalhousie University/WHO Collaborating Centre on Health Workforce Planning and Research, who investigated the impacts of MOCINS on patient, system, and provider outcomes at each of these showcase units. 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 improvements in these outcomes assist in reducing provincial health human resources (HHR) shortages?

Question #1 was addressed using outcomes mapping through 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. A set of simulation models was constructed and used to estimate the gap between the number of these providers required and the number available. These estimates are based on the best available data on the health needs of the Nova Scotia population, how these needs are currently being addressed by the provincial health system, and the supply of selected health care providers. Various simulations incorporating some of the changes measured by the outcomes mapping component into simulation models have been run to estimate the potential effects of these changes on reducing HHR gaps at the provincial level.

A repeated survey design using mixed methods was used for the outcomes mapping portion of the evaluation. This design involves concurrent measurement of process and outcomes indicators at two points in time roughly one year apart in 2009 and 2010 at each showcase unit. In collaboration with the MOCINS Provincial Implementation Team (PIT), Transformation Task Group (TTG) and Evaluation Working Group (EWG), the research team developed a set of evaluation instruments to measure, for each showcase unit, a set of process and outcome

indicators. These are variables which describe, respectively, the degree to which MOCINS has been implemented on the unit, and the effects of that implementation. The instruments were designed to gather information on each of the evaluation indicators from relevant sources: patients and families, health care providers, units/unit managers, district administrators, or some combination of these, depending on the nature of the indicator. These instruments included:

- An Administrative Process Record (APR) for the unit managers (electronic or paper-based according to each manager's preference);
- A paper-based questionnaire for patients and their families;
- A web-based questionnaire for health care providers on the unit; and
- Focus group reporting templates called Performance Journals used to capture information from focus groups conducted separately for unit staff and district administrators.

The provider and patient/family questionnaires made use of existing measurement tools where appropriate, and were reviewed by the Evaluation Working Group and some key informants within the District Health Authorities in a content validation process. After further revising the instruments based on feedback from this process, they were submitted for ethics review and Privacy Impact Assessment and approvals were obtained. During the analysis of data collected by the provider and patient/family questionnaires, the subscales used in each of these instruments were examined for internal consistency and construct validity with the Cronbach's Alpha.

The patient and family questionnaire was administered in 2009 and 2010 and had response rates of 30% and 32%, respectively. The response rates for the provider survey were 29% in 2009 and 35% in 2010. Focus groups were conducted with approximately 5-15 staff from each of the fourteen showcase units, as well as the Vice Presidents of Patient Care from each District Health authority and the IWK in both 2009 and 2010. Administrative Process Records were distributed to the managers of each showcase unit in 2009 and 2010.

Readers should bear in mind that the results described in this report are specific to the fourteen showcase units currently implementing MOCINS. The purpose of this analysis is not to generalize these findings to the entire health care system, although the focus groups conducted with key stakeholders specifically addressed the transferability of collaborative care models to other units and facilities. Further implementation of such models should be evaluated for its effectiveness.

The results detailed in this report include the perspectives of the people most directly impacted by MOCINS—the patients, families, health care providers, and administrators involved in the

initiative—and there is congruence between the messages reported from these key stakeholders both quantitatively and qualitatively. In addition, this report included results of analysis of administrative data for the showcase units that are consistent with the messages derived from the focus groups and surveys.

The evaluation results indicate that MOCINS is making a difference for patients and their families, health care providers, and the health system. The evaluation data indicates that on units where care is more coordinated, the team climate is more positive and providers' various roles are clear, there are better outcomes. Such outcomes include shorter lengths of stay in the hospital and fewer repeat admissions for patients as well as fewer shifts missed due to injury among providers. At the same time provider job satisfaction also improved. Further, investments made through MOCINS in supporting team-delivered care models that involve the patient and family in care planning and use evidence to inform care planning and delivery are associated with fewer medical errors, fewer patient deaths per acuity-adjusted hospital cases, fewer Occupational Health and Safety incidents for providers, and better health status reported by patients within four months of discharge. Some of these effects mean potentially significant savings to Nova Scotia's health care system. Further, results of simulation modeling suggest that initiatives such as MOCINS have the potential to substantially reduce provincial HHR shortages, thus further improving the ability of the provincial health care system to respond to the health needs of its population.

These results demonstrate that the MOCINS vision of health care teams with providers collaborating to deliver patient-centered, high quality and safe health care is being realized. The center-piece of the Collaborative Care Model is the patient and his or her family. As has been mentioned, those showcase units with a higher care planning index in this study - meaning they involved the patient and the family in care planning more than other units – had patients who reported shorter lengths of stay in the hospital, fewer repeat admissions and better self-reported health status within four months of discharge. Further, the model was intended to improve the patients' hospital experience. Indeed, all 15 measures of patient experience (e.g., satisfaction, told about medication side effects, given information that was clear, treated with respect) showed improvement over the course of the study.

Many objectives of the Collaborative Care Model have been addressed by this evaluation and shown to be achieved. Examples are provided here. The change lever entitled "People" indicates that a goal of the model was to have a coordinator plan and monitor care. Accordingly, the care coordination index assessed in this evaluation increased 6.8% ($p=0.017$) during the implementation period. Increased value for support areas was another objective, and the significantly increased assistive personnel index reflects this achievement. Under the

“Process” change lever both of the team climate and discharge planning indices increased significantly over the course of the evaluation, demonstrating success on these fronts.

One of the four supporting pillars of the Collaborative Care Model is “ongoing staff development and mentorship”. The evaluation documented associations between involvement in professional development for team effectiveness or role optimization and higher indices on care coordination, assistive personnel, team climate and role clarity. Another pillar is “committed and supportive leadership”. In both 2009 and 2010 the majority of unit managers felt that their unit received adequate support/endorsement from the Department of Health and the District Health Authority. This was not the majority’s perception of their institution in 2009, but in 2010 76.9%—more than three quarters—of showcase unit managers felt supported by their institutional leadership.

Some more specific potential areas for investment are also suggested by the evaluation results. For example, nearly half of the showcase unit patients sampled reported not being sufficiently involved in decisions about their care, although this improved over the course of the evaluation. Considering the central role that patients and their families play in care planning, and the results described above demonstrating the association of care planning with improved patient and system outcomes, an increased focus on involving patients and their families in care planning could result in significant benefits in terms of patient and system outcomes.

In addition, this report highlights the association between the clarity of role definitions for showcase unit staff and outcomes for patients and providers—that is, units where staff roles were more clearly defined and less complex tended to have patients who had shorter lengths of stay and fewer repeat admissions as well as fewer shifts missed by RNs. Given that other studies have found that increased role clarity is also associated with increased staff satisfaction and reduced staff turnover, and that an important component of MOCINS was a program aimed at improving role clarity, the potential value of continuing this type of investment in ensuring staff roles are well-defined and understood is evident.

The evaluation was limited by the lack of availability of some administrative data to measure patient, provider and system outcomes that may have been affected by MOCINS. These limitations challenged both the outcome mapping and simulation modeling. Sustained, intensive efforts by managers of the showcase units yielded improved data collection in 2010 compared to 2009, but several important gaps in the desired evaluation data remained. It was clear from the work of the managers that much of the administrative data collected by hospitals in Nova Scotia is not easily accessible to those who may want to use it to inform health care planning, and that the information that is available is not easily integrated across the multiple stewards of it. A critical challenge seemed to be that much of the administrative

data that is collected cannot be disaggregated to the level of individual hospital units, which limits the usefulness of this data for planning at the unit level. In the context of a knowledge based economy, there is much to be gained in building knowledge networks and producing the kind of data essential to transforming or changing health systems. Data, evidence and research is a source of power but it requires institutional and coalition support also. While evidence-based decision making is designed to highlight empirical evidence, without essential data, most decisions will remain political.

It is important to note that the positive evaluation results also highlight concerns among providers about the sustainability of MOCINS, most notably that the positive beginnings of MOCINS will lose momentum and not be sustainable without continued commitment from DHA and IWK leadership as well as the Department of Health. If the initial successes of MOCINS are to be maintained and built upon, continued support from the DHAs, IWK and the Department of Health is essential. The sustainability of any new program or idea requires finding ways to build essential coalitions between the key stakeholders required for setting agendas, defining problems and implementing solutions. MOCINS provides valuable lessons related to building such coalitions that can be used to share experiences and knowledge in a way that is very beneficial for social cohesion and learning.

MOCINS is an important part of the provincial strategy to improve health care delivery in Nova Scotia, and the results of the evaluation indicate that it is working. However, there are other challenges facing the health care system in Nova Scotia—such as shortages of equipment—that MOCINS cannot solve on its own, and these challenges continue to impact MOCINS implementation.

Based on the results of this evaluation, the research team recommends that the Department of Health continue its partnership with the District Health Authorities and the IWK to support of the MOCINS in the following ways:

1. **Expand the implementation of the Collaborative Care Model to other units and sectors as a vehicle to increase and establish coordinated team delivered care.** Coordinated team care models were shown to be associated with lower patient lengths of stay and fewer repeat admissions and medical errors as well as a more productive, satisfied health workforce. Each of these means potentially significant savings to Nova Scotia's health care system. Further, the importance of continued support and expansion of collaborative models of care has been emphasized by both administrators and front-line health care providers.
2. **Maintain the momentum that has been established to optimize the roles and utilization of health care providers through ongoing professional development activities.** Doing so can prevent showcase units from operating differently from others and promote

transferability of team delivered care models within and across organizations and sectors. **Existing programs that include RNs, LPNs and assistive personnel should be broadened to include physicians and allied health professions.** Engagement of providers in professional development activities during MOCINS implementation was found to be associated with a variety of improved outcomes for providers, and focus group participants indicated that more work was required to optimize professional roles, particularly for members of allied health professions.

3. **Develop a broad, comprehensive communication strategy to develop an understanding of MOCINS—including the findings of this evaluation—within the Department of Health, the DHAs and IWK, the showcase units, patients and families, the general public, and other health care stakeholders such as regulatory colleges and unions.** The importance of effective communication to promote understanding of MOCINS is emphasized in the findings from focus groups with the showcase unit providers as well as administrators.
4. **Increase focus on care planning, including discharge planning, that makes patients and their families integral parts of the care that occurs on the showcase units and after discharge.** Results of the evaluation indicate that a large proportion of patients and families report not being sufficiently involved in patient care, but also that this type of involvement is associated with improved outcomes for patients, providers and the system overall.
5. **Ensure that unit managers and other leaders at the point of care are supported as they strive to manage and plan a patient focused health care system.** The importance of leadership to the success of MOCINS was highlighted at a number of focus groups. Leadership from unit managers, facility and DHA and IWK decision-makers and DoH were all cited as being integral to the success of MOCINS.
6. **Engage partners in education such as universities, colleges and the Department of Education in the process of preparing Nova Scotia’s health care providers to work in collaborative care settings.** The ability of providers to function effectively within the Collaborative Care Model will be enhanced by having interprofessional practice integrated into their pre-licensure education.
7. **Collaborate with the DHAs, IWK, and other partners such as researchers as necessary to ensure that there is ongoing monitoring and evaluation of the health care system to maintain and improve patient care and workplace quality. Monitoring and evaluation must incorporate outcomes for patients and their families, providers, and the health system overall so as to allow for fully informed policy making that considers each of these perspectives as opposed to considering only a minimum set of indicators.** The bulk of the analyses provided in this report would not have been possible with a less rigorous,

comprehensive approach to the evaluation that focused simply on, for example, administrative data, and would not have allowed a full understanding of the impact of MOCINS.

8. **Invest further in the health information systems available to support evidence-informed decision making in health care at all levels. This includes the collection of additional information as well as improving the accessibility and integration of existing systems.** The lack of availability and accessibility of some desired data, despite the best efforts of showcase unit managers and others, was a significant challenge to the evaluation process but also is a clear hindrance to those seeking to organize health care, particularly at the unit level.
9. **Facilitate further sharing of the knowledge and experience developed by showcase units in the implementation of MOCINS so that front line staff as well as managers, policy makers, educators and researchers can continue to learn from each other how they successfully implement collaborative care models under various settings and conditions, including acute, continuing and primary care settings across the province.** Focus group participants indicated that such opportunities would allow for more efficient implementation of MOCINS and avoid the need to ‘reinvent the wheel’ on some units seeking solutions to common challenges, both related and unrelated to MOCINS.
10. **Ensure that HHR planning in Nova Scotia is conducted on a consistent, systematic basis with full consideration of the population’s health needs, the way in which services are provided, the way in which health care providers are educated and trained, and the conditions in which they work.** The findings of the simulation modeling component of the evaluation suggest that the optimization of provider roles incorporated in MOCINS is timely as past HHR policies in the province have resulted in HHR shortages, particularly for Registered Nurses. Further, if these policies remain unchanged, the results indicate these shortages will only increase in the future.

CONTEXT¹

The Model of Care Initiative in Nova Scotia (MOCINS) was launched in March 2008. It arose out of the recommendations of the Provincial Health Services Operational Review (PHSOR)² and was one of the first health transformation initiatives made possible through a partnership of the Department of Health, District Health Authorities (DHAs) and the IWK. The impetus for the Model of Care Initiative was to achieve sustainability surrounding the growing health human resource challenges being experienced in Nova Scotia, as well as across Canada. The original 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, of high quality, safe, and cost-effective. While the original mandate holds true for today there is an increasing recognition that the Model of Care Initiative is critical to the successful implementation of a collaborative practice model that has as its basic tenet a patient- centric care delivery system.

In keeping with the mandate, a Collaborative Care Model was designed early in the initiative by a provincial inter-professional design team that worked through a highly consultative methodology. The Collaborative Care Model is a conceptual framework that is used to guide local implementation of new service delivery models in acute care in-patient units. Through its application, the model helps to ensure the right people, processes, technology and information systems are in place to provide patient-centered, high quality, safe, and cost effective care. It aligns the healthcare system with the health needs of Nova Scotians and orients providers to work to their optimal scope of practice, collaboratively within inter-professional teams. Envisioned characteristics of the Collaborative Care Model are displayed in Figure 1.

Once designed, implementation of the Collaborative Care Model became the main objective of the MOCINS under the leadership of district and provincial teams. Through its local application the model was intended to:

- enhance the patient care experience;
- improve the work environment for nurses, other health professionals, and support staff, supporting them to work to their full potential;
- reduce occupational health and safety issues through increased supports of both people and technology;
- better support patient flow through improved discharge planning, helping patients return home in a timely manner with the support they need; and, as a result, reduce the cost of delivering care while improving patient care.

¹ Material detailing the context and implementation strategies for MOCINS were provided to the evaluation team by the MOCINS project leadership team within the Nova Scotia Department of Health.

² Provincial Health Services Operational Review, 2008. This report is available online at http://gov.ns.ca/health/reports/pubs/Provincial_Health_Services_Operational_Review_Report.pdf

Figure 1: Collaborative Care Model



Specific MOCINS Activities

The activities of MOCINS can be divided into four phases: Mobilization, Design, Implementation and Planning, and Implementation and Evaluation.

Phase A: Mobilization (December 2007 – February 2008)

During the mobilization phase, agreement was secured from Department of Health (DOH) and Health Authority (DHA/IWK) leadership to initiate the Model of Care Initiative. A Provincial Design Team and Steering Committee was established. A rapid action design methodology was confirmed.

Phase B: Design (March – June 2008)

During the design phase, a provincial inter-professional design team worked through a highly consultative methodology to define a future vision for care delivery, build the foundation for a new model of care, redesign current roles, and establish new roles and team models. The result was the Collaborative Care Model described above.

Phase C: Implementation Planning (June- September 2008)

The focus of the implementation planning phase was to ready the Initiative to move the new model from a conceptual stage to an implementation phase. Some of the activities included initiating the completion of standardized role descriptions for all members of the health care team, developing general health human resources principles, identifying selection criteria for the initial implementation units, developing an evaluation framework, confirming the leadership structure, selecting the initial implementation units - referred to as showcase units, and developing a rollout methodology.

Phase D: Implementation and Evaluation (Wave 1 Implementation began October 2008)

During the implementation and evaluation phase a Provincial Implementation Team, made up of nursing, allied health and physician leaders from the showcase units, along with project leaders from the Department of Health, facilitated the first implementation of Collaborative Care Model in 14 showcase units spread across all district health authorities and the IWK. This work was guided by a steering committee.

Using a needs-based approach to health system and workforce optimization (Besner et al., 2005), an informed understanding of the patient population on the showcase units and population health data in the districts directed the implementation activities to optimize the roles of health care providers and to streamline processes that were wasteful, prevented patient and family involvement in their own care, limited role optimization, and no longer added value to the patient and family experience. Instead new processes were introduced to meet the changing needs of patients, enable staff to work to their full potential, and improve efficiency.

In October 2008, implementation activities began in all 14 showcase units and in some cases, prior to this. Examples of these activities are described below, categorized under the four change levers of the Collaborative Care Model – people, process, information, and technology. The majority of activity and accomplishments of the first phase of implementation occurred within the people and process change levers of the model with limited activity the information and technology levers.

People: The establishment of province-wide standardized roles to enable more consistent work practices at full scope of practice is a critical enabler for the successful implementation of the newly designed Collaborative Care Model. During the first phase of implementation, draft role descriptions for a number of health care professionals were created using current standards and scopes of practice and endorsed by the respective regulatory bodies.

The standardized role descriptions, combined with an evidence-informed method of using patient population data, enabled the showcase units to begin to create new staffing models that are responsive to the care needs of patients. A staffing analysis tool was developed to

ensure consistency in planning, measurement, and comparison of data across all showcase units. Consensus was achieved on the use of the new staffing analysis tool that enabled showcase units in all DHAs and the IWK to look at their baseline staffing model with associated costs, and to plan future staffing models consistent with the criteria of the Collaborative Care Model – patient-centered, high quality, safe and cost effective. While there were no cost savings targets identified during the first phase of implementation, the parameter of cost neutral or better was used in the development of the new staffing models.

Process: During the first phase of implementation, individual showcase units redesigned a number of processes to eliminate waste, prevent duplication of effort and enable patient and family self care. The structure of the Provincial Implementation Team served as a network for the DHA/IWK Model of Care Leads and Showcase Unit Managers to share ideas, expertise, experiences and practical approaches as they redesigned key work processes. Examples include:

- Addition of “primary care cupboards” in patient rooms that enabled all medication preparation, delivery, education, and documentation to be done at the bedside;
- New construction of a patient and family lounge that is intended to enable group education, exercise, and dining for the stroke patient population;
- Relocation of supplies closer to the point of care to reduce unnecessary travel;
- Establishment of preadmission classes for groups of patients and families to assist them to prepare for orthopedic surgery and plan in advance for post discharge recovery. One DHA is reporting a reduction in length of stay as a result of this and other related model of care related changes;
- Establishment of pre-birth classes to inform expectant mothers about their stay post partum;
- Use of white boards for efficient communication of “patient status at a glance”³ This is a visual display of relevant patient information that make shift handovers quicker and safer for the patient, improves patient flow – avoiding delays in discharge, and saves time looking for patient information. One of the fourteen showcase units had an electronic version of the dry erase white board although this was in place prior to implementation of the Collaborative Care Model;
- Changes in shift report that improve efficiency through the use of SBAR⁴ and organizing shift report around groups of patients (as opposed to the whole unit). One DHA is reporting an initial reduction in overtime as a result; and

³ Developed by the UK’s National Health Service Institute for Innovation and Improvement. For details, see http://www.institute.nhs.uk/quality_and_value/productive_community_services/patient_status_at_a_glance.html

⁴ Developed by Leonard, Bonacum and Graham for Kaiser Permanente in the US. For details, see documentation at <http://www.ihl.org/IHI/Topics/PatientSafety/SafetyGeneral/Tools/SBARTechniqueforCommunicationASituationalBriefingModel.htm>

- Creation of an inter-professional Kardex to enable integrated team communication around patient care that replaced multiple single discipline communication tools.

Information: During the first phase of implementation, a consistent patient profile template was prepared for use across all showcase units. Additionally population health data was made available through the DHA/IWK and Nova Scotia Community Counts. Results of this activity informed the creation of new core care teams on the showcase units (i.e. number of Registered Nurses, Licensed Practical Nurses, Physiotherapists, Assistive Personnel, Housekeepers, etc.) , enabled better planning of care in response to the known needs and risk factors of certain patient populations.

Nova Scotia has an aging population and this demographic is reflected in the showcase units. Sixty-six percent (66%) of the patients on the showcase units (exclusive of the IWK) were 60 years of age and over. Of that number, 47% were 70 years of age and over. Understanding the average age of the patients on the showcase units enabled better planning of care in response to the known needs and risk factors of the elderly. For example, in a number of showcase units equipment was purchased and staff were assigned to enhance patient mobility as a means of reducing the known complications of immobility and de-conditioning of the elderly population.

Technology: Individual districts purchased equipment such as ceiling lifts, bed alarms, etc to improve patient and staff safety and achieve efficiency in care process during the first phase of implementation. Some districts are more advantaged than others with technology and as such, examples of mobile communication devices, electronic bed maps, and tracking technology can be seen in isolated instances.

One of the critical enablers of the new model of care is ongoing education, training, and mentorship. Two examples of MOCINS education and training activities are the Role Optimization Program offered by the Registered Nurses Professional Development Centre and the Building a Better Tomorrow Together (BBTT) program designed by Barefoot Facilitation and Development. Both of these programs are funded by the Nova Scotia Department of Health.

The Role Optimization Program⁵, as its name suggests, is a set of workshops designed to provide education and support to the nursing staff and managers across the province that have, or will be implementing the Collaborative Care Model. More specifically, the program aims to help MOCINS staff and managers optimize the roles of RNs, LPNs and assistive personnel within the Collaborative Care Model. Integrated within this program is a train-the-trainer component

⁵ Registered Nurses Professional Development Centre, (2010). Halifax Nova Scotia

designed to build capacity within the DHAs and IWK for long-term sustainability; this component is expected to be finalized in the fall of 2010.

BBTT⁶ is a series of team-based learning and development workshops aimed at enhancing interprofessional collaboration and patient-centred practice within new and existing health care teams. Another component of BBTT was the training of 79 district staff as facilitator to develop team development workshops aimed at enhancing interprofessional collaboration and patient-centred practice. As with implementation of MOCINS in general, districts are at different stages of offering BBTT to MOCINS units as well as to primary health care teams. The inclusion of representatives of both the acute and primary health care settings in the participant pool across the districts was part of the strategy to encourage collaboration across the continuum of care—one of the pillars of MOCINS' Collaborative Care Model. The Department of Health continues to financially support ongoing development and support for these facilitators.

The Collaborative Care Model has been implemented in a series of waves. The first wave of implementation began with 14 showcase units across the province. It is these 14 units that are the focus of this evaluation. Each of the district health authorities and IWK is at a different level of implementing the Collaborative Care Model and this is understandable as in some districts, a supporting infrastructure and early outcome data have enabled them to proceed with MOCINS on a number of additional units while in other districts the progress is slower but appropriately aligned with local capacity. Together as a province, the district health authorities, IWK and Department of Health, continue their partnership to support and expand the implementation of the Collaborative Care Model provincially.

⁶, Primary Health Care, Nova Scotia Department of Health (2009). Building a Better Tomorrow Together (BBTT). Team Development for Primary Health Care Collaboration . Material produced by Barefoot Facilitation and Development.

EVALUATION DESIGN

Objective

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

The key questions guiding the evaluation are 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 improvements in these outcomes assist in reducing provincial health human resources (HHR) shortages?

Question #1 has been addressed using outcome mapping. 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 has been addressed using simulation modeling. Both of these methods are discussed in detail below.

Outcome Mapping Process and Outcome Indicators

Outcome and process indicators are variables that are used in the evaluation to assess the project’s effectiveness. These indicators were defined based on the OM evaluation framework. OM starts with identifying the boundary partners of the project, the individuals and organizations (i.e., stakeholders) that function within the boundary or sphere of influence of the project, and whose attitudes, behaviours and partnerships are likely to be affected by the strategies and activities of the project. These are the patients and families of the showcase units, the staff who work there, policy makers at the unit, facility, DHA and provincial level, and other stakeholders. These other stakeholders include representatives of the various professional associations and unions representing the unit staff as well as the educators who teach them both before and after they begin practice.

Outcome challenges are identified for each group of boundary partners, with focus on those closest to the project initiatives. These describe how the attitudes, behaviours and partnerships of boundary partners are expected to change if the project is successful. Outcome indicators are then defined for each of the outcome challenges. Outcome indicators are a set of graduated

progress markers (i.e., quantitative statistical indicators, but can also be qualitative indicators) that represent the information that the project will gather in order to monitor achievements (i.e., changes) that reflect a contribution toward realizing the goal and objectives of the project.

Once the outcome challenges have been identified, the strategies and activities of the project (i.e., interventions/programs) that are intended to result in or produce the boundary partner changes are clarified. And once the strategies and activities of the project are clarified, process indicators are specified. There are two types of process indicators; those that reflect the extent to which these strategies and activities have been implemented in the project, and those that reflect the extent to which boundary partners are engaged in those strategies and activities. The evaluation process then becomes a matter of collecting data on these indicators and examining the associations between the process and outcome indicators.

Simply put, three key questions are used to guide this mapping procedure for the identification of the process and outcome indicators:

1. Who should be affected by this new model of care initiative?
2. How much are they involved?
3. What effect has this had on them (i.e., what changes do we expect to see as a result)?

Tables 1 and 2 list the process and outcome indicators that have been identified by the evaluation team in consultation with the MOCINS team and incorporated into the evaluation.

Table 1: MOCINS Process Indicators

| Process Indicators |
|---|
| 1. Resources (budget, staff ⁷ , equipment and/or supplies) have been allocated at the provincial, DHA and unit level to support implementation of the new model of care within the current envelope of dollars |
| 2. Care Coordinators have been assigned and are functioning in a care coordinator role |
| 3. Care coordinator role is optimized/maximized |
| 4. Roles/scopes of practice have been standardized/optimized in practice and understood by the entire team |
| 5. Health care needs indicators for the patients on the unit have been identified |
| 6. Status of patients' needs indicators are reported to care team regularly to patients, families and teams |
| 7. Care team's composition is based on patients' needs indicators |
| 8. Patients/families appropriately informed, updated regarding care |
| 9. Activity level/degree of participation of the patient/family in care |
| 10. Level of commitment/support to implementation of the new model of care by |

⁷ "Staff" refers to all staff including front-line and management.

| Process Indicators |
|--|
| government officials, DHA management, and organization senior management |
| 11. Quality of work life indicators monitored regularly (e.g. "Canadian Quality of Work Life" indicators) |
| 12. Patient safety and service quality indicators monitored regularly |
| 13. Key patient care processes (e.g., interprofessional patient care planning, clinical pathways, documentation systems, LOS management and integrated discharge planning, communications) reviewed for efficiency and effectiveness |
| 14. Key patient care processes optimized |
| 15. Care Coordinator liaises with originating/disposition unit/programs/staff (e.g. physicians) where appropriate |
| 16. Unit providers consulted on most appropriate technology to support care |
| 17. Plan for roll-out of new technology developed in consultation with providers |
| 18. Providers/staff trained to use new technology |
| 19. Provider/staff adoption of new technology |
| 20. Prevalence of commonality in technology adopted |
| 21. Available technology being used to full functionality |
| 22. Availability of ongoing clinical skills development programs based on staff needs |
| 23. Staff attendance/participating in clinical skills development programs |
| 24. Availability of ongoing leadership development programs based on staff needs |
| 25. Staff attendance/participation in leadership development programs |
| 26. Availability of ongoing mentorship development programs based on staff needs |
| 27. Staff attendance/participation in mentorship development programs |
| 28. Availability of ongoing technology education programs based on staff needs |
| 29. Staff attendance/participation on technology education programs |
| 30. Availability of ongoing team effectiveness programs based on staff needs |
| 31. Staff attendance/participation in team effectiveness programs |
| 32. Staff/provider participation in mentorship |

Table 2: MOCINS Outcome Indicators

| Outcome Indicators |
|--|
| 1. Patient satisfaction (patient complaints, compliments) |
| 2. Family satisfaction |
| 3. Association between unit patients' needs and care team composition |
| 4. Service delivery integrated |
| 5. Coordinated care |
| 6. Patient flow (e.g. bed turns) |
| 7. Care plan goals are achieved |
| 8. Patient function and health status pre and post (e.g. pain, range of motion, Frailty Index) |
| 9. Length of stay (within and beyond unit) |
| 10. Status of discharge planning |
| 11. Number of people awaiting LTC beds |

| Outcome Indicators |
|---|
| 12. Readmission and repeat admission (within and beyond unit) |
| 13. Falls |
| 14. Medical errors/Adverse Events |
| 15. Hospital infections |
| 16. Failure to rescue |
| 17. Mortality |
| 18. Provider satisfaction |
| 19. Provider productivity |
| 20. Provider familiarity with available technology |
| 21. Provider assessment of technology |
| 22. Timeliness of information provision |
| 23. Care delivery planning informed by review of evidence |
| 24. Patient/family goals are clear |
| 25. Team's goals are clear to all team members and patient and family |
| 26. Team members' roles are clear to all members of the team including the patient and family |
| 27. Practice protocols in place and followed |
| 28. Optimized communication |
| 29. Functional partnerships established |
| 30. Providers feel there is an interdependence of roles |
| 31. Team Effectiveness |
| 32. Providers feel their scopes of practice are being optimally utilized |
| 33. Services delivered by most appropriate providers |
| 34. All staff feel valued |
| 35. Incidence of OH&S issues |
| 36. Occupational commitment |
| 37. Staff intention to remain |
| 38. Staff turnover |
| 39. Overtime |
| 40. Absenteeism |
| 41. WCB lost time |
| 42. Incidence of violence on the unit |

Outcome Mapping Study Design

A repeated survey design using mixed methods was used for the outcomes mapping portion of the evaluation. This design involved concurrent measurement of process and outcomes indicators at two points in time, the first being as early as possible in 2009 (MOCINS initiatives in most showcase units were to start in 2009) and the second approximately one year later at each showcase unit. This allowed summative analysis of the association between process and

outcome indicators (change variables) at each site and for the project as a whole. The combination of repeated measures and the diverse range of process indicators measured allowed the analysis the effects of varying degrees of implementation of and engagement in the different elements of MOCINS from unit to unit.

Recognizing that the new model of care was implemented on 14 different showcase units across the province, and that each of these units is unique in its structure, resources, patient population, and so on, it follows that the implementation of the model would have begun and progressed differently on each unit. The evaluation accounted for these differences in several ways. First, the evaluation measured outcome indicator changes in each unit over time and determined how these were associated with the process indicators which reflect the level of engagement in and implementation of the MOCINS initiatives. Second, the association between engagement and outcomes was assessed in each survey period (2009 and 2010). This approach used the variability in the timing and level of implementation, particularly in 2009, to help identify associations with outcomes. Third, the associations with provider and patient outcomes were examined with multivariate models that controlled for showcase unit; i.e., the associations were examined within each unit. Finally, the qualitative information gathered about each unit through focus groups at the beginning and end of the evaluation provided important information to put the quantitative data in context; this ensured that the impact of the model implementation on each unit was fully understood.

Outcome Mapping Study Populations and Sample Sizes

The primary study populations included all staff of the showcase units and a sample of patients discharged from each showcase unit, in addition to the vice presidents of patient care from each DHA and the IWK. The sample size calculations for the patient survey were based on the key variable of patient satisfaction in the total sample, across the 14 showcase units. In order to be 95% confident that a shift in patient satisfaction of 10.0 percentage points would be identified as statistically significant, assuming a baseline prevalence of 70%⁸, 378 patients were required in both the 2009 and 2010 surveys⁹. Conservatively assuming a response rate of 40%, a sample of approximately 950 patients was selected from across the 14 showcase units in 2009 and 2010. This meant selecting approximately 70 patients from each show case unit in 2009 and 2010.

⁸ Statistics Canada estimates patient satisfaction in Nova Scotia to be around 86%. We use the more conservative estimate of 70% which requires a larger sample size.

See <http://www.statcan.gc.ca/pub/82-401-x/2006000/t/4151058-eng.htm>

⁹ See for example Colton T. *Statistics in Medicine*. Little, Brown and Company, Boston. 1974.

These 70 patients were selected randomly from each unit. Since the number of patients discharged from these units ranged from about 40 to over 100 per month, the sample was randomly selected from all patients discharged in the four month period of approximately March to June, in 2009 and follow up in 2010. Relative weights were calculated to account for the varying sampling fractions and response rates across showcase units (given their different volumes of patients)¹⁰.

Focus groups were conducted with a purposive sample of the key boundary partners, including the staff of each showcase unit as well as the vice presidents of patient care from each DHA and the IWK, at the beginning and end of the evaluation period.

DATA COLLECTION PROTOCOLS

Development of the Instruments

Evaluation instruments were developed to gather information on each of the evaluation indicators from the relevant sources: patients and families, health care providers, units/unit managers, district administrators, or some combination of these, depending on the nature of the indicator. For example, questions on patient satisfaction were asked only of patients and families, while questions assessing the coordination of care on the unit were asked of the providers and managers of the unit in addition to the patients and families. These instruments included:

- A paper-based or electronic Administrative Process Record (APR) for the unit managers;
- A paper-based questionnaire for patients and their families;
- A web-based questionnaire for health care providers on the unit; and
- Focus group reporting templates called Performance Journals used to capture information from focus groups conducted separately for unit staff and district administrators.

The *Administrative Process Record* recorded activities and outputs of the strategies implemented at each showcase unit throughout the study period. It measured process (implementation) indicators, and collected data on the unit-level outcome indicators such as staff turnover and numbers of patient falls, infections and deaths. The Administrative Process Record also collected each unit manager's observations of concurrent extraneous events/factors that could confound the statistical association between the process and outcome variables. These could then be captured in the analytical data set as context variables

¹⁰ See for example Aday and Cornelius. *Designing and Conducting Health Surveys*. Jossey-Boss, San Francisco. 2006.

for which one can conduct adjustment in the analysis. To collect the administrative data of the Administrative Process Record, the unit manager was encouraged to consult with staff outside the unit such as managers, administrators, data analysts and health records staff. However, instructions were given to not consult providers on the unit as they will be completing their own assessment of initiative implementation.

The *Provider Data Collection Tool* charted the responding provider's status on the outcome indicators such as job satisfaction and assessments of the team climate on their units. It captured data that will allow calculation of changes in the provider as well as data on factors which may contribute to these changes. It was a web-based questionnaire which providers were invited to complete in 2009 and at the end of the study period in 2010. It also included process indicators that reflect the extent to which the provider was involved in the strategies/activities of the MOCINS project.

The *Patient and Family Data Collection Tool* measured patient and family status on outcome indicators as well as relevant contributing factors. Examples of patient outcome indicators include patient experience in hospital, length of stay in the showcase unit, emergency visits for a related problem within 30 days of discharge, readmissions within 30 days, and self-assessed general health status. It was a mailed, self-administered questionnaire which patients of the showcase units were invited to complete and return one month following their stay with the unit. It too was administered in 2009 and the end of the study period in 2010.

The *Performance Journal* was a record of two rounds of stakeholder focus groups; one at the beginning and one at the end of the evaluation period. Topics discussed during these focus groups included lessons learned about which aspects of MOCINS worked well, which did not, the sustainability of the project, and the transferability of the project to other units and care settings.

The provider and patient/family questionnaires made use of existing measurement tools where appropriate (references for these tools are provided in Appendix A), and went through several draft reviews by the research team. The Evaluation Working Group and some key informants within the District Health Authorities and IWK then reviewed the instruments in a content validation process. After further revising the instruments based on feedback from this process, they were submitted for ethics review and approval was obtained. During the analysis of the first round of data collected by the provider and patient/family questionnaires the subscales used in each of these instruments were examined for internal consistency reliability and construct validity with the Cronbach's Alpha.

Ethics and Privacy Approvals

Ethics approval was obtained from each of the nine District Health Authorities and the IWK prior to the initiation of data collection from June to September 2009; an annual update was submitted prior to the 2010 data collection. In addition, the project was submitted to the Nova Scotia Government for a Privacy Impact Assessment. This process, which assesses the project from recruitment of participants to final database storage and dissemination, ensured that information obtained from Nova Scotians met the provisions of the *Freedom of Information and Protection of Privacy Act* (Sections 24, 26 and 27) and the *Hospitals Act* (section 71). The project obtained approval from the Minister of Health's office in August 2009.

Administration of the Instruments

As each of the evaluation instruments was targeted at a different group of boundary partners (stakeholders), each was administered separately. The health care provider survey was web-based, as noted above. It was developed and administered online through Dalhousie University's website with *Opinio* web survey software. Each provider working on the unit was invited to complete the survey via an invitation distributed by the unit manager on behalf of the research team. Web responses were received from August to November of 2009 and May to July of 2010 for the initial and follow-up surveys, respectively.

The patient and family survey was distributed in hard (paper) copy to a random sample of the individuals who had been patients of the showcase units in the four months prior to the survey distribution. The sample population was identified for each showcase unit by health records staff at each District Health Authority and the IWK, and the surveys themselves were mailed to these individuals by Medavie Blue Cross. Along with the actual survey, patients and families sampled were also provided with a prepaid, pre-addressed envelope in which to return their completed surveys to the research team. The patient and family surveys were collected between September and October, 2009 for the initial administration and June and July, 2010 for the follow-up.

The APRs were distributed to the managers of each showcase unit in September 2009, at which time each manager had the opportunity to review the APR with members of the research team, in person, to clarify any questions they had with the instrument. This consultation was also available via phone and email in the following months. The same process was followed in June 2010. Of the 14 showcase units, 13 provided a completed APR in 2009, and 14 in 2010. Within these APRs there were missing data for some variables. For example, since it is easier for some hospitals to provide the average length of stay for all patients as opposed to that of only those patients from any given unit, average length of stay in the hospital as a whole (including all

units the patient was on during their stay) was reported in more APRs than the average length of stay on the specific showcase unit.

Focus groups were conducted with approximately 5-15 unit staff members at each of the showcase units between August and September, 2009, and between June and July of 2010. In addition, a focus group was held with the Vice Presidents of Patient Care from each DHA in September, 2009, and July of 2010. The subject matter of each focus group was the same, following the structure of the Performance Journal. The focus group discussions were captured through notes taken by members of the research team as well as audio recordings. Manual thematic analyses of recorded content were carried out.

Simulation Modeling Methodology

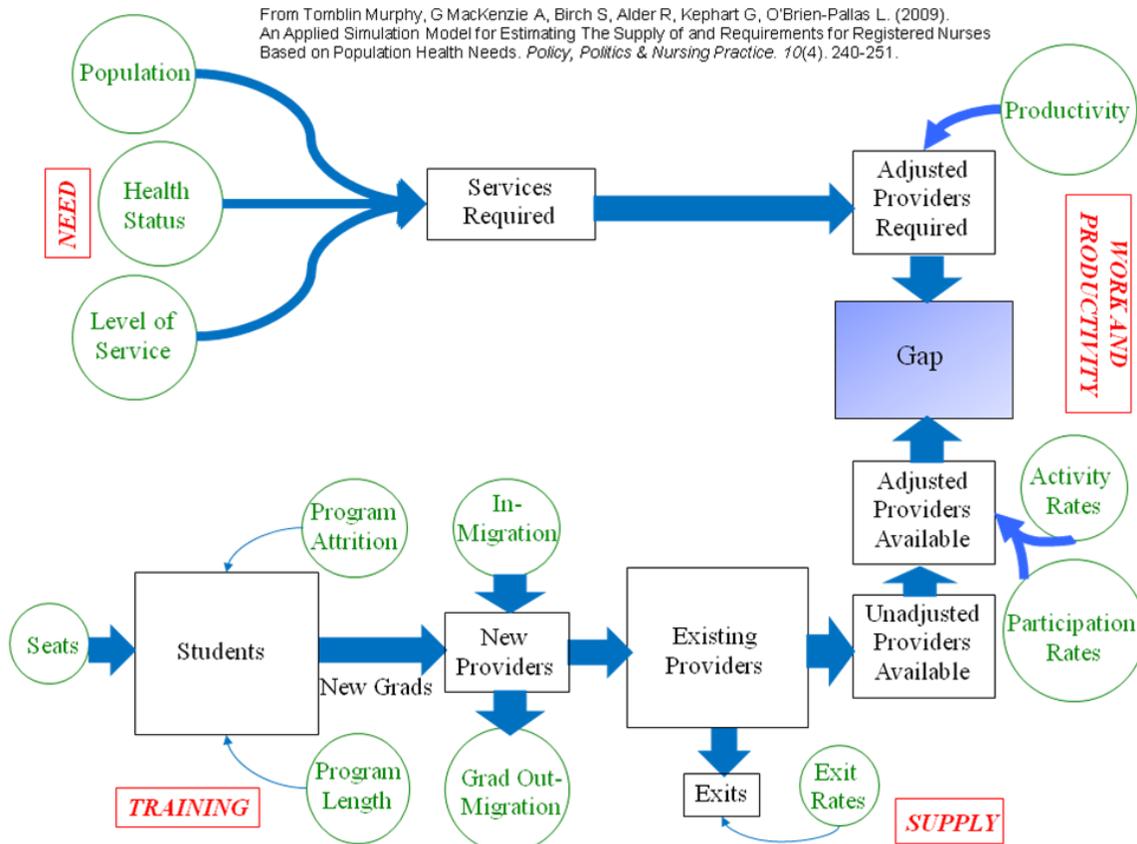
The Nova Scotia Department of Health has a suite of simulation models developed for registered nurses (RNs), family physicians, and medical radiation technologists (MRTs) (Tomblin Murphy et al., 2007a; 2007b; 2008) that it uses to inform HHR planning for these professions. Building on these models and informed by recent advancements by members of the evaluation team (Tomblin Murphy et al., 2009), models specific to acute care RNs, hospitalists and family physicians providing hospital care, and physiotherapists were developed for the purposes of this evaluation to estimate the potential impacts of Collaborative Care Models on provincial HHR shortages. The models were designed to be specific to the acute care sector because it is in this sector that MOCINS has been focused to date, and therefore this is the sector where its impacts are to be evaluated.

Informed by both conceptual (O'Brien-Pallas & Tomblin Murphy, 2006) and analytical frameworks (Birch et al., 2007), a system dynamics simulation approach to modeling (Forester, 1968; Sternman, 2000; Kephart et al, 2004) was applied to implement the mathematical relationships described in the analytical framework, specific to the acute care sector. These models were adapted from those developed by members of the evaluation team for use by the Nova Scotia Department of Health (Tomblin Murphy et al. 2007a, 2007b, 2008) as well as more recent work by some team members that advanced the measurement of population health needs (Tomblin Murphy et al., 2009).

The models simultaneously estimate the supply of and requirements for each type of provider (RN, family physician/hospitalist, and physiotherapist) in the acute care sector and calculate the difference between these estimates as the 'gap' (i.e., shortage or surplus) for each year of the planning period. The models are each made up of four modules: training, supply, work and productivity, and needs. Although identified separately for clarity and convenience, there are strong relationships between the modules. For example, the 'outputs' of the training module

will affect those of the 'supply' module as providers complete their education and training and enter the workforce. The relationship between all four modules is shown in Figure 2.

Figure 2: Simulation Model



The purpose of these models is not necessarily to predict the future, but rather to integrate knowledge of different components of the health care system in order to improve understanding of how various factors affect the supply of and/or requirements for health care providers in acute care. The models are designed to allow policy makers to 'rehearse' potential policy changes by altering the value of policy variables in the model and examining the effects of this change on the supply of and requirements for a given type of health care provider. Moreover, because many of the variables in the model, such as population size and needs for care, lie beyond the scope of HHR policy, these models support the consideration of the effects of HHR policies in different future contexts. The models provide a means of testing and evaluating a variety of policy options in order to determine the most efficient and effective ways to manage HHR under different future scenarios.

The Training Module

Provider education and training programs in Nova Scotia represent an important source of additions to the supply of acute care providers in the province. The training module focuses on

estimating the flow of *new graduates* from these programs into the provincial supply, which requires an understanding of the factors affecting that flow. The size of first-year enrolment, or number of *seats*, in an education/training program is just one of several determinants of the flow of new graduates. The flow of graduates will also depend on *program length* (i.e., the distribution of years to graduation among cohorts of students), the *attrition rate* of the program (i.e. the proportion of students who enrol in the program but do not graduate) and the rate of entry to the provincial supply by new graduates. The latter rate is determined by *graduate out-migration*; that is, graduates of Nova Scotia programs that do not enter the provincial supply of providers (but may instead, for example, begin practice in a different province or country).

The Supply Module

The purpose of the supply module is to estimate the future size of the supply of acute care providers in Nova Scotia based on the *existing* supply, the number of *new providers* entering that supply, and the number of *exits* from that supply over time.

The existing provider supply is the number of providers in the existing population that are potentially available to provide acute care to patients. This includes all those who are currently licensed to provide patient care in general, whether or not the individual is currently active in the delivery of health care services. This existing stock is specified by single year of age.

Providers entering the existing stock are considered to be of two types— *new graduates* of local provider education and training programs, and providers beginning practice in the region who had previously been practicing elsewhere (or not at all). The latter phenomenon, termed *in-migration*, would include providers migrating from outside Nova Scotia.

Providers exit the available supply for a variety of reasons: death, retirement, relocation, change of profession, and so on¹¹. The volume and type these exits vary by age, and, changes in particular sources of exit can be simulated by adjusting exit rates at different ages. For example, adjusting exit rates over age 55 can be used to simulate alternative retirement scenarios.

Together, flows in (new providers) and out (exits) of the existing supply of providers determine whether the supply grows or declines. In the short-term, the age distribution of this supply can exert a very powerful influence on its rate of growth or decline in size. For example, since rates

¹¹ By leaving the profession, we mean doing so permanently by allowing their certification to lapse. In our approach, providers who maintain their eligibility to work in the profession are treated as non-active members of the stock of providers.

of exit are larger at older ages (especially due to retirement), the total number of providers 'lost' will depend on the proportion of the supply in those age groups with the highest incidence of retirement.

The Work and Productivity Module

The simulation model differentiates between the size of the provider stock (that is, a head count of licensed providers) and the contributions of those providers to the health care system. The capacity of the provider stock to meet requirements depends on both the number of providers and the hours of labour they provide. The work and productivity module therefore translates the size of the stock into the effective supply of full-time equivalent (FTE) providers given the level of participation and activity of those in the stock. It also translates the required number of services into the required number of FTE providers according to the rate at which an average provider can be reasonably expected to perform these services (i.e. *productivity*).

Providers in the stock are characterized by different levels of *participation* and *activity*. For example, some are unemployed, others employed but not engaged in service delivery, and others employed in sectors other than acute care, such as public health; these are deemed non-participants in direct acute patient care. Among those employed in acute care delivery (i.e., participants), the number of hours worked varies (e.g., part-time, full-time or more than full-time). Changes in the distribution of participation and activity of the providers in the stock provide important mechanisms for meeting health care requirements. Shifting providers from part-time to full-time hours or adding over-time shifts increases the number of FTEs providing care. However, this may also negatively affect the productivity of providers or the rates at which they exit the system. For example, excessive overtime hours may be associated with lower productivity rates, or burn-out resulting in higher rates of exit from the stock or providers (O'Brien-Pallas et al., 2005).

The work and productivity module considers the portion of the licensed supply of providers who practice acute patient care (participation), the average number of hours per provider (level of activity) and the average level of service delivery per hour of work (level of productivity) in translating the number of services required and licensed providers into, respectively, the number of FTE providers (for each of the three professions) required and available.

The Needs Module

This module estimates the number of services required to meet the health needs of a given population based on the first three components of the analytical framework described by Birch et al. (2007); demography, need, and level of service. More specifically, this estimate was

based on 1) the size and age/sex distribution of the population, 2) the distribution of chronic conditions and injuries within that population, and 3) the number of services received by that population according to their level of need (measured here by the prevalence of chronic conditions and incidence of injury). Multiplying these three components yields the number of services required to meet the health needs of the population.

Data Sources

Once constructed, the models for each profession were populated with the most comprehensive and current data available. These are described below according to the four modules that make up the model and also summarized in Table 1.

The Training Module

Data on the size (in terms of enrolment), duration and program attrition rates of RN, family physician/hospitalist, and physiotherapy education and training programs were provided by the universities that provide these respective programs—St. Francis Xavier University and Cape Breton University for RNs, and Dalhousie University for all three professions. Estimates of the rates of out-migration of graduates were obtained from different sources for each profession. For RNs, the number of grads coming out of the three programs each year was compared to the number of newly licensed nurses who had graduated from a Nova Scotia program the previous year. For family physicians, the Canadian Post-MD Education Registry (CAPER) annual census of graduate physicians tracks the 5-year practice location of the graduates of each program; that is, it provides the number of graduates of Dalhousie’s family medicine program that are still practicing in the Atlantic provinces five years after graduation. Ideally this measure would be specific to Nova Scotia; this value was adjusted to allocate Nova Scotia a share of new grads proportional to its population compared to that of the rest of the Atlantic provinces. For physiotherapists, a convenience sample of the graduates who completed Dalhousie’s program in 2009 was conducted to determine how many of them were still in Nova Scotia.

The Supply Module

The Nova Scotia Department of Health provided data on the number of RNs and family physicians currently licensed in the province by age. The Nova Scotia College of Physiotherapists provided similar data but these were only available by age for 2005 and 2006 (the overall count was available up to 2008); therefore the average age distribution for these two years was applied to the 2008 count to estimate the current stock by age. In-migration of all three professions was measured by registry data from the Department of Health. Exit rate data for RNs was provided from registry data by the Department of Health. For family

physicians and physiotherapists, exit rates were estimated by comparing the supply of each profession by age from year to year, after adjusting for new registrants; data for both of these came from registry data at the Department of Health.

The Work and Productivity Module

Participation rates are generally defined as the proportion of all licensed providers of a given profession who practice direct patient care as opposed to being exclusively involved in, for example, research, administration, or education. Since the models being used for this evaluation are specific to the acute care sector, the participation rates are further specified as being the proportion of licensed providers who practice direct patient care in that sector. Since the number of licensed RNs, family physicians, and physiotherapists in Nova Scotia is already part of the Supply Module, all that is needed to calculate participation rates is the number of these who are practicing direct patient care in acute care. For RNs, this figure was obtained from Canadian Nurses Association data. For family physicians, this was taken to be the number of family physicians who had submitted at least one billing from a hospital setting—this was provided by the Department of Health. For physiotherapists, this figure was provided by the Department of Health.

The activity rate for a group of providers is generally defined as the average proportion of a full time equivalent (FTE) that the average provider in that group represents. For Nova Scotia RNs and physiotherapists in the acute care sector, whose hours spent working are recorded for payment purposes, it is possible to calculate the total hours worked in acute care by all of these providers; this data was provided by the Department of Health. Dividing this value by the number of providers who worked those hours yields the average hours worked per provider, and comparing this figure to a benchmark for the average hours worked per FTE yields the portion of an FTE the average provider in that group represents. For RNs, this benchmark was taken from a recent study published by the Canadian Nurses Association (Tomblin Murphy et al., 2009). In the absence of such a benchmark for physiotherapists, the CNA estimate was used as an approximation. For family physicians, like other physicians, it has been common to use billings as a proxy for measuring levels of activity (CIHI, 2007); data on the billing quintiles of Nova Scotia family physicians working in hospitals was provided by the Department of Health and compared to national averages for family physicians (CIHI, 2007).

The Needs Module

Current and future estimates of the size of Nova Scotia's population by age and sex were obtained from Statistics Canada. Estimates of the prevalence of chronic conditions and the incidence of injury were taken from Statistics Canada's Canadian Community Health Survey

(CCHS). In the absence of ‘gold standards’ describing the appropriate levels of service for a given set of chronic conditions and injury, existing levels of service—i.e. the ‘status quo’—were used. The number of resource intensity-adjusted days of hospital care received by people in Nova Scotia according to their level of need was measured by combining self-reported data on hospital stays from the CCHS and adjusting based on administrative data provided by the Department of Health. Self-assessed measures of unmet need for acute care services were also taken from the CCHS.

It is important to note that although these models are specific to providers working in acute care, the service requirements for this sector will be influenced by the organization and levels of service provided in other sectors. For example, there are a number of patients in acute care facilities in Nova Scotia who have been medically assessed and found to require long-term care services. They remain in acute care, however, due to a shortage of beds in long-term care facilities in the province. The opening of new long-term care beds or facilities would, other things equal, increase the level of service in that sector as there would be an increase in the amount of long-term care provided to Nova Scotians. This increase would also impact the acute care sector, as patients who had previously been managed in an acute care setting while waiting for a long-term care bed would be moved to the appropriate setting and most likely be replaced by more acute patients. This would mean that, other things equal, the level of service in acute care would increase as a result of a change in the level of service in long-term care.

Table 3 below summarizes the sources of the various data items for each profession.

Table 3: Simulation Modeling Data Sources by Profession

| Module | Data Item | RN Source | FP/Hospitalist Source | Physiotherapist Source |
|----------|--------------------|---|------------------------------------|------------------------------|
| Training | Enrolment | CBU, St. F. X., Dalhousie Schools of Nursing | Dalhousie Med School | Dalhousie Health Professions |
| | Program Attrition | CBU, St. F. X., Dalhousie Schools of Nursing | Dalhousie Med School | Dalhousie Health Professions |
| | Program Length | CBU, St. F. X., Dalhousie Schools of Nursing | Dalhousie Med School | Dalhousie Health Professions |
| | Grad Out-Migration | Difference between new grads and new registrants from NS (DoH ¹²) | CAPER ¹³ 2008-09 census | Survey of 2009 grads |

¹² Nova Scotia Department of Health

| Module | Data Item | RN Source | FP/Hospitalist Source | Physiotherapist Source |
|---------------------|---|-------------------------------|-------------------------------|-------------------------------|
| Supply | In-Migration | DoH | DoH | DoH |
| | Existing Stock | DoH | DoH | NSCP ¹⁴ |
| | Exit Rates | DoH | DoH | NSCP |
| Work & Productivity | Participation Rate | CNA ¹⁵ | DoH | DoH |
| | Activity Rate | DoH | DoH | DoH |
| | Productivity ¹⁶ | DoH | DoH | DoH |
| Need | Population | Statistics Canada projections | Statistics Canada projections | Statistics Canada projections |
| | Prevalence of Chronic Conditions & Injury | CCHS ¹⁷ | CCHS | CCHS |
| | Self-assessed unmet need | CCHS | CCHS | CCHS |
| | Level of Service | DoH / CCHS | DoH / CCHS | DoH / CCHS |

Data Limitations

Although the data used to populate the simulation models were the best available at the time, a number of data elements have limitations that necessitated certain assumptions, and these should be considered when interpreting the results of the simulations. It is important to note, however, that the models are designed to be continuously updated as more recent or more accurate data become available.

Small cell sizes for Nova Scotia respondents to the CCHS meant that estimates of the prevalence of chronic conditions and incidence of injury for some age/sex groups were unreliable. In these cases values for the Atlantic region—and in some for Canada as a whole—were used as proxies

¹³ Canadian Post-MD Education Registry

¹⁴ Nova Scotia College of Physiotherapists

¹⁵ Canadian Nurses Association

¹⁶ Measured as the number of Resource Intensity Weighted patient days of care per FTE

¹⁷ Statistics Canada's Canadian Community Health Survey

for Nova Scotia values. The assumption here is that the levels of need for these age/sex groups in the Atlantic region (or Canada as a whole) are representative of the levels of need for those same groups in Nova Scotia.

The level of service allocated to individuals according to their level of need, if based on current service patterns, would ideally be measured by administrative data. The Nova Scotia Department of Health systematically collects detailed data on each hospital discharge which is used to populate the Canadian Institute for Health Information's Discharge Abstract Database. While the age and sex of patients are part of the information included in this database, unfortunately these data do not allow for the direct measurement of the amount of hospital care received according to the needs indicators used in these models. Self-reported data from the CCHS is therefore used as a proxy. To enhance the validity of this measure, the self-reported levels of service by age and sex are adjusted according to the levels of service by age and sex measured from the administrative data. The assumption made by this approach is that healthy individuals' recollections of the amount of time they spend in hospital are as accurate or inaccurate as those of unhealthy individuals.

Although existing data sources allow for the estimation of flows of health care providers in and out of Nova Scotia, these sources are rarely specific to the sector in which those providers work. As data on the exit rates of providers specific to acute care were not available, it was assumed that the rates at which each type of providers exits the province or profession were representative of the rates at which they exit the acute care sector.

Data on the current number of physiotherapists registered in Nova Scotia was not available by age. However, age-specific data was available for 2005 and 2006; therefore it was assumed that the average age distribution from those two years has not changed significantly.

Although the number of family physicians providing hospital care can be determined from administrative data collected by the Department of Health, the number of hospitalists is not so difficult to obtain due to the relatively recent deployment of this type of physician in the province. The number of hospitalists was estimated by consultations with District Health Authorities, and it was assumed that hospitalists had the same age distribution as family physicians providing hospital care.

There appeared some disagreement between the annual physiotherapist supply data provided by Nova Scotia College of Physiotherapists and the data on newly registered physiotherapists supplied by the Department of Health. Specifically, increase in supply according to the former source was greater than that described in the latter. Since these data sources were combined in order to estimate exit rates for physiotherapists in the province, these rates may over- or

under-estimate the true exit rates for physiotherapists, depending on which of the two sources is correct.

Unless it is assumed that Nova Scotia's acute care system is meeting the all the province's needs, it is important to consider unmet need for acute care in these models. In the absence of formal assessments based on clear medical criteria, self-assessments captured by the CCHS seem to be the best available measure of this unmet need. Because they are self-assessments, however, they are subject to the personal biases of the individual respondents.

ANALYSIS OF OUTCOME MAPPING DATA

For both of the provider and the patient/family questionnaires the data were handled comparably. They were captured in a SAS dataset, the response rates were calculated by showcase unit, and the relative weights for each respondent were generated. Sub-scale analyses were carried out using Cronbach's Alpha, index variables were derived, and variable distributions were assessed.

Given that some of the showcase units had begun implementing components of the Collaborative Care Model (i.e. changes to staffing mix) before the first round (2009) of evaluation data collection, the focus of the data analyses at that point was to examine associations between variables that reflect MOCINS activities and outcome variables that reflect provider, patient and system effects at that time. This analysis was also performed on the 2010 data.

There are several variables that reflect the degree to which the Collaborative Care Model has been implemented on the showcase units: time since the showcase unit started the initiatives (some had not yet begun implementing staffing mix changes at the time of the initial data collection while some had begun months before), provider attendance at MOCINS professional development sessions, and provider workplace indices. The provider workplace indices reflect the effects of key MOCINS activities, and in this sense they are provider outcomes variables. Examples include the care coordination index, the extent to which assistive personnel are valued, team climate, role clarity and the extent to which care planning involves the patient and family. Job satisfaction is also a provider outcome.

Patient outcome variables included the NRC Picker patient experience index¹⁸. They also included length of stay in the hospital, length of stay in the showcase unit, ER visits within 30

¹⁸ See Jenkinson C et al. (2003). Properties of the Picker Patient Experience questionnaire in a randomized control trial of long versus short form survey instruments. *Journal of Public Health Medicine* 25:197-201.

days of discharge, readmissions within 30 days, and the patient's self-assessed general health status.

Statistical associations between the provider's attendance at professional development sessions and their score on the provider workplace indices were examined. A limitation of this particular analysis is acknowledged here in that most of the MOCINS activities were not formal professional development sessions and thus may not have been fully captured by respondents' description of their professional development activities. Other MOCINS activities included hiring assistive personnel, meetings with the hospital's professional practice coordinators to understand the new roles of RNs and LPNs; having regular inter-professional care planning meetings, and stream lining key processes like discharge planning. Nevertheless, attendance at professional development sessions is an example of MOCINS activities for which data were easily captured.

Associations between provider workplace indices and patient outcomes were also examined. To accomplish this, the mean workplace index scores by showcase unit were calculated in the provider dataset, and those mean values were linked to the patient dataset by showcase unit. So all patients from a given showcase unit would have the same values for the provider workplace indices.

For provider and patient outcomes, the difference between 2009 and 2010 was tested using t-tests¹⁹ 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., ER visits or general health status). Adjustment for showcase unit (using SAS PROC SURVEY) as well as provider age, sex, occupation and years in the unit was carried out, and the multiple-testing environment was accounted for with Bonferroni adjustment²⁰.

Following the second and last round of data collection, the data from the initial and follow-up Provider Data Collection Tools were linked by respondent identification number. The resulting data set was analyzed, first to calculate changes from initial to follow-up assessment of the outcome indicators, and then to estimate the association between process indicators and these

¹⁹ Out of about 250 provider respondents in each survey, 55 were the same individuals in both (about 20%). Given that 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.

²⁰ See for example Bland and Altman (1995). Multiple significance tests: the Bonferroni method. *British Medical Journal*. 310:170.

changes after adjustment for potential confounders. Regression coefficients were estimated by maximum likelihood using generalized models.

Data in the Administrative Process Record were analyzed to generate unit-level variables. For example, staff turnover rate was calculated for the unit as a whole, not for individual providers. These data were then linked with the provider workplace outcomes 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 multi-level models. The association between the mean provider workplace indices and the system outcomes was tested using ordinary least squares regression.

OUTCOME MAPPING RESULTS

The results of the outcomes mapping portion of the evaluation are presented below. Described first are the perspectives of the showcase unit managers, followed by results from the provider survey, the patient and family survey, and the administrative process record. Finally, the results of linking the data from different sources are presented.

MOCINS Implementation

As noted above, each of the fourteen showcase units is unique in terms of its patient population, setup, and other characteristics. As a result of this, the implementation of the Collaborative Care Model has occurred differently for each unit. Table 4 below shows the variation in the points in time at which the showcase units first instituted staff changes as part of the MOCINS project.

Table 4: Start Dates for MOCINS Implementation and Evaluation

| Showcase Unit | Start Date of Staffing Mix Changes |
|--|------------------------------------|
| IWK: Family Newborn/Adult Women's Surgery Unit | September 2008 |
| Halifax Infirmary: Medicine | October 2008 |
| Yarmouth Regional Hospital : 4- East | October 2008 |
| Cape Breton Regional Hospital: Orthopedic Surgery | January 2009 |
| South Shore Regional Hospital: Cardiovascular Unit | April 2009 |
| Valley Regional Hospital: Medical Unit | May 2009 |
| Aberdeen Hospital : Medical Unit 2-N | June 2009 |
| Aberdeen Hospital : Medical Unit 4-N | June 2009 |
| St. Martha's Regional Hospital: Progressive Care Unit | June 2009 |
| Colchester Regional Hospital : 3-North Medical/Surgical | July 2009 |
| First Administration of Evaluation Instruments (Opening) | August 2009 |
| Dartmouth General: 4-West Medicine/Cardiology | September 2009 |
| Dartmouth General: 3-West Surgery | November 2009 |
| Cumberland Regional Healthcare Center: Medical Unit | January 2010 |
| Second Administration of Evaluation Instruments (Closing) | July 2010 |

The fact that some of the showcase units began implementing some components of the Collaborative Care Model (e.g. staffing mix changes or process improvements) before the

evaluation component of the project had commenced meant that a comparatively simple 'before and after' evaluation of MOCINS was not possible. As noted above, however, to account for the varying timelines of MOCINS implementation across the showcase units as well as the uniqueness of these units in structure, resources, patient population, and so on, three different strategies were incorporated into the evaluation process. First, the evaluation measured outcome indicator changes in each unit over time and determined how these were associated with the process indicators which reflect the level of engagement in and implementation of the MOCINS initiatives. Second, the association between engagement and outcomes was assessed in each survey period (2009 and 2010). This approach used the variability in the timing and level of implementation, particularly in 2009, to help identify associations with outcomes. Third, the associations with provider and patient outcomes were examined with multivariate models that controlled for showcase unit; i.e., the associations were examined within each unit. Finally, the qualitative information gathered about each unit through focus groups at the beginning and end of the evaluation provided important information to put the quantitative data in context; this ensured that the impact of the model implementation on each unit was fully understood.

Essential to understanding the implementation of MOCINS are the perspectives of the managers of the showcase units. As part of the evaluation, each unit manager was asked for their assessment of the change management supports available as part of MOCINS, the kinds of professional development activities available to unit staff, and reviews or revisions to patient care processes as part of MOCINS. These questions were asked during both data collection periods; in the second, they were asked about changes that occurred following the initial survey. The responses of the unit managers to these questions are summarized in tables 5-7.

Table 5: Unit Managers' Assessments of Support for MOCINS Implementation, 2009/2010

| Implementation Initiatives | 2009 | | 2010 | |
|---|------|----------|------|----------|
| | N | % Agreed | N | % Agreed |
| <u>Change Management Support</u> | | | | |
| Unit has been allocated additional financial resources for MOCINS | 11 | 18.2 | 13 | 38.5 |
| Unit has been allocated additional staff for MOCINS | 11 | 54.5 | 13 | 38.5 |
| Unit has been allocated additional equipment/supplies for MOCINS | 11 | 27.3 | 13 | 30.8 |
| Current financial resources sufficient to implement MOCINS | 11 | 45.5 | 13 | 38.5 |
| Current staff sufficient to implement MOCINS | 11 | 45.5 | 12 | 33.3 |
| Current equipment/supplies sufficient to implement MOCINS | 11 | 27.3 | 13 | 46.2 |
| Unit received adequate support/endorsement from DOH | 9 | 88.9 | 13 | 69.2 |
| Unit received adequate support/endorsement from DHA | 11 | 81.8 | 12 | 66.7 |
| Unit received adequate support/endorsement from institution | 10 | 40.0 | 13 | 76.9 |
| Staff have been adequately informed/consulted | 11 | 72.7 | 13 | 92.3 |
| Providers consulted on equipment/technology needs | 11 | 27.3 | 13 | 84.6 |
| Assistive personnel hired in unit as part of MOCINS | 11 | 72.7 | 13 | 69.2 |

As few as nine and as many as thirteen of the showcase unit managers (two of the units share the same manager) responded to these questions, with response rates improving in 2010 compared to 2009. 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. Fewer than half of the managers agreed that the unit has sufficient resources to implement MOCINS, a finding that is consistent with some of the other evaluation findings presented later in this report.

Most managers reported receiving adequate support to implement MOCINS from the Department of Health and their Health Authorities and IWK in both 2009 and 2010. While only 40% of managers reported receiving adequate support from their respective institutions to implement MOCINS in 2009, this proportion almost doubled in 2010. The majority of managers reported that their staff had been adequately informed or consulted about MOCINS, with more of them reporting as much in 2010 than in 2009. Although less than a third of managers reported that the providers on their units had been consulted regarding the equipment and technological needs of their units in 2009, this proportion increased to about 85% in 2010. Most managers reported hiring assistive personnel as part of MOCINS implementation on their units.

Table 6 shows the proportion of showcase unit managers reporting whether various kinds of professional development activities are available to staff on their units.

Table 6: Professional Development Opportunities on MOCINS Showcase Units, 2009/2010

| Implementation Initiatives | 2009 | | 2010 | |
|---|------|----------|------|----------|
| | N | % Agreed | N | % Agreed |
| <u>Staff Development</u> | | | | |
| Unit provides clinical skill development activities | 11 | 100.0 | 13 | 100.0 |
| Unit provides leadership skills development activities | 11 | 72.7 | 13 | 84.6 |
| Unit provides mentorship activities | 11 | 100.0 | 13 | 100.0 |
| Unit provides technology skills development activities | 11 | 81.8 | 12 | 91.7 |
| Unit provides team effectiveness development activities | 8 | 87.5 | 12 | 66.7 |
| Unit provides scope of practice development activities | 11 | 90.9 | 13 | 92.3 |
| Unit provides role optimization activities | 11 | 90.9 | 13 | 100.0 |

The showcase unit managers' responses indicate that all fourteen units provided clinical skills development and mentorship activities before both the first and second data collection periods, all units provided role optimization activities before the second data collection period, and the majority provided other types of professional development opportunities for staff.

Table 7 shows the proportion of showcase unit managers reporting whether various kinds of patient care processes have been reviewed as part of the MOCINS project.

Table 7: Patient Care Processes Reviews on MOCINS Showcase Units, 2009 and 2010

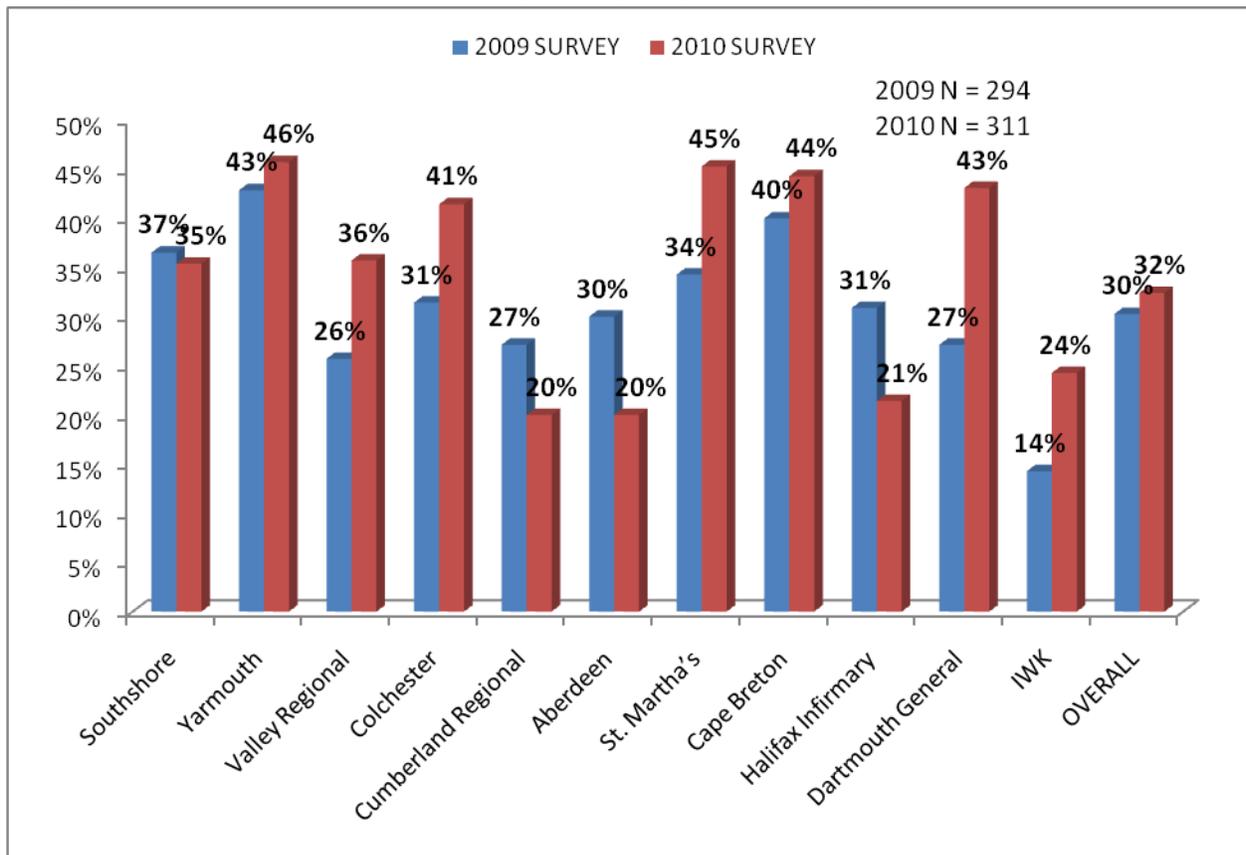
| Implementation Initiatives | 2009 | | 2010 | |
|---|------|----------|------|----------|
| | N | % Agreed | N | % Agreed |
| <u>Care Process Reviews</u> | | | | |
| Interprofessional pt. care planning on the unit has been reviewed | 11 | 81.8 | 12 | 66.7 |
| Clinical pathways on the unit have been reviewed | 11 | 27.2 | 13 | 53.8 |
| Document systems on the unit have been reviewed | 11 | 72.7 | 13 | 76.9 |
| Length of stay management on the unit has been reviewed | 11 | 81.8 | 13 | 61.5 |
| Discharge planning on the unit has been reviewed | 11 | 72.7 | 13 | 61.5 |
| Communications among staff have been reviewed | 10 | 90.0 | 13 | 76.9 |
| Communications between staff and pt/family have been reviewed | 9 | 100.0 | 13 | 69.2 |

For each of the above patient care processes, the majority of unit managers reported that they had been reviewed before either the first or second data collection periods. Less than a third of managers reported that clinical pathways had been reviewed prior to the 2009 evaluation period, but more than half reported that they had prior to the 2010 period.

MOCINS Patient and Family Survey

To administer the patient and family survey, questionnaires were mailed to 971 patients discharged from any of the 14 showcase unit between March 1st and June 30th, 2009 (for the first round of data collection) and January 1st to April 30th, 2010 (for the second round of data collection). In 2009, completed questionnaires were received from 294, for a total response rate of 30.3%. In 2010, 311 responses were received, for a response rate of 32%. The response rates by showcase unit are shown in Figure 3.

Figure 3: MOCINS Patient and Family Survey Response Rates by Showcase Unit, 2009/10



Sample weights were calculated to ensure the results represent the population; weighting by the inverse of the response rate by age and sex groups. Descriptive statistics on the respondent samples in both 2009 and 2010 are provided in Table 8.

Table 8: Distribution of Patient Survey Respondents, Nova Scotia 2009

| Descriptor | 2009 Distribution | 2010 Distribution |
|-----------------------------|-------------------|-------------------|
| Gender | | |
| Females | 68.8% | 59.9% |
| Males | 31.2% | 40.1% |
| Average Age | 56.5 yrs | 66.7 yrs |
| Marital Status | | |
| Single | 9.8% | 5.7% |
| Married/Common Law | 68.8% | 63.1% |
| Divorced | 3.8% | 7.4% |
| Widowed | 17.6% | 23.8% |
| Who Completed Survey | | |
| Patient Alone | 73.8% | 66.7% |
| Patient with Help | 16.0% | 21.6% |
| Others on Behalf of Patient | 10.2% | 11.8% |

Figure 4 presents the proportion of patients reporting each of the Picker Patient Experience items on the 2009 and 2010 surveys. To test for significance in the differences in each item between the two time periods, chi-squared analysis was performed. While none of the individual differences was found to be significant, the fact that all fifteen of them was reported as less common in 2010 is highly unlikely to be due to chance. The item experienced by the highest proportion of patients at both points in time was “Not sufficiently involved in decisions”—over half the patients and families surveyed reported feeling this way in 2009, with just under half reporting as much in 2010.

Figure 4: Patient/Family-Reported Hospital Experience in 2009 and 2010

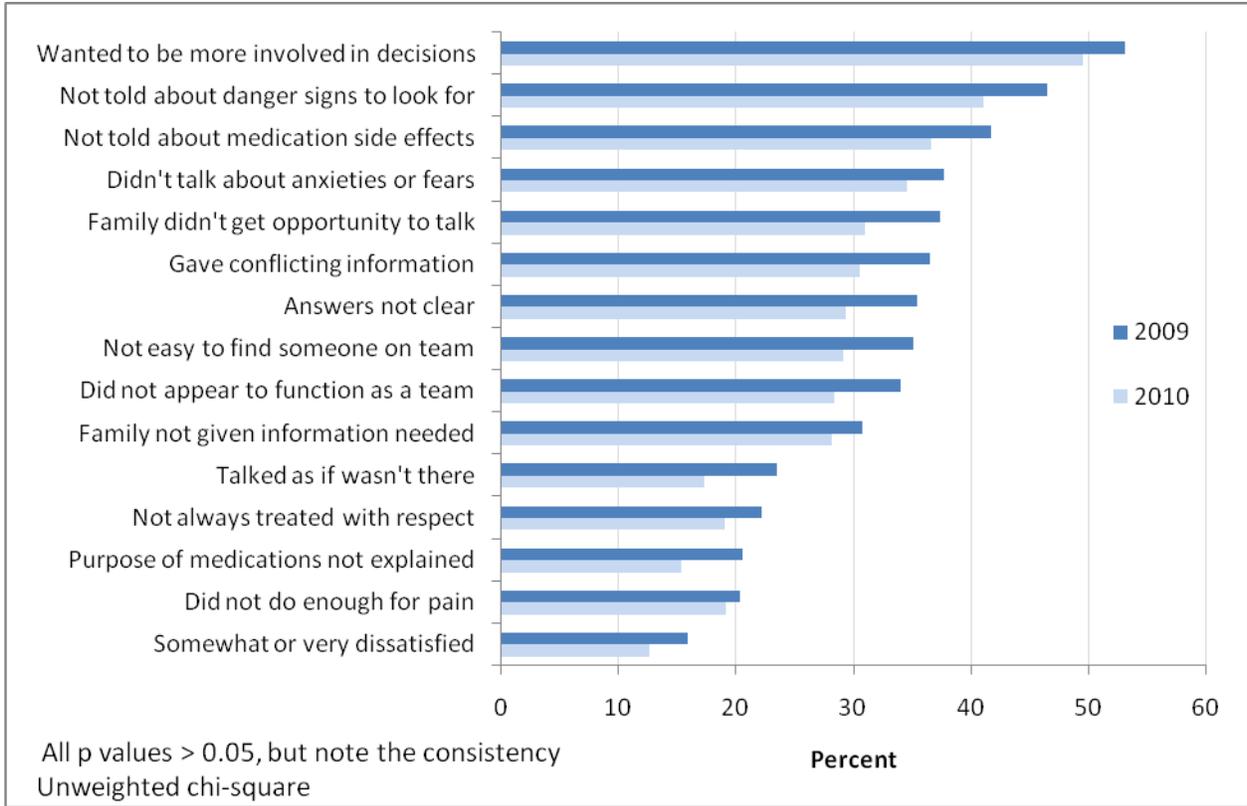
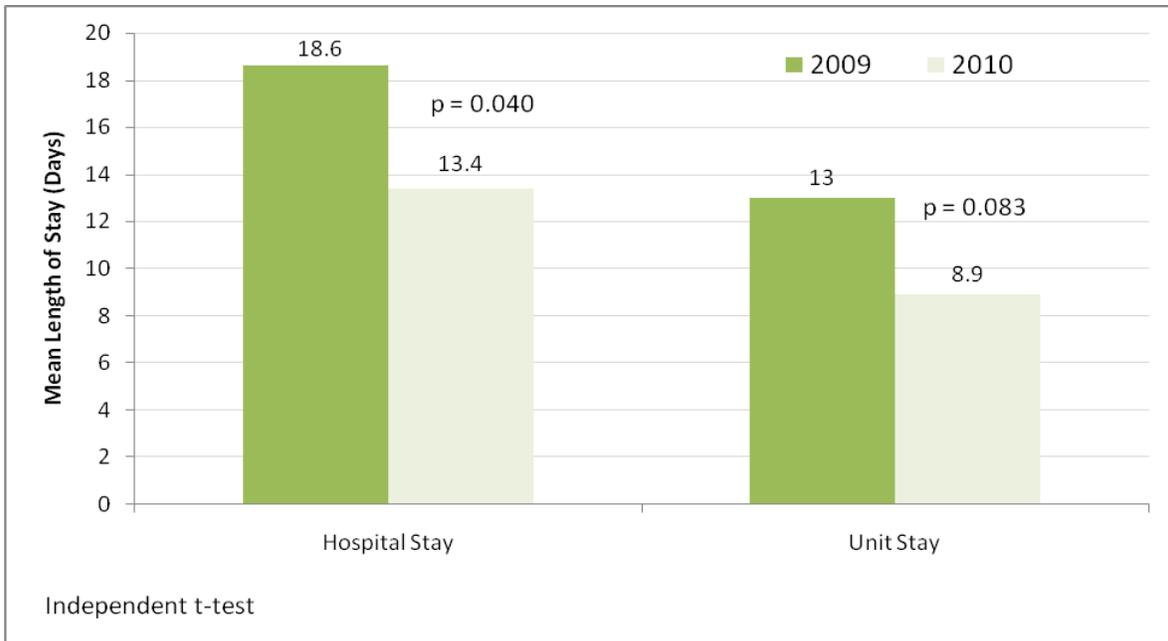


Figure 5 shows the differences in lengths of stay—both on the showcase unit and in the hospital overall—reported on the patient and family surveys in 2009 and 2010.

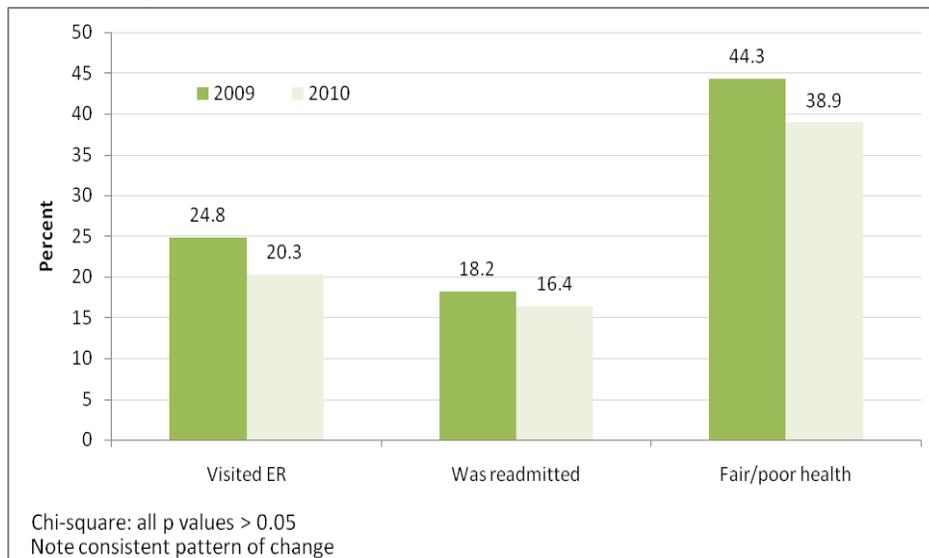
Figure 5: Lengths of Stay Reported by MOCINS Patients and Families, 2009/10



MOCINS showcase unit patients reported, on average, lower lengths of stay in both the showcase units themselves and in the hospital overall in 2010 compared to 2009. Both these differences were found to be significant at a level of $\alpha=10\%$. As will be discussed later in the report, these changes were significantly associated with improvements in care coordination, team climate and other workplace indices that changed under the implementation of the Collaborative Care Model.

Figure 6 shows the changes in three other outcomes reported by patients of MOCINS showcase units in 2009 and 2010. These include the proportion of patients who reported visiting an emergency room within 30 days of being discharge from a showcase unit for a complaint related to the condition for which they had been hospitalized, the proportion who were readmitted to hospital within 30 days of being discharged from a showcase unit for a complaint related to the condition for which they had been hospitalized earlier, and the proportion who reported feeling in fair or poor health following their discharge from a showcase unit.

Figure 6: MOCINS Patient Outcomes in 2009 and 2010

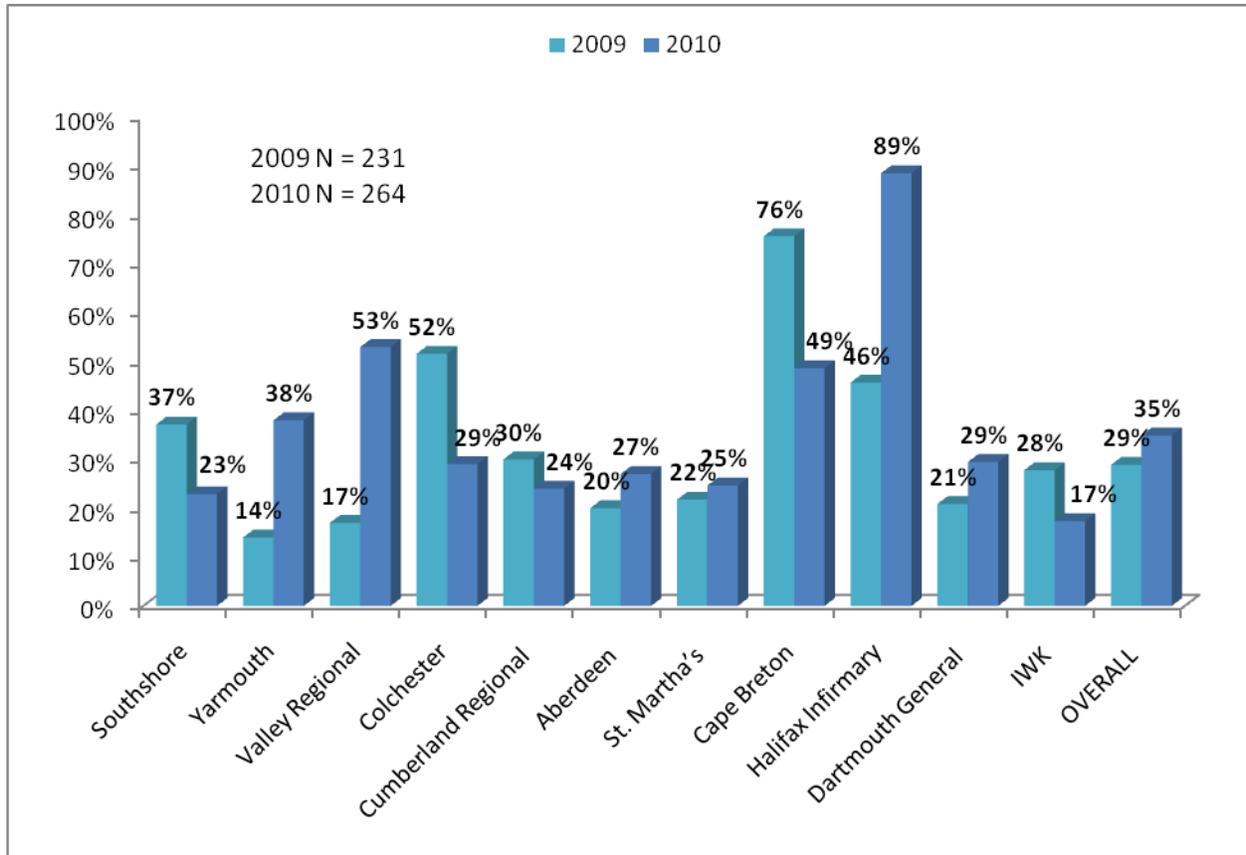


MOCINS showcase unit patients reported fewer ER visits, fewer readmissions, and better health following discharge in 2010 compared to 2009. Although the differences between the time periods for each indicator were not found to be statistically significant by chi-squared analysis, as seen above with the patient experiences, the consistency of each indicator showing such positive change over time is unlikely to be due to chance.

MOCINS Provider Survey

Invitations to complete the first and second questionnaires were sent to 800 providers across the 14 showcase units during the first data collection period. A total of 231 completed and submitted the first questionnaire on-line between August and October 2009, for an overall response rate of 29%. There were 264 respondents to the second questionnaire between May and July 2010, which was distributed to 755 providers, for an overall response rate of 35%. The response rates varied by showcase unit as depicted in Figure 7.

Figure 7: MOCINS Evaluation Provider Survey Response Rates by Showcase Unit



To adjust for the differential response rate by showcase unit as well as by age and sex of the respondent, the analyses in this report related to providers were weighted, with weights calculated as the inverse of the response rate by age and sex for each showcase unit. This means that the data for respondents for a subgroup with a lower response rate is given more weight in the analysis than those data from respondents of units with a higher response rate. Descriptive statistics on the respondents to both samples are provided in Table 8.

Table 8: Distribution of Provider Survey Respondents, Nova Scotia 2009/10

| Descriptor | 2009 Distribution | 2010 Distribution |
|---|-------------------|-------------------|
| Profession | | |
| RN | 49.7% | 36.7% |
| LPN | 27.7% | 22.4% |
| Unit Clerk | 7.1% | 3.4% |
| Other (e.g. physician, OT, PT, pharmacist, assistive personnel) | 15.6% | 29.2% |
| Gender | | |
| Female | 95.5% | 92.8% |

| | | |
|-------|-------|--------|
| Male | 4.5% | 7.2% |
| Age | | |
| 20-29 | 31.3% | 23.4% |
| 30-39 | 21.2% | 23.11% |
| 40-49 | 27.4% | 23.9% |
| 50-59 | 18.1% | 17.8% |
| 60-69 | 2.0% | 3.0% |

The index variables listed in Table 9 have been derived from a series of related but independent variables in the providers' questionnaire. The bullets under each variable name are the main dimensions measured by the variable named.

Each of these index variables reflects MOCINS initiatives in the workplace of the showcase units. The RN has taken on a major role in care coordination, creating care plans for patients in consultation with the physician and other professions (e.g., physiotherapy, pharmacy, nutrition), assigning some stable and predictable patients to LPNs, counseling and advocating for patients and families as well as providing clinical care for complex, unstable patients.

Assistive personnel such as patient support workers (PSWs) or Continuing Care Assistants (CCAs) have, in many showcase units, taken on the personal care of patients (e.g., bathing, toileting, etc.). This has freed up the LPN to carry out clinical roles previously done by RNs (e.g., giving medications, monitoring patients, starting IVs, removing sutures, staples and drains).

Team effectiveness seminars and role clarification documents and activities have been conducted or created. Evidence-based care planning, involvement of patients and their family in planned care, and the enhancement of key processes such discharge planning are key MOCINS initiatives in many of the showcase units.

Table 9: Name and Composition of MOCINS Evaluation Provider Workplace Index Variables

| Care Coordination |
|---|
| <ul style="list-style-type: none"> • The care coordination role is important for coordinating other members of the team • The care coordination role ensures that the internal communication within the team is efficient • The individual responsible for care coordination in my unit effectively navigates the hospital's network to respond to the patients and family immediate needs |
| Assistive Personal |
| <ul style="list-style-type: none"> • Assistive personnel in our unit are valued members of our health care teams • Assistive personnel participate in the delivery of care appropriate with their level of training, skill, and knowledge • Assistive personnel assist the work of the RN and LPN |

| |
|---|
| <ul style="list-style-type: none"> • Assistive personnel function under the supervision and direction of an RN or LPN when assisting in the provision of direct patient care |
| Team Climate |
| <ul style="list-style-type: none"> • My work unit's objectives are clear • The objectives of my work unit are worthwhile to the hospital • We have a "we are together" attitude • People feel understood and accepted by each other • There are real attempts to share information throughout the work unit. • In this work unit we take the time needed to develop new ideas • People in the work unit cooperate to help develop and apply new ideas • The members of the work unit build on each other's ideas to achieve the best possible outcome |
| Role Clarity |
| <ul style="list-style-type: none"> • I feel certain about how much authority I have • Clear, planned goals and objectives exist for my job • I know what my responsibilities are • I know exactly what is expected of me |
| Role Conflict |
| <ul style="list-style-type: none"> • I have to do things that should be done differently • I have to break a rule or policy in order to carry out an assignment • I work with two or more different teams who operate quite differently • I receive incompatible requests from two or more people • I receive an assignment without adequate resources and materials to execute it |
| Care Planning |
| <ul style="list-style-type: none"> • Extent patients' care planning is evidence-based • Extent patient is involved in their care planning • Extent the family is involved in their loved one's care planning |
| Discharge Planning |
| <ul style="list-style-type: none"> • On this unit health care providers effectively participate in discharge planning • Discharge planning begins early in the unit stay of most patients • Families are involved frequently in discharge planning • On this unit most health care providers are actively involved in discharge planning • An appropriate orientation to discharge planning is provided to new staff members • After the patient has left the unit, health providers are able to obtain information about how well the discharge plan worked • The discharge planning in this unit is effective in ensuring appropriate patient lengths of stay • Overall, discharge planning in this unit is carried out appropriately to meet the patients' needs |
| Job Satisfaction |

Level of satisfaction with the following:

- The care coordination function within your unit
- Communications in your organization
- Communications in your work unit
- The amount of control you have over your job activities
- Your involvement in decision making processes in your organization
- Your amount of responsibility
- Enough time to do your job adequately
- Extent to which you can trust your organization
- Your organization’s support for your learning and development
- Safety of your work environment
- The balance between your work and family/personal life
- The leadership on your unit

All 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 (Table 10). The descriptive statistics for these and other provider outcomes as measured in both surveys are provided in Table 11.

Table 10: Internal Consistency of Provider Workplace Indices

| Provider Workplace Indices | Items | Cronbach’s Alpha |
|----------------------------|-------|------------------|
| Care Coordination Index | 3 | 0.92 |
| Assistive Personnel Index | 4 | 0.90 |
| Team Climate Index | 15 | 0.95 |
| Role Clarity Index | 6 | 0.85 |
| Role Conflict Index | 8 | 0.81 |
| Care Planning Index | 3 | 0.75 |
| Discharge Planning Index | 11 | 0.93 |
| Job Satisfaction Index | 18 | 0.95 |

Table 11: Descriptive Statistics for MOCINS Provider Outcomes, 2009 and 2010

| Provider Outcome | First Survey | | | Second Survey | | | Ratio of Means (2 nd /1 st) | P Value [^] |
|---------------------|--------------|-----------|-------------|---------------|-----------|-------------|--|----------------------|
| | N | Mean or % | S.E of Mean | N | Mean or % | S.E 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 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 $\alpha=0.05$

The overall ‘scores’ of the showcase units on the care coordination, assistive personnel, team climate, care planning, discharge planning, role clarity and job satisfaction scales all increased from 2009 to 2010, most of them significantly so. In addition, their scores on the role conflict index decreased during this time. Intention to leave increased between 2009 and 2010, but this difference was not significant. Providers reported missing fewer shifts—due to Workers Compensation Board incidents or otherwise—in 2010 than in 2009, but again this difference was not significant. Finally, providers reported working significantly less overtime in 2010 compared to 2009. Important to consider in interpreting these results is that these analyses were adjusted for the showcase unit; in other words, pre-existing differences between the showcase units that do not change over time have been separated out so as not to influence the results.

Although showcase units started the MOCINS initiatives at different times, these provider workplace indices did not vary significantly with the length of time between their respective start dates and the first set of data collection. An exception was the assistive personnel index, which increased with length of time since unit started the MOCINS project ($p=0.0004$). This is likely due to the fact that most of these indices reflect initiatives that defined MOCINS from the onset; e.g., care coordination and planning, role clarification and team development. In contrast, the assistive personnel were, in some showcases, new to the unit and over time the value of these team members became more appreciated.

The next step of the analysis is investigating the association between these workplace indices and provider attendance at MOCINS professional development sessions. An important factor to consider when examining Table 12 is that for this analysis the alpha level was divided by 8 – the number of workplace indices tested for each type of professional development in order to adjust for the multiple testing environment²¹. In the interests of brevity, only those

²¹ This is known as the Bonferroni method. See for example Bland and Altman (1995). Multiple significance tests: the Bonferroni method. *British Medical Journal*. 310:170.

associations found to be at or close to the conventional level of statistical significance are shown in the table.

Table 12: Associations between Professional Development and Provider Workplace Indices, Nova Scotia 2009 - 2010

| Professional Development Opportunities Attended | Associated Workplace Indices | Regression Coefficient [^] | P Value |
|---|------------------------------|-------------------------------------|---------|
| 2009 Provider Survey (N = 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* |
| | Role clarity | 3.688 | 0.002* |
| Other staff development | Care coordination | 2.019 | 0.005* |
| | Job satisfaction | 10.587 | 0.003* |
| 2010 Provider Survey (N = 264) | | | |
| Leadership skills | Care planning | 1.483 | 0.039 |
| | Job satisfaction | 6.212 | 0.023 |
| Technology skills | Job satisfaction | 6.926 | 0.014 |
| Team effectiveness | Care coordination | 1.247 | 0.065 |
| | Job satisfaction | 4.994 | 0.073 |
| Role optimization | Role clarity | 1.573 | 0.056 |

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

*Statistically significant after Bonferroni adjustment

According to the 2009 provider survey, attendance at professional development sessions aimed at team effectiveness was associated with higher levels of the care coordination and assistive personnel indices. It was also associated with a higher team climate score, but at a lower level of statistical significance. Professional development focused on role optimization was associated with a higher team climate score and greater role clarity. It was also associated with a higher level of value for assistive personnel, though not at the same level of statistical significance.

Technology skills development refers to development on communication technology, information technology, diagnostic technology and therapeutic technology. Though not shown, provider attendance at technology skills development opportunities was associated with a shorter length of stay in the showcase unit and a higher level of self-assessed health among patients discharged from such providers' showcase units. These associations may reflect the

increased care coordination role of the RNs and the increased role of LPNs in patient monitoring. Attendance at other professional development opportunities was associated with higher care coordination scores and a higher level of provider satisfaction.

Results from the 2010 survey show that provider attendance at staff development sessions focused on leadership skills was associated with higher care planning and job satisfaction scores. Provider attendance at sessions aimed at technology skills development was also associated with higher job satisfaction. Attendance at team effectiveness sessions was associated with higher care coordination and job satisfaction, and attendance at role optimization sessions was associated higher role clarity.

In 2010, there were fewer associations between the workplace indices and provider attendance at professional development 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 to 2009; this reduced variation is shown by the lower Standard Errors of the Means in Table 11. Other things being equal, the less variation there is in a particular variable, the more difficult it is to determine what factors are associated with those variations—therefore where there was less variation in the 2010 workplace indices than in those of 2009, one would expect to find fewer factors associated with those indices in 2010 than in 2009.

Next, the association between attendance at professional development and changes in these workplace indices from 2009 and 2010 were investigated. By pairing observations from respondents who completed the survey in both 2009 and 2010, it is possible to measure changes in workplace indices at the level of individual providers between these two periods and determine the degree to which these changes are associated with the attendance (or non-attendance) of those providers at various kinds of professional development activities. 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. Table 13 shows the types of professional development activities found to be associated with changes in specific workplace indices at a level of significance of less than 0.1. In other words, the probability that a particular association shown in Table 13 is due to chance is less than 10%. Due to the smaller N making it less likely that an association would be found to be significant due to chance alone, Bonferroni adjustment was not done in this analysis.

Table 13: Associations between Professional Development and Changes in Workplace Indices, MOCINS 2009-2010

| Attended Professional Development Opportunities [^] | Associated Changes in Workplace Indices (N = 55) | Regression Coefficient ^{^^} | P 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.

Providers who attended professional development sessions focusing on leadership skills reported higher levels of care planning, care coordination, and role clarity in 2010 compared to 2009. Similarly, those who attended sessions aimed at mentorship reported higher discharge planning and job satisfaction scores in 2010 than they did in 2009. In addition, providers who attended role optimization sessions reported reduced role conflict in 2010 compared to 2009.

MOCINS System Outcomes

Administrative Process Records were distributed to the managers of each showcase unit to collect administrative data on system outcomes related to MOCINS in September of 2009 and May of 2010. Such outcomes include lengths of stay in the specific showcase unit and in the hospital as whole, repeat admissions, medical errors, occupational health and safety incidences, number of alternative level of care patients on the unit, and staff productivity²² (see Table 12 for a list of such outcomes). Administrative data on these outcomes were captured in the administrative process records and are reported at the level of the showcase unit.

Table 14 provides the mean and median changes in the system outcome measures from 2009 to 2010, and provides the p value based on the paired t-test. While the total number of showcase units in this study was 11 (units at Aberdeen and Dartmouth were combined), the number that reported data in both 2009 and 2010 was very small, ranging from two to six, depending on the outcome variable. The result was that all of the mean changes were highly likely to be due to chance—this is reflected in the p-values in the right-most column.

²² Productivity is calculated as the number of Resource IntensityWeight (RIW)-adjusted patient days of care per FTE provider.

**Table 14:
Change in System Outcomes in Showcase Units Reporting 2009 and 2010 Data**

| System Outcomes | Units Reporting 2009 & 2010 Data (N) | Change from 2009 to 2010 | | Std Dev | P Value§ |
|-------------------------------------|--------------------------------------|--------------------------|--------|---------|----------|
| | | Mean | Median | | |
| Falls per total # patients | 6 | 0.012 | 0.018 | 0.048 | 0.561 |
| Adverse events per total # patients | 4 | 0.030 | 0.065 | 0.161 | 0.731 |
| Deaths per RIW* cases | 4 | 0.009 | -0.003 | 0.000 | 0.488 |
| Readmission rate | 4 | -0.085 | -0.046 | 0.089 | 0.154 |
| Repeat admission rate | 2 | -0.023 | -0.023 | 0.032 | 0.499 |
| Medical errors per total # patients | 3 | 0.092 | 0.026 | 0.117 | 0.307 |
| Infections per total # patients | 4 | 0.018 | -0.001 | 0.065 | 0.626 |
| Length of stay in the unit | 3 | 1.143 | 1.380 | 1.094 | 0.212 |
| Length of stay in hospital | 6 | 0.802 | 0.305 | 7.884 | 0.813 |
| Occupation health & safety issues | 4 | 16.75 | 12.00 | 22.01 | 0.225 |
| ALC^ patients per total # patients | 5 | -0.012 | 0.000 | 0.028 | 0.391 |
| Staff turnover rate | 6 | -0.094 | -0.024 | 0.256 | 0.490 |
| Overtime per # staff | 3 | 3.645 | 9.187 | 11.84 | 0.647 |
| RN Shifts missed due to illness | 3 | -15.51 | 0.834 | 59.76 | 0.697 |
| RN Shifts missed due to injury | 3 | 0 | 0 | 0 | 0 |
| LPN Shifts missed due to illness | 2 | -20.49 | -20.49 | 25.06 | 0.454 |
| LPN Shifts missed due to injury | 3 | -11.21 | -1.000 | 18.561 | 0.405 |
| RN productivity | 5 | 22.48 | 6.927 | 35.00 | 0.224 |
| LPN productivity | 5 | 22.48 | 6.927 | 35.00 | 0.224 |
| Assistive personnel productivity | 3 | 132.2 | 43.60 | 194.8 | 0.361 |

§Based on paired t-test

* Resources intensity weighting reflects level of patient acuity

^Alternative level of care

Analyses Combining Patient, Provider and System Outcomes

An additional level of analysis involved linking the data from the various collection tools aimed at providers, patients and families, and the units themselves. The goal of this analysis was to examine the association between the provider workplace indices that reflect the MOCINS initiatives and patient outcomes as well as system outcomes. The unit-level patient outcome measures and the unit-level system outcome measures were linked with the provider data by showcase unit. With this linkage, the average provider workplace index for each showcase unit can be compared with the value of the system or patient outcome variables in each unit.

Tables 15 and 16 provide the associations between the eight provider workplace indices described in the previous section and the six patient outcomes described in this section. Table 15 shows the results for 2009, while Table 16 is specific to 2010. In order 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) such that the conventional level of statistical significance ($\alpha=0.05$) is met if the p value is equal to or less than 0.008²³.

The associations found between provider workplace indices and patient outcomes were similar in 2009 and 2010. At both points in time, a higher assistive personnel index was found to be associated with significantly higher lengths of stay in the hospital, a higher care planning index was found to be associated with significantly lower lengths of stay in hospital, as well as better patient health following discharge, and a higher role clarity index was also associated with significantly lower lengths of stay in hospital. Also, the discharge planning, role conflict, care coordination and job satisfaction indices were not found to be associated with significant differences in patient outcomes in either 2009 or 2010.

In 2009, a higher assistive personnel index was associated with significantly higher lengths of stay on the showcase unit as well as in the hospital; however in 2010 the association with unit length of stay was not significant. In 2010, higher team climate and role clarity indices were both associated with significantly lower lengths of stay on the showcase units; in 2009 these associations were not significant.

²³ As noted earlier, this is known as the Bonferroni method. See for example Bland and Altman (1995). Multiple significance tests: the Bonferroni method. *British Medical Journal*. 310:170.

Table 15:

Associations between Provider Workplace Indices and Self-Reported Patient Outcome Indices, Nova Scotia 2009

| Provider Workplace Indices (MOCINS-related Initiative) | Self-Reported Patient Outcomes Indices | | | | | |
|---|---|----------------------------|---------------------------------|--------------------------------------|---|---------------------------------------|
| | Negative Hospital Experience [^] | Length of Stay in Hospital | Length of Stay in Showcase Unit | ER Visit within 30 Days of Discharge | Re-Admission to Hospital within 30 Days | Self-Reported Health Status Fair/Poor |
| | Coefficient§ (p value) | Coefficient§ (p value) | Coefficient§ (p value) | Coefficient " (p value) | Coefficient " (p value) | Coefficient" (p value) |
| Care Coordination Index | -0.504 (0.174) | -0.215 (0.063) | -0.121 (0.307) | -0.043 (0.692) | 0.026 (0.806) | -0.055 (0.481) |
| Assistive Personnel Index | 0.014 (0.917) | 0.111** (0.001) | 0.148** (0.000) | -0.026 (0.721) | 0.094 (0.354) | 0.097 (0.230) |
| Team Climate Index | -0.127 (0.119) | -0.065** (0.008) | -0.015 (0.057) | -0.042 (0.244) | 0.003 (0.933) | -0.037 (0.121) |
| Care Planning Index | -1.358 (0.057) | -0.608** (0.005) | -0.496 (0.044) | -0.481 (0.097) | -0.362 (0.226) | -0.996** ($<.0001$) |
| Discharge Planning Index | -0.150 (0.148) | -0.075 (0.018) | -0.055 (0.104) | -0.057 (0.146) | -0.022 (0.571) | -0.059 (0.014) |
| Role Clarity Index | -0.222 (0.250) | -0.164** (0.005) | -0.125 (0.078) | -0.168 (0.189) | -0.092 (0.473) | -0.204 (0.010) |
| Role Conflict Index | 0.122 (0.458) | 0.090 (0.049) | 0.098 (0.072) | 0.034 (0.627) | -0.058 (0.375) | -0.045 (0.382) |
| Job Satisfaction Index | -0.065 (0.202) | -0.035 (0.030) | -0.025 (0.164) | -0.025 (0.164) | -0.009 (0.679) | 0.017 (0.426) |

[^] Based on Picker Patient Experience (PPE-15)
[§] Weighted multiple regression analysis adjusting for showcase unit.
["] Weighted logistic regression analysis adjusting for showcase unit.
^{**} Statistically significant at $\alpha=0.05$ with Bonferroni adjustment ($0.05/6 = 0.008$)

Table 16:**Associations between Provider Workplace Indices and Self-Reported Patient Outcome Indices, Nova Scotia 2010**

| Provider Workplace Indices (MOCINS-related Initiative) | Self-Reported Patient Outcomes Indices | | | | | |
|---|---|----------------------------|---------------------------------|--------------------------------------|---|---------------------------------------|
| | Negative Hospital Experience [^] | Length of Stay in Hospital | Length of Stay in Showcase Unit | ER Visit within 30 Days of Discharge | Re-Admission to Hospital within 30 Days | Self-Reported Health Status Fair/Poor |
| | Coefficient§ (p value) | Coefficient§ (p value) | Coefficient§ (p value) | Coefficient " (p value) | Coefficient " (p value) | Coefficient " (p value) |
| Care Coordination Index | 0.045 (0.745) | -0.025 (0.363) | -0.073 (0.033) | -0.043 (0.692) | 0.026 (0.806) | -0.055 (0.481) |
| Assistive Personnel Index | 0.186 (0.024) | 0.055** (0.005) | 0.023 (0.311) | -0.026 (0.721) | 0.094 (0.354) | 0.097 (0.230) |
| Team Climate Index | 0.023 (0.668) | -0.005 (0.609) | -0.015 (0.209) | -0.042 (0.244) | 0.003 (0.933) | -0.037 (0.121) |
| Care Planning Index | 0.032 (0.953) | -0.432** ($<.0001$) | -0.433** ($<.0001$) | -0.481 (0.097) | -0.362 (0.226) | -0.996** ($<.0001$) |
| Discharge Planning Index | -0.004 (0.954) | -0.017 (0.106) | -0.029 (0.031) | -0.057 (0.146) | -0.022 (0.571) | -0.059 (0.014) |
| Role Clarity Index | -0.077 (0.686) | -0.087** (0.008) | -0.121** (0.005) | -0.168 (0.189) | -0.092 (0.473) | -0.204 (0.010) |
| Role Conflict Index | 0.044 (0.589) | -0.033 (0.075) | -0.013 (0.573) | 0.034 (0.627) | -0.058 (0.375) | -0.045 (0.382) |
| Job Satisfaction Index | 0.035 (0.182) | 0.009 (0.126) | 0.002 (0.809) | -0.009 (0.679) | 0.017 (0.426) | 0.007 (0.687) |

[^] Based on Picker Patient Experience (PPE-15)
[§] Weighted multiple regression analysis adjusting for showcase unit.
["] Weighted logistic regression analysis adjusting for showcase unit.
** Statistically significant at $\alpha=0.05$ with Bonferroni adjustment ($0.05/6 = 0.008$)

In comparing the mean provider outcomes by showcase unit with the unit-level system outcomes, ordinary least squares regression (OLS) models were used. The association of individual provider scores with the unit-level system outcomes was also assessed using multilevel models (MLM). Since 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 here²⁴. Table 17 presents these significant associations between system outcomes and provider workplace indices.

Table 17: Associations between MOCINS Provider Workplace Indices and System Outcomes, Nova Scotia 2009 - 2010

| Provider Workplace Index | Associated System Outcomes | Regression Coefficient ^a | P Value |
|---------------------------------------|--|-------------------------------------|---------|
| 2009 Provider Survey (N = 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 |
| | LPN Productivity ^a | 0.098 | 0.024 |
| Care Planning | 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 due to injury per RN ^a | -0.114 | 0.028 |
| | Shifts missed due to injury per LPN ^a | -0.027 | 0.019 |
| Discharge Planning | Repeat Admissions ^a | -14.11 | 0.043 |
| | Deaths per RIW case ^a | -174.2 | 0.002 |
| | Shifts missed due to injury per RN ^a | -0.1445 | 0.049 |
| Role Clarity | Repeat Admissions ^a | -9.695 | 0.035 |
| | Shifts missed due to injury per RN ^a | 0.281 | 0.043 |

²⁴ The n in these analyses is small (effectively equal to the number of showcase units without missing data). Therefore 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.

| | | | |
|---------------------------------------|--|--------|-------|
| Role Conflict | 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 (N = 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 |

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

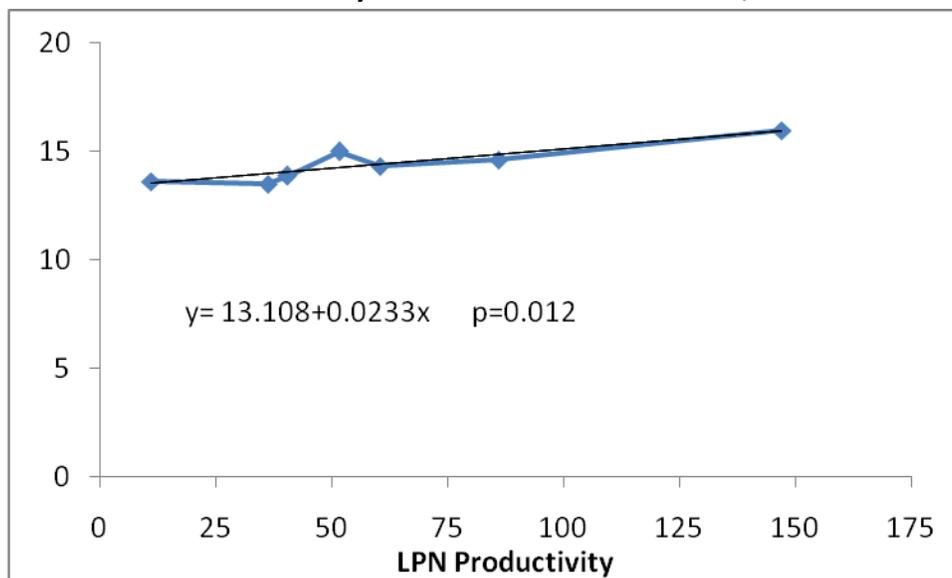
^a Outcomes measured using administrative data

[#]Self-reported from provider survey

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

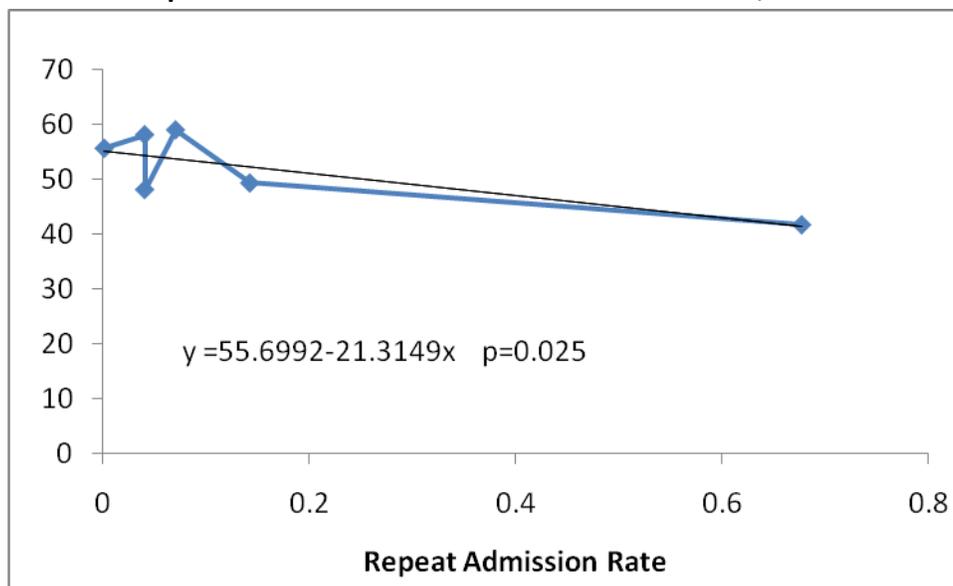
Results of this analysis indicate that in 2009, units with higher care coordination scores had significantly higher LPN productivity. Productivity (i.e., the number of resource intensity weighted patient days of care per FTE) is shown on the X-axis, and the care coordination index is shown on the Y-axis. The diamonds in the figure are the showcase units. So in Figure 7 data for both variables was available for only seven of the showcase units. Nevertheless, the association is statistically significant; i.e., unlikely to be due to chance ($p < 0.05$). This relationship is depicted in Figure 8.

Figure 8: Relationship between Care Coordination Index and LPN Productivity on MOCINS Showcase Units, 2009



Units with a higher assistive personnel index—that is, units where assistive personnel are more valued parts of the care team, supporting the work of and supervised by RNs and LPNs—had significantly fewer infections per patient. Units with a higher team climate index had significantly fewer repeat admissions and medical errors. The team climate index indicates that, from the providers’ point of view, the work unit’s objectives are clear and are worthwhile to the hospital. Providers have a "we are together" attitude, and feel understood and accepted by each other. There are real attempts to share information throughout the work unit. Providers take the time needed to develop new ideas, they cooperate to apply new ideas, and they build on each other's ideas to achieve the best possible outcome. Figure 9 shows the relationship between team climate and repeat admissions.

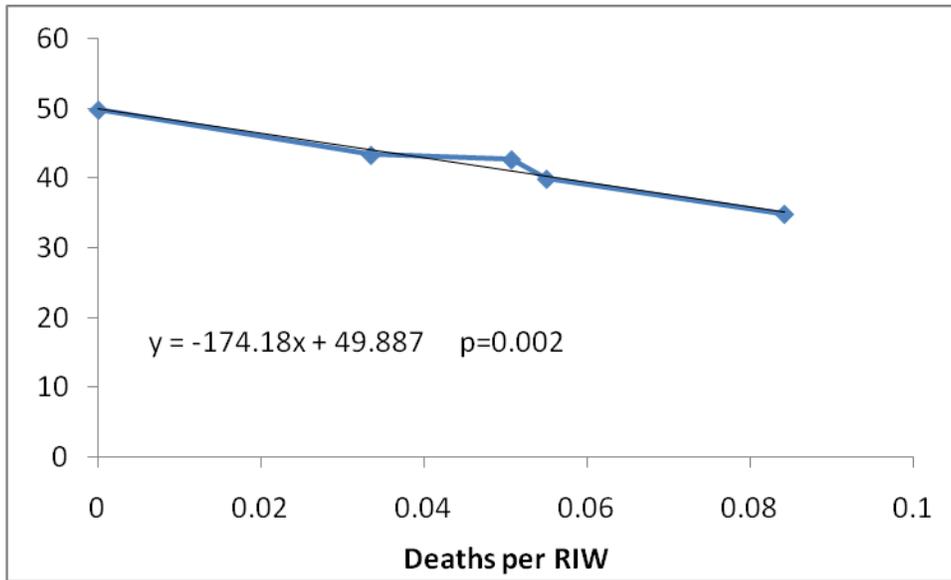
Figure 9: Relationship between Team Climate Index and Repeat Admissions on MOCINS Showcase Units, 2009



On units with higher care planning indexes, there were lower lengths of stay, fewer repeat admissions, deaths²⁵, and shifts missed due to injury per RN and LPN. Each of these associations was statistically significant. Units with a higher discharge planning index had significantly fewer repeat admissions, deaths, and shifts missed due to injury per RN. The relationship between the discharge planning index and the number of deaths on the unit (weighted by RIW) is shown in Figure 10.

²⁵ To 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 (RIW) on each unit.

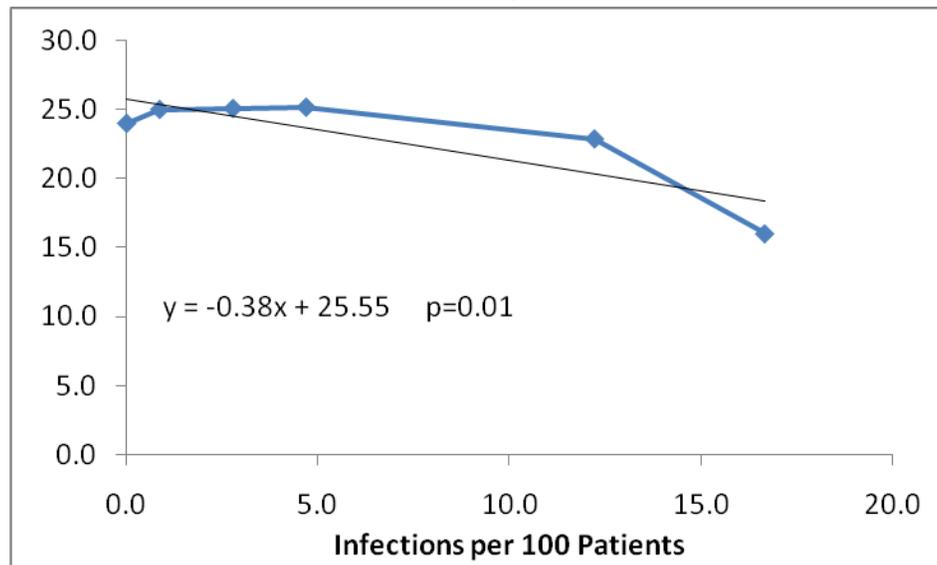
Figure 10: Relationship between Discharge Planning Index and Deaths per RIW on MOCINS Showcase Units, 2009



Units with a higher role clarity index had significantly fewer repeat admissions and shifts missed due to injury per RN. On units where the role conflict index—an opposite construct to the role clarity index—was higher, repeat admissions were significantly higher. Finally, in 2009, units with a higher job satisfaction index had significantly fewer repeat admissions and medical errors per patient.

In 2010, there were fewer statistically significant associations detected. Units with a higher assistive personnel index had significantly fewer infections per patient and higher job satisfaction. The former relationship is shown in Figure 11.

Figure 11: Relationship between Assistive Personnel Index and Number of Infections per Patient, 2010



Units with a lower role conflict index had significantly lower overtime use per staff. On units with higher care planning scores—that is, units where patient care is more evidence-based and patients and their families are involved in care planning—there were fewer occupational health and safety incidents and RN productivity²⁶ was significantly lower. This last finding is consistent with RNs shifting their focus from clinical interventions to care planning and coordination.

A statistical caveat is noteworthy with respect to Table 15 and Figures 8-11. In the analyses reported earlier in this report for provider outcomes, the number of statistically significant associations between such outcomes and process indicators of MOCINS initiatives (such as professional development) was about the same in 2009 and 2010. The same occurred with the associations between provider workplace indices and patient outcomes. In contrast, in Table 15 the number of statistically significant associations between workplace indices and system outcomes is more numerous in 2009 than in 2010.

A two-part explanation may account for this observation. First, a little more than half the showcase units started implementing MOCINS initiative before the first (2009) evaluation survey (see Table 10); by the time of the 2010 evaluation survey, all showcase units of course had been implementing such initiatives for some time. Thus, in effect, the 2009 analyses benefited from a quasi-experimental design effect that the 2010 analyses did not. In other words, due to the varied implementation start times for the showcase units relative to the 2009 evaluation survey times there was more systematic variability among the showcase units in 2009 than in 2010. This means that evidence for associations between MOCINS initiatives and

²⁶ Number of Resource Intensity Weighted patient days of care per FTE

better system outcomes can be gleaned from the 2009 data as much or more than from the 2010 data.

A second reason for seeing more statistically significant associations in 2009 than in the 2010 data is that while the systematic variation in 2010 among showcase units is reduced relative to 2009 for the above stated reason, the random variability in these outcomes would likely remain the same in 2009 and 2010. In other words, the natural random variation is relatively more pronounced in 2010 compared to 2009. With the provider outcomes, which were based on survey sample sizes of about 250 in both 2009 and 2010, and the patient outcomes (n=300 in both) there was enough statistical power to discern associations among the natural random variation even in 2010. But for the system outcomes (e.g., staff productivity or turnover), which have one value for each showcase unit, the effective sample size in both 2009 and 2010 was only about 11, the number of showcase units. With this small sample size it is difficult to discern the reduced true associations among the relatively more pronounced random variation in 2010.

Summary of Quantitative Findings

The general approach to the analyses of quantitative data was to identify changes from 2009 to 2010 in provider, patient and system outcomes, and to determine if there were associations between engagement in MOCINS initiatives and higher levels of these outcomes. Provider outcomes were the providers' assessments of MOCINS-related workplace indices, and were the direct outcomes of the MOCINS initiatives. They include care coordination by RNs, enhanced roles for LPNs and assistive personnel, role clarification, team development, improved processes such discharge planning, and evidence-based care planning that involves the patient and family. In turn, these provider workplace indices were expected to enhance patient and system outcomes.

Between 2009, the year most showcase units implemented the new model of care, and 2010 there were statistically significant increases in provider outcomes: the care coordination index increased 6.8%, the assessed value of assistive personnel increased 4.3%, team climate increased 4.9%, and the discharge planning index increase by 7.2%. In addition, self-reported overtime went down 42% and job satisfaction increased 5.8%.

Among those providers who responded to both the 2009 and 2010 surveys, the greatest increases in care planning, care coordination, role clarity, discharge planning and job satisfaction were documented in those who attended MOCINS-related professional development activities in the interim. Indeed those providers who attended professional development opportunities related to role optimization showed the greatest decrease in their role conflict index.

All measured patient-reported outcomes improved between 2009 and 2010. Every one of the 15 hospital experience dimensions of the Picker instrument (e.g., satisfaction, always treated with respect; care providers functioned as team, patient more involved in decisions) shifted positively between 2.0 and 8.0 percentage points. Self-reported visits to the Emergency Department went down 4.5 percentage points; self-reported readmissions went down 1.8 percentage points; and self-reported health status within four months after discharge increased 5.4 percentage points. None of these changes was statistically significant, but the consistency suggests they are highly unlikely to be due to chance. The self-reported length of stay in the hospital did go down statistically significantly ($p = 0.04$) from a mean of 18.6 days in 2009 to a mean of 13.4 days in 2010. The self-reported length of stay in the showcase unit also went down about four days between 2009 and 2010, but this difference was not quite at the conventional level of statistical significance ($p = 0.08$).

Those showcase units with higher average team climate, care planning and role clarity indices, as reported by their providers, also had the shortest lengths of stay in the unit and the hospital, as reported by their patients. In addition, those units with the highest care planning index (meaning they do more evidenced-based planning and involve the patient/family more) had patients that reported better health status within four months from discharge. These associations, which were highly statistically significant, suggest that the patient outcome changes between 2009 and 2010 noted above may be attributable to the MOCINS initiatives.

Similar observations were made with system outcomes. Those showcase units with higher mean scores on care coordination, team climate, care planning and discharge planning had higher LPN productivity, fewer shifts missed by RNs and LPNs due to injury, and fewer occupational health and safety incidents. Those showcase units with higher mean scores on assistive personnel, team climate, care planning, discharge planning and role clarity indices had fewer repeat admissions, fewer infections per patient, and fewer medical errors per patient. Those with higher care planning and discharge planning indices had fewer patient deaths per acuity-adjusted patient days of care.

The consistency of the associations between MOCINS initiatives and fewer repeat admissions, fewer infections, fewer medical errors and fewer patient deaths all suggest that the MOCINS initiatives are associated with better quality of patient care. Taken together, the results of these analyses provide strong evidence that outcomes for patients, providers and the system have improved during MOCINS implementation, and strong evidence that these improvements are due, at least partially, to MOCINS.

Focus Group Themes

Focus groups were conducted in August and September of 2009 and June and July of 2010. At both times there were 11 focus groups covering the 14 showcase units (several units were combined since they were in the same facility). Each was attended by approximately 5-15 healthcare providers who worked on the showcase unit. Additional focus groups were held with the Vice-Presidents of Patient Care from each DHA and the IWK in 2009 and 2010. The facilitators directed the discussions around four broad areas: successes, challenges, transferability and sustainability. The discussions were audio recorded, transcribed and analyzed according to these four themes. A summary of the themes that emerged from these discussions, including pre-existing challenges, team-based patient care, communication, role optimization, leadership, and stakeholder engagement, is provided here—readers will note that there is often overlap between themes.

Pre-existing Challenges

Implementation of the Collaborative Care Model has been hindered by a number of pre-existing challenges to the health care system in Nova Scotia. The most significant of these cited by focus group participant was **staff shortages**. Although MOCINS is designed, in part, to help alleviate staff shortages by making more effective use of existing resources participants have indicated that pre-existing shortages are too large for their effects to be entirely counter-acted by the Collaborative Care Model. Further, staff reported that shortages have limited their ability to participate in the professional development and education activities included in MOCINS, to optimize provider roles, and to provide effective team-based patient care, particularly on nights and weekends when allied health care professions are not available. Several units reported that ongoing staff shortages have had a negative impact on patient care. For example, several units reported that patients are often hesitant and/or apologetic when asking staff members for assistance because they seem so overworked. Staff on one unit reported that elderly patients waiting to get into long-term facilities are not being provided with adequate leisure activities, which would ultimately improve their sleeping habits and recuperation time if made available. Some units have reported that staff often feel compelled to work outside of their scope of practice in order to cope with the shortages, while others units have had to hire temporary staff to allow regular staff to take any time off. Several units noted that while there are mechanisms for replacing nursing staff who are sick or on leave, no such mechanisms exist for allied health professions.

There are indications that MOCINS is helping to offset the impacts of these staff shortages. Most units reported that participation in MOCINS has improved patient care and working conditions for staff. One unit attempted to address shortages by reallocating existing funds

associated with vacant RN posts that had not been possible to fill for some time to hiring members of other professions such as physiotherapy and pharmacy. Providers on that unit report that while this has significantly improved patient care and working conditions for staff, more staff are required to ensure continuity of care on nights, weekends, and allow for sick and vacation leave for staff.

Another challenge to the implementation of the Collaborative Care Model has been **physician engagement**. Although several units reported receiving full support and participation from physicians in implementing collaborative patient care, for most units the lack of engagement from physicians significantly detracted from the success of the Initiative. It should be noted, however, that these units indicated that physician relations have been a long-standing issue, independent of MOCINS. In these cases the structure of physician involvement in hospital care was not viewed as being patient-centered. Suggestions for improving physician engagement included continued financial incentives for collaborative practice but also other evidence-informed incentives on an on-going basis.

A **lack of communication** from one particular district was identified by several units as a long-standing challenge to patient care in general that has also impacted MOCINS. These units reported that while this district requires extensive documentation on patients before accepting them for treatment, no similar documentation about their time in the district is shared when the patients are transferred back to other districts. This requires staff to spend hours or days trying to connect with district staff to find out why medications were changed, what treatments occurred and so on. This district was referred to as ‘an information black hole’. Additional challenges related to communication are described under a separate theme.

Team-based Patient Care

The vast majority of focus group participants reported that, through MOCINS, they have developed a better understanding of the roles and scopes of the various professions on the care team and how to practice in collaboration with team members from these professions. The introduction of assistive personnel has been well received on most showcase units. Several units reported that assistive personnel have allowed nurses to spend more time with patients and do more thorough assessments and decreased the need for patient sitters; one unit reported not being able to remember how they managed without them. Collaborative care has allowed some staff members to do extra tasks on top of their basic duties, making them feel better about the quality of their work and happier in the workplace. Further, units have been receiving positive feedback from families on the assistive personnel. Most participants also reported feeling that their participation in MOCINS has resulted in improved patient care on their units, has produced a more positive work environment and helped to reduce staff absenteeism. Some units even reported seeing other units, which were not involved in

MOCINS, beginning to make changes to promote collaborative care after learning about what was happening on the showcase units. One focus group participant echoed her support for the spread of the project by saying “I don’t see how we can’t do this.” Other units described the need for MOCINS to expand beyond acute care, for example to the home or continuing care sectors, so that its benefits could be fully realized.

Although most units perceived the Collaborative Care Model as a worthwhile undertaking, staff on one showcase unit viewed it purely as an excuse to cut budgets at the expense of patient care. Focus group participants from this unit perceived MOCINS simply as a means of cutting regulated nursing positions and bringing in non-regulated personnel instead, which did not make sense to staff given the perceived acuity and complexity of the unit’s patient load. This change—and thus the entire initiative—is therefore viewed by this unit’s staff as having a strongly negative impact on both patient care and working conditions for staff of this unit. Participants indicated that as a result of this change this unit, which had previously been regarded as perhaps the best in the district, was now an undesirable place to work and that staff were considering leaving to work in ‘calmer places like the ER.’

Communication

Although some units reported few issues with MOCINS and most reported that their participation in it had improved communication between staff on the units, most also indicated that there was at least some misunderstanding of what the Initiative was all about, within and beyond the unit. For example, some expressed that they learned about their own professional scopes of practice, but were not provided enough information about the project itself. Others talked about a constant fear of job loss because they were not sure what types of changes the project would involve; as noted above there is a perception among a small minority of staff that MOCINS is simply an excuse to cut RN positions. Most units suggested that, for the project to transfer effectively between units, more advance (i.e. before implementation) consultation and feedback from units would be very helpful. Finally, a number of units reported that staff—both within and outside the showcase units—are blaming problems on MOCINS that have nothing to do with 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.

Also related to communication, several units expressed a desire for more opportunities to dialog with the other showcase units to discuss shared challenges and lessons learned. There was a sense from some staff that had the units been able to discuss these things with each other on a regular basis, much frustration and ‘re-inventing the wheel’ could have been avoided.

Role Optimization

Most units reported making good progress in optimizing provider roles as part of MOCINS, and that the various professional development activities the Initiative included were very helpful. For example, most units reported that LPNs have been working to a fuller scope of practice, particularly when RNs are short. One unit noted the importance of LPNs in caring for stable patients as well as those awaiting long-term care placements. However, several units reported reluctance of some nurses to ‘give up’ certain tasks, and that even when some are distributed more optimally (e.g. allowing LPNs to administer medications), the RN’s time is quickly taken up by other urgent activities.

While most units reported that MOCINS has helped to optimize staff roles, they also indicated that this has largely been limited to nursing professions. Several units reported feeling like full implementation of the Collaborative Care Model would require guidance and support in optimizing the roles of non-nursing professions as well. Several of these units also cited shortages of staff as negating role optimization efforts. Staff at one facility, for instance, noted that having a single physiotherapist and no assistants for the site means that there is little room for the physiotherapist’s role to be optimized there.

Although most units reported that collaboration among staff has been increasing under the Collaborative Care Model, one unit felt that there is still far more work to be done as the focus of the collaboration is still working toward making work life better for staff and is not yet fully geared toward improving patient care. This unit reported that while many staff would like to collaborate, units are so busy that there is often no time to learn to do so effectively; staff are reluctant to ask for help from other team members for fear of bothering them.

Optimizing scopes of practice and clarifying roles for different professions is seen as a very valuable undertaking; however for most units this is only useful during weekdays as weeknights and weekends usually mean that only nursing staff are available. The same is true when allied health staff have sick time or vacation—while in nursing there is some mechanism to maintain the continuum of care, this is not usually so for allied health. In this same vein, there is some sense that the collaborative care model is something of a ‘tease’ given current fiscal restraints—staff see ‘how good things can be’ during weekday hours when all team members are present, but then every night ‘that gets taken away, but the patients still need care’. Some suggested that a plan be built into the next showcase units that would outline mechanisms for the replacement of all inter-professional team members in order to keep teamwork in place consistently.

Leadership

The importance of leadership to the success of MOCINS was highlighted by a number of participants, and the units reported different perceived levels of leadership engagement in the Initiative. Although some units reported benefiting from strong leadership presence, others felt that there is still a lack of support from management, partly because management staff themselves are so busy. Many would like to see a reduction in the span on control of managers in order to reduce their workload and allow them to better address challenges associated with patient care in general and the implementation of MOCINS specifically.

Several units reported that the expansion of MOCINS has created competing priorities for a limited number of unit managers and DHA/IWK leads. It has been a huge time commitment to be present on multiple units, and also to help transfer lessons-learned about the project between units. Much training and professional development has been invested into managers and co-leads, making them essential in the implementation of the Collaborative Care Model on additional units. However, several units reported a perception that these individuals are being spread too thinly as they work on MOCINS in addition to their regular duties. They felt that a continued effort was needed to find tools and mechanisms to spread the knowledge and skills of co-leads and support managers of upcoming units in order to build capacity as the project roles out further. One unit reported being aware of several other units that would like to get involved with the project, but have no one to help them move forward.

Staff on one showcase unit noted that MOCINS “will not make a dysfunctional unit functional, but it can make a good unit better.” Irrespective of MOCINS, a number of participants reported that leadership presence is highly valued, and there is a sense that it will continue to be important as units continue to evolve and change continuously, with new procedures and patient populations.

Stakeholder Engagement

According to the focus group participants, the impact of unions on MOCINS varied considerably across the showcase units. While some reported that unions have been supportive of MOCINS and frequent dialogue with unions related to MOCINS implementation has helped to keep unions updated about the project and its expansion, others indicated a sense that more effort should have been put into the partnerships with unions earlier on in the project. For example, as noted above, there remains sensitivity and tension around RN positions, which has been attributed by some to an initial lack of union engagement in MOCINS.

One of the units felt that project partners (e.g. government, unions, employers, academic

partners, and researchers) are generally not committed to and in support of the project. This unit felt like their voices were not being heard due to this lack of commitment. Others noted the importance of support from the Department of Health in moving the project forward. There are fears that politicians will become involved in the project and that cuts will be made in order to fulfill other provincial commitments.

Summary of Qualitative Findings

In general, the Model of Care Initiative continues to be viewed by most front line providers as a valuable undertaking; indeed, it is viewed by many as 'the way we have to go'. Over the evaluation period, most of the showcase units have continued to make progress in implementing the collaborative care model, and staff continue to believe it has helped to increase understanding among staff of the respective roles and scopes of practice of the different health professions on the team, and helped to improve communication between staff members and with patients and families. These, in turn, have helped to continue improve working conditions and patient care as staff report knowing the patients and each other better as a result of MOCINS.

Health care providers and other team members seeking to implement MOCINS have faced a number of challenges, the most significant of which have not been related to MOCINS itself. These have included issues such as shortages of staff, equipment and supplies, difficulty engaging physicians, and communication with other districts, which 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, strikes, 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 within and outside the showcase units have been blaming problems on MOCINS that have nothing to do with 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.

The main concern of the providers remains that the commitment they have made to making the Initiative work be demonstrated by DHA and provincial leadership in continuing to move the MOCINS forward. Among the issues that the evaluation of MOCINS has brought to light, a number of units reported not having sufficient resources to meet the needs of their patients; while MOCINS is helping, it will not, on its own, solve all the problems currently facing the health care system.

SIMULATION MODELING RESULTS

The acute care supply of and requirements for RNs, hospitalists and family physicians providing hospital care, and physiotherapists were estimated based on the data described above. Results indicate that there were shortages of each of these professions in Nova Scotia in 2008. **It is important to note that these baseline estimates were based on current practice patterns.**

While there were approximately 4420 FTE RNs providing acute care in Nova Scotia in 2008, results suggest Nova Scotians actually required the services of about 4570 FTE RNs in acute care. Thus as of 2008 there was a shortage of approximately 150 FTE acute care RNs in Nova Scotia. There were approximately 150 FTE hospitalists and family physicians providing hospital care in Nova Scotia in 2008; however approximately 155 were needed. Therefore there was a shortage of approximately five FTE hospitalists or family physicians providing hospital care as of 2008. Nova Scotians required the acute care services of approximately 137 FTE physiotherapists in 2008. That year, however, there were only about 132 FTE physiotherapists providing acute care services in the province. The shortage of acute care physiotherapists in Nova Scotia, then, was about five FTEs as of 2008. If all model parameters remain unchanged—that is, if the ‘status quo’ continues—these shortages will increase over the next 15 years to approximately 2600 FTE RNs, 25 FTE hospitalists or family physicians providing hospital care, and 40 FTE physiotherapists.

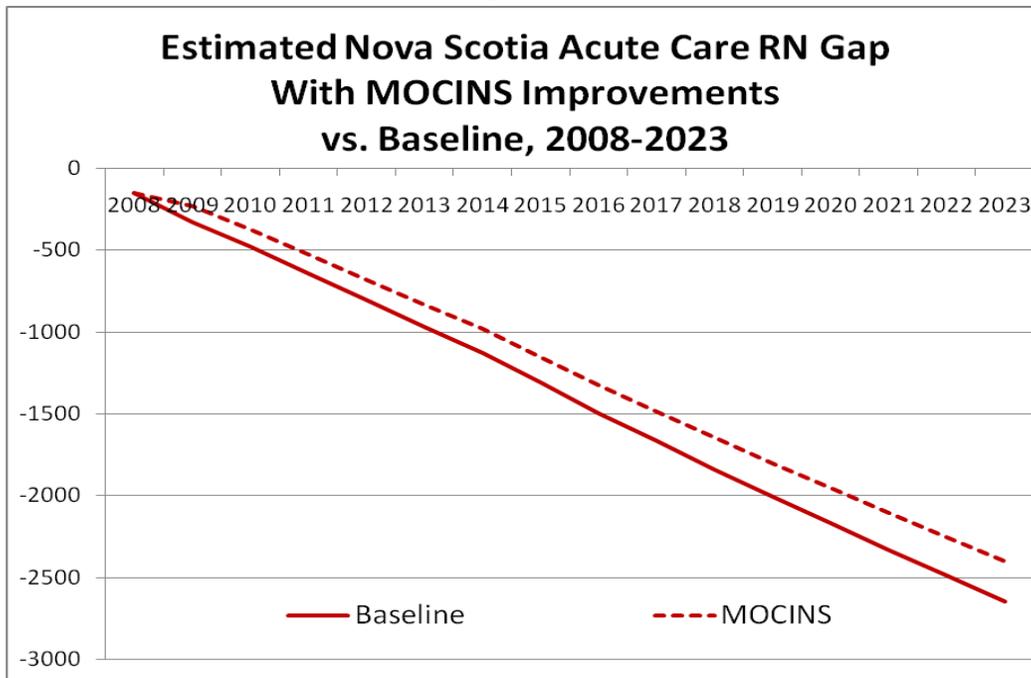
The outcome mapping results of the evaluation provide the basis for some potential policy scenarios that may influence the estimated future supply of and requirements for each of these professions in acute care. The results indicate that MOCINS showcase units have been able to substantially reduce the amount of resources required once patients arrive at hospitals as measured by the number of Resource Intensity-Weighted patient days of care, lengths of stay, repeat admissions and emergency room visits. These improved system outcomes have coincided with improvements in patient satisfactions and safety outcomes such as reduced medical errors and deaths, as well as improvements in outcomes for providers such as job satisfaction, reduced overtime and reduced Occupational Health and Safety incidents. Productivity of some provider groups have been impacted as well—productivity²⁷ of RNs has decreased on units where care planning has been enhanced (though it is expected that in the longer term care planning will lead to increased productivity of RNs), while that of LPNs has increased.

Using the simulation model, a scenario has been run to demonstrate some of these effects on provincial HHR gaps for each of the three professions above. Put another way, the models

²⁷ Number of resource intensity weighted patient days of care per FTE

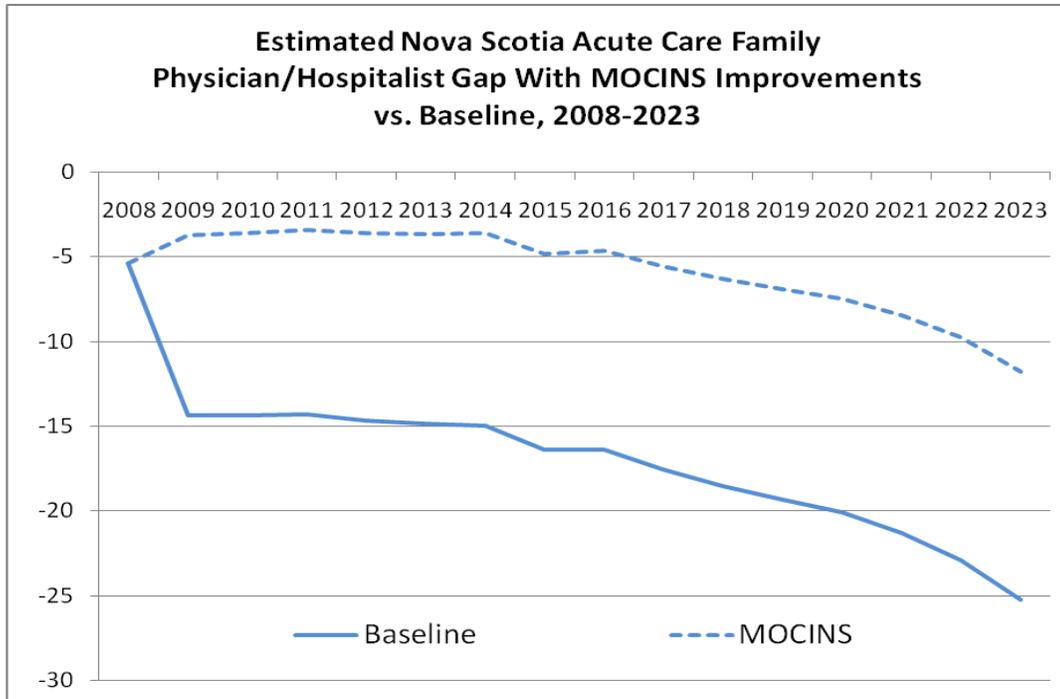
make it possible to estimate what would happen to provincial HHR gaps if the outcomes associated with MOCINS were achieved at every unit in every hospital across the province. For each profession, the levels of acute care services required have been reduced according to the reductions in resource intensity-weighted patient days of care measured by the outcome mapping portion of the evaluation, activity levels have been reduced according to the reductions in overtime use, and productivity has been adjusted according to the changes in it measured above. The results of these scenarios are shown in Figures 12-14.

Figure 12



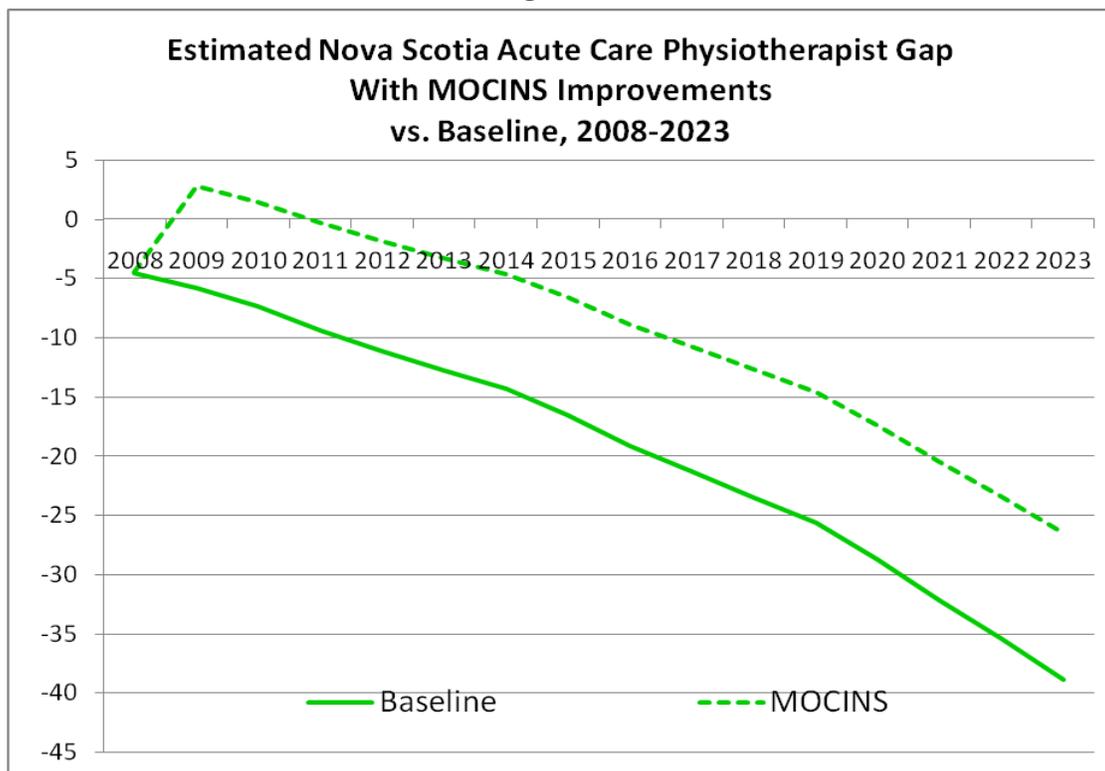
The combined effects of the changes to levels of service, activity rates and productivity are to reduce the provincial shortage of RNs by approximately 250 FTEs over 15 years.

Figure 13



The combined effects of the changes simulated is a reduction of approximately 50% in the shortage of hospitalists and family physicians providing hospital care over a 15-year period, from about 25 FTEs to 12 FTEs.

Figure 14



The combined effects of the above changes on the physiotherapist shortage was a reduction of approximately 38% from about 40 FTEs to 25 FTEs over 15 years.

The scenarios above are examples of how the impacts of MOCINS on provincial HHR shortages can be estimated using simulation modeling tools. As the variety and quality of health system and outcome data collected in Nova Scotia expand, more impacts of initiatives such as MOCINS can be measured and their impacts on shortages estimated in the same way.

DISCUSSION

As noted earlier, the main objective of the MOCINS is to build a Collaborative Care Model that recognizes that care will be transformed through committed providers (*people*), working collectively as a team through clear and well understood *processes*, by ensuring access to necessary *information* to support care delivery, research and academic mandates, and utilizing *technology* to provide timely and safe care. The evaluation of MOCINS is designed to determine to what degree this objective is achieved and how taking this approach changes patient, provider and system outcomes.

This report examined the relationships between the initiative's implementation and the outcomes at each showcase unit. The results detailed in this report include the perspectives of the people most directly impacted by MOCINS—the patients, families, health care providers, and administrators involved in the initiative—and there is congruence between the messages reported from these key stakeholders both quantitatively and qualitatively. For example, a number of focus group respondents described feeling more satisfied with their jobs, which is consistent with the findings of the analysis of the provider questionnaire. In addition, this report included results of analysis of administrative data for the showcase units that are consistent with the messages derived from the focus groups and surveys.

MOCINS is making a difference for patients and their families, health care providers, and the health system. The evaluation of MOCINS indicates that on units where care is more coordinated, the team climate is more positive and providers' various roles are clear, there are better outcomes. Such outcomes include shorter lengths of stay in the hospital and fewer repeat admissions for patients as well as fewer shifts missed due to injury and higher job satisfaction among providers. At the same time provider job satisfaction also improved. Further, investments made through MOCINS in supporting team-delivered care models that involve the patient and family in care planning are associated with fewer medical errors, fewer patient deaths per acuity-adjusted hospital cases, and better health status reported by patients within four months of discharge. Some of these effects mean potentially significant savings to Nova Scotia's health care system. Further, results of simulation modeling suggest that initiatives such as MOCINS have the potential to substantially reduce provincial HHR shortages.

These results demonstrate that the MOCINS vision of health care teams with providers collaborating to deliver patient-centered, high quality and safe health care is being realized. The center-piece of the MOCINS schematic (Figure 1) is the patient and his or her family. As has been mentioned, those showcase units with a higher care planning index in this study - meaning they involved the patient and the family in care planning more than other units - had patients with shorter lengths of stay in the hospital, fewer repeat admissions and better self-

reported health status within four months of discharge. Further, the model was intended to improve the patients' hospital experience. Indeed, all 15 measures of patient experience (e.g., satisfaction, told about medication side effects, given information that was clear, treated with respect) showed improvement over the course of the study.

Many objectives of the model depicted in Figure 1 have been addressed by this evaluation and shown to be achieved. Examples are provided here. The change lever entitled "People" in Figure 1 indicates that a goal of the model was to have a coordinator plan and monitor care. Accordingly, the care coordination index assessed in this evaluation increased 6.8% ($p=0.017$) during the implementation period. Increased value for support areas was another objective, and the significantly increased assistive personnel index reflects this achievement. Under the "Process" change lever both of the team climate and discharge planning indices increased significantly, demonstrating success on these fronts.

One of the four supporting pillars in Figure 1 is "ongoing staff development and mentorship". The evaluation documented associations between involvement in professional development for team effectiveness or role optimization and higher indices on care coordination, assistive personnel, team climate and role clarity. Another pillar is "committed and supportive leadership". In both 2009 and 2010 the majority of unit managers felt that their unit received adequate support/endorsement from the Department of Health and the District Health Authority. This was not the majority's perception of their institution in 2009, but in 2010 76.9%—more than three quarters—of showcase unit managers felt supported by their institutional leadership.

Some more specific potential areas for investment are also suggested by the evaluation results. For example, nearly half of the showcase unit patients sampled reported not being sufficiently involved in decisions about their care. Considering the central role that patients and their families play in care planning, and the results described above demonstrating the association of care planning with improved patient and system outcomes, an increased focus on involving patients and their families in care planning could result in significant benefits in terms of patient and system outcomes.

In addition, this report highlights the association between the clarity of role definitions for showcase unit staff and outcomes for patients and providers—that is, units where staff roles were more clearly defined and less complex tended to have patients who had shorter lengths of stay and fewer repeat admissions as well as fewer shifts missed by RNs. Given that other studies (e.g. O'Brien Pallas et al., 2005) have found that increased role clarity is also associated with increased staff satisfaction and reduced staff turnover, the potential value of investment in ensuring staff roles are well-defined and simple is evident.

Readers should bear in mind that the results described in this report are specific to the fourteen showcase units currently implementing MOCINS. The purpose of this analysis is not to generalize these findings to the entire health care system, although the focus groups conducted with key stakeholders specifically addressed the transferability of collaborative care models to other units and facilities. Further implementation of such models should be evaluated for its effectiveness.

The evaluation was limited by the lack of availability of some administrative data to measure patient, provider and system outcomes that may have been affected by MOCINS. These limitations challenged both the outcome mapping and simulation modeling. Sustained, intensive efforts by managers of the showcase units yielded improved data collection in 2010 compared to 2009, but several important gaps in the desired evaluation data remained. It was clear from the work of the managers that much of the administrative data collected by hospitals in Nova Scotia is not easily accessible to those who may want to use it to inform health care planning, and that the information that is available is not easily integrated across the multiple stewards of it. A critical challenge seemed to be that much of the administrative data that is collected cannot be disaggregated to the hospital unit level, which limits the usefulness of this data for planning at the unit level. In the context of a knowledge based economy, there is much to be gained in building knowledge networks and producing the kind of data essential to transforming or changing health systems. Data, evidence and research is a source of power but it requires institutional and coalition support also. While evidence-based decision making is designed to highlight empirical evidence, without essential data, most decisions will remain political.

It is important to note that the positive evaluation results also highlight concerns among providers about the sustainability of MOCINS, most notably that the positive beginnings of MOCINS will lose momentum and not be sustainable without continued commitment from DHA and IWK leadership as well as the Department of Health. If the initial successes of MOCINS are to be maintained and built upon, continued support from the DHAs, IWK and the Department of Health is essential. The sustainability of any new program or idea requires finding ways to build essential coalitions between the key stakeholders required for setting agendas, defining problems and implementing solutions. MOCIN provides valuable lessons related to building such coalitions that can be used to share experiences and knowledge in a way that is very beneficial for social cohesion and learning.

MOCINS is an important part of the provincial strategy to improve health care delivery in Nova Scotia, and the results of the evaluation indicate that it is working. However, there are other challenges facing the health care system in Nova Scotia—such as shortages of equipment—that MOCINS cannot solve on its own, and these challenges continue to impact MOCINS

implementation.

RECOMMENDATIONS

Based on the results of this evaluation, the research team recommends that the Department of Health continue its partnership with the District Health Authorities and the IWK to support of the MOCINS in the following ways:

1. **Expand the implementation of the Collaborative Care Model to other units and sectors as a vehicle to increase and establish coordinated team delivered care.** Coordinated team care models were shown to be associated with lower patient lengths of stay and fewer repeat admissions and medical errors as well as a more productive, satisfied health workforce. Each of these means potentially significant savings to Nova Scotia's health care system. Further, the importance of continued support and expansion of collaborative models of care has been emphasized by both administrators and front-line health care providers.
2. **Maintain the momentum that has been established to optimize the roles and utilization of health care providers through ongoing professional development activities.** Doing so can prevent showcase units from operating differently from others and promote transferability of team delivered care models within and across organizations and sectors. **Existing programs that include RNs, LPNs and assistive personnel should be broadened to include physicians and allied health professions.** Engagement of providers in professional development activities during MOCINS implementation was found to be associated with a variety of improved outcomes for providers, and focus group participants indicated that more work was required to optimize professional roles, particularly for members of allied health professions.
3. **Develop a broad, comprehensive communication strategy to develop an understanding of MOCINS—including the findings of this evaluation—within the Department of Health, the DHAs and IWK, the showcase units, patients and families, the general public, and other health care stakeholders such as regulatory colleges and unions.** The importance of effective communication to promote understanding of MOCINS is emphasized in the findings from focus groups with the showcase unit providers as well as administrators.
4. **Increase focus on care planning, including discharge planning, that makes patients and their families integral parts of the care that occurs on the showcase units and after discharge.** Results of the evaluation indicate that a large proportion of patients and families report not being sufficiently involved in patient care, but also that this type of involvement is associated with improved outcomes for patients, providers and the system overall.

5. **Ensure that unit managers and other leaders at the point of care are supported as they strive to manage and plan a patient focused health care system.** The importance of leadership to the success of MOCINS was highlighted at a number of focus groups. Leadership from unit managers, facility and DHA and IWK decision-makers and DoH were all cited as being integral to the success of MOCINS.
6. **Engage partners in education such as universities, colleges and the Department of Education in the process of preparing Nova Scotia’s health care providers to work in collaborative care settings.** The ability of providers to function effectively within the Collaborative Care Model will be enhanced by having interprofessional practice integrated into their pre-licensure education.
7. **Collaborate with the DHAs, IWK, and other partners such as researchers as necessary to ensure that there is ongoing monitoring and evaluation of the health care system to maintain and improve patient care and workplace quality. Monitoring and evaluation must incorporate outcomes for patients and their families, providers, and the health system overall so as to allow for fully informed policy making that considers each of these perspectives as opposed to considering only a minimum set of indicators.** The bulk of the analyses provided in this report would not have been possible with a less rigorous, comprehensive approach to the evaluation that focused simply on, for example, administrative data, and would not have allowed a full understanding of the impact of MOCINS.
8. **Invest further in the health information systems available to support evidence-informed decision making in health care at all levels. This includes the collection of additional information as well as improving the accessibility and integration of existing systems.** The lack of availability and accessibility of some desired data, despite the best efforts of showcase unit managers and others, was a significant challenge to the evaluation process but also is a clear hindrance to those seeking to organize health care, particularly at the unit level.
9. **Facilitate further sharing of the knowledge and experience developed by showcase units in the implementation of MOCINS so that front line staff as well as managers, policy makers, educators and researchers can continue to learn from each other how they successfully implement collaborative care models under various settings and conditions, including acute, continuing and primary care settings across the province.** Focus group participants indicated that such opportunities would allow for more efficient implementation of MOCINS and avoid the need to ‘reinvent the wheel’ on some units seeking solutions to common challenges, both related and unrelated to MOCINS.

10. **Ensure that HHR planning in Nova Scotia is conducted on a consistent, systematic basis with full consideration of the population’s health needs, the way in which services are provided, the way in which health care providers are educated and trained, and the conditions in which they work.** The findings of the simulation modeling component of the evaluation suggest that the optimization of provider roles incorporated in MOCINS is timely as past HHR policies in the province have resulted in HHR shortages, particularly for Registered Nurses. Further, if these policies remain unchanged, the results indicate these shortages will only increase in the future.

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APPENDIX A: REFERENCE LIST FOR INSTRUMENT DEVELOPMENT

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APPENDIX B: BRIEF

Seeking to optimize the utilization of the health care workforce, the Model of Care Initiative in Nova Scotia (MOCINS) is viewed as an essential building block in responding to the growing Health Human Resources (HHR) challenge being experienced worldwide and, ultimately, achieving a sustainable health care system. Data collected to evaluate MOCINS include the perspectives of the people most directly impacted by MOCINS—the patients, families, health care providers, and administrators involved in the initiative.

MOCINS is making a difference for patients and their families, health care providers, and the health system. Results indicate that over the course of the evaluation, care coordination, the appropriate use of assistive personnel, team climate and discharge planning all increased significantly. In addition, average lengths of stay and numbers of repeat admissions and emergency room visits by patients have decreased. On showcase units where care is more coordinated, the team climate is more positive and providers' various roles are clear, there are better outcomes. Such outcomes include shorter lengths of stay in the hospital and fewer repeat admissions for patients as well as fewer shifts missed due to injury and higher productivity among providers. At the same time provider job satisfaction also improved. Further, investments made through MOCINS in supporting team-delivered care models that involve the patient and family in care planning are associated with fewer medical errors, fewer patient deaths per acuity-adjusted hospital cases, and better health status reported by patients within four months of discharge. Some of these effects mean potentially significant savings to Nova Scotia's health care system. Further, results of simulation modeling suggest that initiatives such as MOCINS have the potential to substantially reduce provincial HHR shortages.

It is important to note that the evaluation also highlights concerns among providers about the sustainability of MOCINS, most notably that the positive beginnings of MOCINS will lose momentum and not be sustainable without continued commitment from District Health Authority and IWK leadership as well as the Department of Health. If the initial successes of MOCINS are to be maintained and built upon, continued support from the DHAs, IWK and the Department of Health is essential.

MOCINS is an important part of the provincial strategy to improve health care delivery in Nova Scotia, and the results of the evaluation indicate that it is working. However, there are other challenges facing the health care system in Nova Scotia—such as shortages of staff and equipment—that MOCINS is helping to address but cannot solve on its own, and these challenges continue to impact MOCINS implementation.

Based on the results of this evaluation, the research team recommends that the Department of Health continue its partnership with the District Health Authorities and the IWK to support of the MOCINS in the following ways:

- 1. Expand the implementation of the Collaborative Care Model to other units and sectors as a vehicle to increase and establish coordinated team delivered care.** Coordinated team care models were shown to be associated with lower patient lengths of stay and fewer repeat admissions and medical errors as well as a more productive, satisfied health workforce. Each of these means potentially significant savings to Nova Scotia's health care system. Further, the importance of continued support and expansion of collaborative models of care has been emphasized by both administrators and front-line health care providers.
- 2. Maintain the momentum that has been established to optimize the roles and utilization of health care providers through ongoing professional development activities.** Doing so can prevent showcase units from operating differently from others and promote transferability of team delivered care models within and across organizations and sectors. **Existing programs that include RNs, LPNs and assistive personnel should be broadened to include physicians and allied health professions.** Engagement of providers in professional development activities during MOCINS implementation was found to be associated with a variety of improved outcomes for providers, and focus group participants indicated that more work was required to optimize professional roles, particularly for members of allied health professions.
- 3. Develop a broad, comprehensive communication strategy to develop an understanding of MOCINS—including the findings of this evaluation—within the Department of Health, the DHAs and IWK, the showcase units, patients and families, the general public, and other health care stakeholders such as regulatory colleges and unions.** The importance of effective communication to promote understanding of MOCINS is emphasized in the findings from focus groups with the showcase unit providers as well as administrators.
- 4. Increase focus on care planning, including discharge planning, that makes patients and their families integral parts of the care that occurs on the showcase units and after discharge.** Results of the evaluation indicate that a large proportion of patients and families report not being sufficiently involved in patient care, but also that this type of involvement is associated with improved outcomes for patients, providers and the system overall.
- 5. Ensure that unit managers and other leaders at the point of care are supported as they strive to manage and plan a patient focused health care system.** The importance of leadership to the success of MOCINS was highlighted at a number of focus groups.

Leadership from unit managers, facility and DHA and IWK decision-makers and DoH were all cited as being integral to the success of MOCINS.

6. **Engage partners in education such as universities, colleges and the Department of Education in the process of preparing Nova Scotia's health care providers to work in collaborative care settings.** The ability of providers to function effectively within the Collaborative Care Model will be enhanced by having interprofessional practice integrated into their pre-licensure education.
7. **Collaborate with the DHAs, IWK, and other partners such as researchers as necessary to ensure that there is ongoing monitoring and evaluation of the health care system to maintain and improve patient care and workplace quality. Monitoring and evaluation must incorporate outcomes for patients and their families, providers, and the health system overall so as to allow for fully informed policy making that considers each of these perspectives as opposed to considering only a minimum set of indicators.** The bulk of the analyses provided in this report would not have been possible with a less rigorous, comprehensive approach to the evaluation that focused simply on, for example, administrative data, and would not have allowed a full understanding of the impact of MOCINS.
8. **Invest further in the health information systems available to support evidence-informed decision making in health care at all levels. This includes the collection of additional information as well as improving the accessibility and integration of existing systems.** The lack of availability and accessibility of some desired data, despite the best efforts of showcase unit managers and others, was a significant challenge to the evaluation process but also is a clear hindrance to those seeking to organize health care, particularly at the unit level.
9. **Facilitate further sharing of the knowledge and experience developed by showcase units in the implementation of MOCINS so that front line staff as well as managers, policy makers, educators and researchers can continue to learn from each other how they successfully implement collaborative care models under various settings and conditions, including acute, continuing and primary care settings across the province.** Focus group participants indicated that such opportunities would allow for more efficient implementation of MOCINS and avoid the need to 'reinvent the wheel' on some units seeking solutions to common challenges, both related and unrelated to MOCINS.
10. **Ensure that HHR planning in Nova Scotia is conducted on a consistent, systematic basis with full consideration of the population's health needs, the way in which services are provided, the way in which health care providers are educated and trained, and the**

conditions in which they work. The findings of the simulation modeling component of the evaluation suggest that the optimization of provider roles incorporated in MOCINS is timely as past HHR policies in the province have resulted in HHR shortages, particularly for Registered Nurses. Further, if these policies remain unchanged, the results indicate these shortages will only increase in the future.