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Better Care and Better Value for Canadians: A Review of RCT Studies of Nurse Interventions

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This review is focused on the effectiveness of nursing interventions for patient outcomes and health-care costs. It was guided by ecological and economic evaluation frameworks. Restricting the first-tier search of over 4,000 articles to randomized controlled trials (RCTs) yielded 203 studies and 9 additional trials that used identical methods of cost evaluation. Of 212 RCTs, 37 met the eligibility criteria. Of the 37 articles, 29 came from the literature search and 8 came from the first author's research unit, which used identical methods of economic evaluation. Of the first 29 studies, 26 found that nurse interventions were more or equally effective and less or equally costly compared to usual care, as was true of 7 of the 9 RCTs with comprehensive economic evaluations. It is effective and efficient to deploy specialty-trained nurses to lead teams of professionals, including physicians, assembled to address complex patient needs. A nurse-led model of proactive and supplemental care for the chronically ill, versus the on-demand, physician-led model now in place, would be more or equally effective and less or equally costly.

Keywords: nursing interventions, economics, chronic illness, outcome research, evidence-based practice

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Résumé

De meilleurs soins et une valeur accrue pour la population canadienne : revue d'essais cliniques randomisés sur les interventions infirmières

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La présente revue porte sur l'efficacité des interventions infirmières en ce qui concerne les résultats pour les patients et les coûts liés aux soins. Sa réalisation a été orientée par un cadre d'évaluation économique et écologique. Restreinte aux essais cliniques randomisés, la première étape de la recherche, effectuée à partir d'un bassin de plus de 4 000 articles, a permis de dégager du lot 203 études et 9 essais cliniques supplémentaires utilisant des méthodes identiques d'évaluation des coûts. Sur ces 212 études et essais, 37 répondaient aux critères d'admissibilité, et parmi ces 37 articles admissibles, 29 provenaient du dépouillement de la littérature et 8 de l'unité de recherche de la première auteure, qui utilise exactement les mêmes méthodes d'évaluation économique. Dans le groupe des 29 premières études, 26 constataient une efficacité des interventions infirmières égale ou supérieure aux soins réguliers pour un coût égal ou inférieur, constatation également présente dans 7 des 9 essais cliniques randomisés ayant fait l'objet d'une évaluation économique approfondie. Il est donc efficace et rentable de déployer du personnel infirmier spécialisé pour diriger des équipes de professionnels, y compris les médecins, mises sur pied pour donner des soins aux patients ayant des besoins complexes. Ainsi, pour les patients souffrant de maladies chroniques, un modèle de soins proactifs supplémentaires dirigé par du personnel infirmier serait, par rapport au modèle actuel de soins sur demande dirigé par des médecins, plus efficace ou également efficace, et ce, pour un coût égal ou inférieur.

Mots-clés : interventions infirmières, économie, maladie chronique, résultats pour les patients, revue, essais cliniques randomisés

Background

Since the signing of the 2004 Health Accord (Health Canada, 2004), a number of improvements in access to Canada's health-care system have been made, especially in hip and knee replacements and cataract surgery. However, a 2008 report on health-care renewal (Health Council of Canada, 2008) identified areas where progress was lagging: safe and appropriate prescribing of medication and compliance, home care, primary health care, the health-care workforce, electronic health records and information technology, and accountability. In preparation for the 2014 Health Accord, Denis, Davies, Ferlie, Fitzgerald, and McManus (2011) recommended the development of models of care that are more responsive to the aging population, the increased prevalence of complex co-morbid chronic diseases, growing inequities in the determinants of health, and the escalating costs that have accompanied technological advances and investments in acute care.

The purpose of this review is to document the comparative effects and costs of models of nursing interventions with a view to addressing the above concerns. Specifically, the review (1) provides evidence for the impact of nursing care across a range of outcome variables, including patient health outcomes (mortality and morbidity) and system impacts (costs of health care); (2) identifies promising nurse-led or nurse-involved service innovations; (3) identifies common characteristics of effective or efficient interventions; and (4) makes recommendations regarding key clinical programs across the range of determinants of health, the health-care system, and policy implications for achieving better care for Canadians.

Complex interventions for complex chronic diseases involve a number of potential interacting factors, such as the nurse provider's level of preparation and whether the focus is on prevention, health promotion, or treatment. Provider characteristics further interact with the patient's transition between some combination of hospital, primary care, specialty clinics, and home care. The patient's co-morbid diseases, characteristics (e.g., age), and circumstances (e.g., living alone) also add complexity. As well, some models of nursing practice serve a "substitution for the physician" function while others "supplement the care provided by physicians."

Secondly, decision-makers want studies of effectiveness and efficiency, not simply reports of patient outcomes (effects) in isolation from resource consumption (costs). This separation of comparative effect and cost has characterized most nursing intervention research to date. Meta-analyses involve separating active components of an intervention and are appropriate only if the components work independently of each other — not

if they work interdependently or synergistically (Birch & Gafni, 1996). Thus, we chose to conduct a review in which the comparative effectiveness on patient and system outcomes is based on treatment goals.

The review was commissioned by the Canadian Health Services Research Foundation and funded by the Canadian Nurses Association.

Methods

We used an ecological framework, similar to that used for the determinants of health, which acknowledges the cumulative and multiple levels of dynamic, reciprocal influences on nursing practice and patient situations. These are (1) competencies and talents of nurses who provide care across the patient's lifespan and settings; (2) larger organizational issues, such as the culture, structure, and economic (reimbursement) policies and their effects on the nurse, nurse workload, scope of practice, development, interdisciplinary collaboration, and provider attitudes; (3) competing goals and practice reimbursement, or funding policies, within and between different ministries of the same and other provincial governments; (4) competencies, involvement, and talents of a range of intersectoral service providers with whom the nurse or the patient interacts; (5) cognitive, emotional, and behavioural competencies of the patient; (6) competencies and talents of personal supports from the patient's family; and (7) supportive nature and demands of the nurse's immediate family (Bronfenbrenner, 1979). A second framework guided the economic evaluation (Birch & Gafni, 1996), which plots effectiveness against costs, producing nine categories of study (Table 1).

Since health-service use has only recently been included in studies, and since a baccalaureate education has recently been made a requirement for entry to nursing practice, we searched the following databases for the years 2003 to 2011: United States Preventive Services Task Force–

Table 1 ***Economic Evaluation Frame***

Costs	Effectiveness		
	Increased	**Same**	**Reduced**
Increased	More effective More costly	Equally effective More costly	Less effective More costly
Same	More effective Equally costly	Equally effective Equally costly	Less effective Equally costly
Reduced	More effective Less costly	Equally effective Less costly	Less effective Less costly

Agency for Health Care Research Quality, Scottish Intercollegiate Guidelines Network, National Institute for Clinical Excellence, Health Evidence Network, Canadian Agency for Drugs and Technologies in Health, CINAHL, PubMed, www.bmj.com, ISI Web of Knowledge, Trip Database, www.health-evidence.ca, Medscape, and Health Economic Evaluations Database. We also searched the grey literature: Google, Google Scholar, and Advanced Google Scholar.

The search terms were as follows: Nursing interventions, Hospitalization rates, Emergency Use, Access to Care, Symptom Management, Hypertension Control, Diabetes Control, Costs, Economic Analyses, Functional Status, Activities of Daily Living, Use of Nursing Homes, Elderly, Caregivers, Cognitive functional states, Cardiovascular Health/Hypertension, Oncology, Diabetes, Nursing Specialists, Nurse Practitioner, Symptom Management, Pressure Ulcers, Wound Care, Neonatal Care, Depression, Psychosocial Functioning, Nurse Staffing Levels, Models of Care, Acute Care, Community Care, Patient Outcomes. Due to the volume of papers, we then restricted the retrieval to randomized controlled trials (RCTs); this minimized the bias of non-comparability of study subjects found in other comparative research designs.

Content eligibility was based on the following: interventions involving nurses with added specific training for the Index condition, or interventions involving nurses with disease-specific master's-level training, such as clinical nurse specialists (CNSs) and nurse practitioners (NPs), now called advanced practice nurses (APNs). This was a review of the international nursing literature. We accepted eligible studies that included registered nurses, acknowledging that scopes of nursing practice and educational preparation vary by jurisdiction, with none of the eligible literature recognizing these distinctions. We excluded studies of technological devices and economic evaluations if the methodology required assumptions about resource use or costs or provided estimates rather than measurement of actual resources used.

Regarding study quality, we included only studies that met at least 16 of 20 criteria appropriate for the assessment of random clinical trials from Williams and colleagues (2009) and Sidani and Sechrest (1999), which included issues such as "length of follow up," "effects on health and functional status," and "use of other health and social services." One author assessed the title and abstract initially to determine if the paper should be included in this review of studies, and then a second time 2 weeks later when summarizing the quality of selected papers using criteria outlined in Table 2.

These RCTs captured different dimensions of health-care use, such as emergency department visits, hospitalizations, length of stay, readmissions, and admissions to nursing homes, as well as various (or unknown)

Table 2 ***Characteristics of High-Quality Studies, Participants, and Intervention Programs***

Quality Criteria for Studies	
1. Study design 2. Treatment schedules compared (setting, content, intensity, duration) 3. Was there adequate concealment? 4. Was the client blinded? 5. Was a power calculation performed? 6. Number randomized/participants 7. Number included in analysis 8. Number withdrawn (giving reasons) 9. Was analysis on the basis of intention to treat? 10. Lists participants	11. Selection criteria described? 12. Inclusion criteria 13. Exclusion criteria (summary characteristics) 14. Age 15. % female 16. Health condition/other/outcomes measure 17. Were assessors blind to the assignment? 18. Length and timing of follow-up(s) 19. Lists health-service/social-service measures 20. Lists client measures/lists any other measures

methods of costing or determining health-service use. Further, because reports often lacked a description of costing methods, it was difficult to tell if costs for the provision of the novel model of care were included. To address these issues, a second-tier search retrieved all published RCTs from 1995 to 2011 that used the Health and Social Services Utilization Questionnaire (HSSU) (Browne, Arpin, Corey, Fitch, & Gafni, 1990). In this way, we could assess any biases that may have affected conclusions drawn from the first group of RCTs. Each of these economic evaluations was assessed for quality using the same instruments used for the previous group, as well as criteria for high-quality economic evaluations established by Drummond, Sculpher, Torrance, O'Brien, and Stoddart (2005). From these studies we determined which features of the nurse model were the most effective and equally or less costly.

The HSSU is a self-report instrument used in structured interviews capturing expenditures from a societal point of view. It includes not only the use of health-care resources, but also social resources, such as child welfare, police, and social work. In addition to these total direct costs from the payer's perspective, it includes total indirect costs for the patient's or carer's time lost from work while consuming care and cash transfer expenditures for being out of work or disabled. However, to be consistent with the other studies discussed in this report, only direct

costs for use of health resources from the payer's perspective were included in the analyses. In each evaluation, the health-care costs of the comparative interventions were included. This component of the HSSU consists of 30 items where the frequency of use of each type of health service (physician, nurse, emergency, hospital, laboratory services, physiotherapy, occupational therapists) during reliable spans of recall (2 weeks for ambulatory visits to 6 months for hospitalizations) is annualized and then multiplied by the dollar value of that service during that study year (Browne, Byrne, Roberts, Gafni, & Whittaker, 2001). It has been cited by Guerriere et al. (2006) as one of the few validated measures of ambulatory utilization.

The 29 RCTs from the first search are discussed separately below.

Results

In the initial search, over 4,000 studies were identified. Restricting studies to RCTs reduced the number to 203. Of these, 29 met 16 of the 20 eligibility criteria outlined in Table 2. The quality criteria for each of the 29 studies are available in Appendix D of the report *Better Care: An Analysis of Nursing and Healthcare System Outcomes* (Canadian Nurses Association, 2011). Appendix D of the report also provides the study authors, title, quality score, country, chronic conditions under scrutiny, study sites, sample size, mean age, percentage of the sample female, experimental model of nursing care, comparison group, and length of follow-up. The studies included persons with diabetes, undergoing endoscopy, cardiac surgery, asthma, wounds, medically stable in-patients, heart failure among ethnically diverse urban residents, Parkinson's disease in the community, stroke survivors, common mental health concerns in primary care, pneumonia in nursing home residents, hospitalization for heart failure, chronic obstructive pulmonary disease at home, children with eczema, rheumatoid arthritis, and risk of breast cancer.

Comparative outcomes for each study also differed as a function of the Index condition under investigation. There were various measures of outcome such as quality of life (SF-12), rate of falls, dyspepsia, decline in $HbA1_c$, Barthel Index of Function, time to wound closure, Zarit Burden Score, family impact, coronary events, and mortality. Also, each study had different measures of resource consumption; these included emergency visits, hospitalization rates, hospitalization days, unscheduled general practitioner visits, and costs in Canadian, American, or British currency. Statistical tests of difference between groups in each study were appropriate to means and standard deviation or percentage, making reports of effect sizes unsystematic. Thus, this article conceptually summarizes outcomes as more or less effective while being more or less expensive.

Table 3 ***Levels of Nurse Preparation by Care Setting and Level of Nurse Involvement in Models of Team Care Reported in 29 RCT Studies***

Training Level and Care Site	Studies of Physician-Led Nurse Involved with Team	Studies of Nurse-led Care with Team
Baccalaureate Nurse Training		
Hospital		Cuthbertson et al. (2009) Loeb et al. (2006)
Primary care		
Community/ home care		Hebert et al. (2008)
Disease-Specific Training Added to Baccalaureate		
Hospital/ specialty clinic		Dunagan et al. (2005) Chan et al. (2009) Scott et al. (2005) Williams et al. (2009) Ⓡ Torrance et al. (2006) Ⓡ
Primary care	Kalra et al. (2004) Vass et al. (2005)	Gary et al. (2009) Griffiths et al. (2004) Kendrick et al. (2006) Raftery et al. (2005) Latour et al. (2007)
Community/ home care	Brumley et al. (2007) Davison et al. (2005) Ricauda et al. (2008)	Harris & Shannon (2008) Hurwitz et al. (2005)
Master's-Prepared (APN, CNS, NP)		
Hospital		Harris, Richardson, et al. (2005) Ⓡ Higginson et al. (2009)
Specialty clinic		Schuttellaar et al. (2011) Ⓡ Tijhuis et al. (2003)
Primary care and community		Goodman et al. (2008) Naylor et al. (2004)
Community/ home care		Castro et al. (2004) Coleman et al. (2006) Dawes et al. (2007)

Ⓡ = nurse-led physician-replacement (or substitution) model
Ⓛ = supplemental nurse-led model

Table 3 shows the locations of the nursing interventions and the level of nurse preparation for specific conditions. Studies were classified by type of nurse preparation, site of intervention, and model and intensity of the nursing role with patients' conditions. Those studies followed by an "R" code were of nurse-led physician-replacement (or substitution) models, and those not followed by an "R" were of supplemental nursing care models. The majority of these high-quality studies were primarily of the supplemental nurse-led model of care (L) provided by nurses with different amounts of training.

The general characteristics of the nurse-led supplemental models of care were as follows: the assignment of a designated group of vulnerable patients, regular assessment and care initiated by the nurse (proactive), and comprehensive (supplemental) care of the other determinants of health that co-exist with the Index medical condition. The main characteristic of the nurse-involved physician-replacement models of care ("R") was that the nurse responds to patients' on-demand request for care. Those studies with both "L" and "R" codes characteristically had both types of nurse intervention.

The mean age of participants in the trials ranged from 1 to 85 years. None of the studies commented on the multicultural mix of patients. For conditions that affect both males and females, the proportion of females in the studies ranged from 19% to 70%. The length of follow-up post-surgery in the trials ranged from 3 months to 4 years. Twenty-four of the trials concerned nurse-led models of care, and four of these concerned models of nursing designed to substitute for (replace) general practitioner (GP) or specialist medical doctor (MD) functions in hospitals or specialty clinics. In nine of the studies of nurse-led models, care was provided by a master's-prepared nurse.

Of the 29 RCTs, 15 were conducted in the United Kingdom, 7 in the United States, 4 in the Netherlands or Denmark, 2 in Canada, and 1 in Italy. In addition, 15 of the 29 studies had large sample sizes.

Different yet comparable currencies were used in any given study. Across jurisdictions, the supplemental nursing model is comparatively less costly per patient than the substitution (replacement) model of nursing because in the supplemental model attention is paid to other risk circumstances and factors that lead to deteriorating health and more use of emergency or hospital resources.

In Table 4 we re-classify models of nursing interventions from the 29 high-quality studies based on the economic evaluation framework. Of the 29 studies, 14 had nurse models categorized as more effective than usual care, and 12 of these 14 studies were also less costly. We designated another two of the 14 studies as more effective and no more costly. Seven of the 29 studies were classified as equally effective and as having a

Table 4 *Economic Evaluation of RCTs of Nursing Interventions and Outcomes*

Costs or Use	Effects				
	Increased		Same		Reduced
Increased	**1**: Nurse model more effective/ more costly		**2:** Nurse model equally effective/ more costly	Cuthbertson et al. (2009) Ⓛ Kendrick et al. (2006) Ⓛ Latour et al. (2007) Ⓛ	**3:** Nurse model less effective/ more costly
Same	**4:** Nurse model more effective/ equally costly	Hurwitz et al. (2005) Ⓛ Vass et al. (2005)	**5:** Nurse model equally effective/ equally costly	Hebert et al. (2008) Ⓛ Harris, Richardson, et al. (2005) Ⓡ Ⓛ Schuttellaar et al. (2011) Ⓡ Ⓛ Torrance et al. (2006) Ⓡ Ⓛ Williams et al. (2009) Ⓡ Ⓛ	**6:** Nurse model less effective/ equally costly
Reduced	**7:** Nurse model more effective/ less costly	Chan et al. (2009) Ⓛ Coleman et al. (2006) Ⓛ Dawes et al. (2007) Ⓛ Gary et al. (2009) Ⓛ Goodman et al. (2008) Ⓛ Harris & Shannon (2008) Ⓛ Higginson et al. (2009) Ⓛ Kalra et al. (2004) Ⓛ Naylor et al. (2004) Ⓛ Raftery et al. (2005) Ⓛ Ricauda et al. (2008) Scott et al. (2005) Ⓛ	**8:** Nurse model equally effective/ less costly	Brumley et al. (2007) Castro et al. (2004) Ⓛ Davison et al. (2005) Dunagan et al. (2005) Ⓛ Griffiths et al. (2004) Ⓛ Loeb et al. (2006) Ⓛ Tijhuis et al. (2003) Ⓛ	**9:** Nurse model less effective/ less costly

Ⓡ = nurse-led physician-replacement (or substitution) model; Ⓛ = supplemental nurse-led model

nursing intervention that was less costly than usual care, while five of the 29 studies were classified as equally effective and equally costly compared with usual care. These studies of equally effective and equally costly types of nurse models were usually (four out of five) studies in which the nurse model was designed to replace the physician function.

We categorized the nursing model in only three of the 29 studies as equally effective but more costly than usual care. In the case of the study by Kendrick and colleagues (2006), which involved the study of serious mental illness in primary care, it was recommended that the more costly community mental health nurse team be used only when the GP's initial treatment failed. The study by Cuthbertson and colleagues (2009) added nurses to follow patients discharged from the intensive care unit (ICU) while still in hospital. We can conclude that existing hospital nursing was sufficient to manage patients discharged from the ICU. The study by Latour and colleagues (2007) demonstrated reduced use of institutionalization for patients who received more community support services.

Only four studies followed patients for longer than 1 year. This fact is important when considering the economic benefits of sustained nursing interventions (20 months to 2 years).

The three studies that followed patients from 20 to 24 months concluded that the nursing intervention was more effective than usual care. Two of these studies showed that the intervention was equally expensive (Hurwitz, Jarman, Cook, & Bajekal, 2005; Vass, Avlund, Lauridsen, & Hendriksen, 2005), whereas the third showed that it was less expensive (Raftery, Yao, Murchie, Campbell, & Ritchie, 2005).

Seven of the studies found the intervention with the nurse model to be equally effective and less expensive than usual care (e.g., Loeb et al., 2006).

The conclusions made about efficiency from these studies could be challenged for three reasons:

- Some of the studies provided only information on comparative hospital and emergency department resource use.
- Others provided information on the use of these same resources and total direct costs from the payer's perspective, but barely described the costing methods.
- Others simply reported direct costs and provided little information on costing methodology.

Because of these problems, in stage 2 of our review we undertook an assessment of our own economic evaluations to see if more detailed economic evaluations supported the conclusions drawn from stage 1.

Stage 2 of our review of nursing intervention focused on RCTs that involved economic evaluations from McMaster University's System-

Linked Research Unit on Health and Social Service Utilization (SLRU). We provide these because each study also met the criteria for high-quality economic evaluations established by Drummond and colleagues (2005). Each SLRU study examined expenditures from a total societal point of view and included the use of not only health-care resources but also social resources, such as child welfare, police, school, and social work. In addition to these total direct costs from the payer's perspective, the SLRU economic evaluations included total indirect costs for the patient's or carer's time lost from work while consuming care and cash transfer expenditures for being out of work or disabled. To be consistent with the other studies discussed in this article, we include only direct costs from the payer's perspective in Table 5. The Browne, Byrne, et al. (2001) study of nurse-led and other interventions also reports a reduction in cash transfers for social assistance within 1 year. In each of the SLRU economic evaluations, the Canadian costs of the comparative interventions were included.

All of the SLRU studies were comparative RCT studies conducted in the same southern Ontario region with the same available resources, policies governing use of services such as home care, and basic or specialized nurses. These studies examined costs for the use of all health and social personnel in both nursing and usual care, and they included the costs of the interventions. The studies illustrate that, typically, expenditures for interventions accumulate in one service sector in order to create savings in another service sector.

Table 5 summarizes the SLRU results to ascertain whether the SLRU conclusions support the conclusions of the 29 RCT studies from the point of view of costs or resources used. The details of these studies are included in Appendix E of the *Better Care* report (Canadian Nurses Association, 2012). The only study that found that the nursing intervention was more effective but more costly (Roberts et al., 1999) came to this conclusion based on a sub-analysis illustrating more effect and more cost for services appropriate for caregivers of people with dementia with poor problem-solving skills. It was concluded that the greater use of community-based services for this subgroup was appropriate. All the other SLRU studies supported the pattern of conclusions drawn from the 29 RCTs. The SLRU RCTs involved people with dysthymia in primary care, at risk for falls while receiving home care, surviving stroke on home care, attending hospital-based specialty clinics for chronic illnesses, or with cardiovascular risk factors in primary care.

No study from stage 1 or stage 2 showed that any nursing intervention was less effective at any cost level. This fact supports the safety of nurses' work.

Table 5 ***Formal Economic Evaluations of RCTs of Nursing Interventions Performed by McMaster University's SLRU Using Same Economic Evaluation Methodology***

Costs or Use	Effects			
	Increased		**Same**	**Reduced**
Increased	**1**: Nurse model more effective/ more costly	Roberts et al. (1999) Ⓛ	**2:** Nurse model equally effective/ more costly	**3:** Nurse model less effective/ more costly
Same	**4:** Nurse model more effective/ equally costly	Mills et al. (2010) Ⓛ Browne et al. (2002) Ⓛ Markle-Reid et al. (2011) Ⓛ Markle-Reid et al. (2010) Ⓛ	**5:** Nurse model equally effective/ equally costly	**6:** Nurse model less effective/ equally costly
Reduced	**7:** Nurse model more effective/ less costly	Harrison et al. (2002) Ⓛ Markle-Reid et al. (2006) Ⓛ Roberts et al. (1995) Ⓛ	**8:** Nurse model equally effective/ less costly	**9:** Nurse model less effective/ less costly

Ⓛ = supplemental nurse-led model

Discussion

The evidence suggests that leadership provided by baccalaureate- and master's-prepared APNs that supplement rather than replace physicians for a designated group of patients were the nursing intervention models that were most effective and less or equally costly.

We argue that problems arise when circumstances in the world change and conventional wisdom does not. The publicly funded Canadian health-care system has been driven principally by physician and hospital-based services providing acute and episodic care that is a poor match for the changing demographics of persons with chronic disease living longer. The health-care system consumes nearly one half of provincial government budgets.

In Ontario, which represents 37% of the Canadian population, an independent report (Ontario Association of Community Care Access Centres, 2010) estimates that millions of dollars could be saved in direct health-care costs within 1 year by (1) having nurses provide leading practices in home wound care, (2) reducing hospital readmission by 10% for those with chronic conditions, (3) providing 25% of palliative care in the home as opposed to in acute-care hospital settings, (4) providing community care for patients at a hospital-designated alternative level of care, and (5) providing proactive community care and patient self-management for those with congestive heart failure and other chronic conditions.

Recommendations

Analyses of 2005 health- and social-service expenditures by member countries of the Organization for Economic Co-operation and Development (Bradley, Elkins, Herrin, & Elbel, 2011) demonstrate that, after adjusting for Gross Domestic Product per capita, it is the ratio of social-service expenditures to health-service expenditures that is more closely associated with improved outcomes in key health indicators, not the amount spent on health services.

This review indicates that models of proactive, targeted, nurse-led care for people with chronic diseases or nurses in a team that supplements physician care and focuses on preventive patient self-management are either more effective and less costly or equally effective and less costly.

Additional key components of more effective and efficient models of care are community-based, nurse-led models of care with an interdisciplinary team including the primary care physician. This complex intervention requires baccalaureate-prepared nurses with special training in the Index condition or master's-prepared APNs who supplement

the care provided by physicians and other professionals. The proactive comprehensive, coordinated model of community care is patient-/family-centred and targeted at community-dwelling individuals with complex chronic conditions and social circumstances.

A nurse leader should be used to identify characteristics of the patient with chronic illness that signify a risk for deterioration and hospitalization, whether in primary care specialty clinics, home care, or nursing homes, or at the point of hospital or emergency department discharge. The assessment and ongoing monitoring should be proactive rather than reactive. The nurse leader would collaborate with homemakers, personal support workers, nursing home personnel, nursing assistants, hospital/emergency department staff, and caregivers in the development and implementation of a patient-centred plan of care, including end-of-life care. When the plan is formulated, the roles of team members would be clarified, along with types and schedules of monitoring, including the specifics of who would conduct the monitoring and reasons for the monitoring. In addition, clear lines of communication in the event of changing situations should be established by the nurse leader.

These recommended models of nursing for chronic illness align with the recommendations for Health Care Transformation (Canadian Medical Association, 2011), which are as follows: (1) The central role of all levels of government is to provide for and sustain the well-being of its citizens now and in the future. (2) The direction for government should be one of continued growth and expansion of health (illness) care or sustainability of the quality of life and the human service system that determines health. (3) Addressing the source of and reasons for excessive and growing health expenditure includes (a) providing nurse-led proactive comprehensive and preventive care for those with chronic illness, (b) financing care by reducing resources for acute hospital care, and (c) having physicians and nurse practitioners continue to provide acute and episodic care.

We recommend that the model be financed through home care by cost reductions generated from lower levels of provision of acute hospital care. After the current hospital caseload of patients awaiting alternative levels of care has been managed, hospital beds could be reduced to free up funds for this reallocation. It is estimated that with an annual average cost of a nurse of $130,000 (including benefits), 7,692 additional nurses could be funded nationally for every $1 billion averted from acute hospital use. Some savings could also be reallocated to increase funding for social resources for persons receiving social assistance and the working poor.

Conclusion

It is effective and efficient to deploy baccalaureate- and master's-prepared nurses to lead teams of professionals, including physicians, assembled to address complex patient needs. A nurse-led model of proactive and supplemental care for the chronically ill, as opposed to the on-demand, physician-led model now in place, is more or equally effective and less or equally costly.

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