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**Evidence Brief:
Strengthening Chronic Disease Management in Ontario**

19 October 2009

McMaster Health Forum

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KEY MESSAGES

What's the problem?

- The overarching problem is a lack of co-ordinated and proactive chronic disease management (CDM) in Ontario's healthcare system.
 - Chronic diseases are a significant and growing challenge in the province. For example, 33% of Ontarians had at least one chronic disease in 2005, and 12% had two or more.
 - Cost-effective programs, services, and drugs are not always getting to those living with chronic disease. For example, in 2007 only 40% of Canadians with chronic disease reported receiving reminders when they were due for preventive care or follow-up care for their condition. This proportion was lower than in any of six comparator countries.
 - A variety of gaps in existing delivery arrangements (e.g., a lack of self-management supports for patients and decision supports for healthcare teams), financial arrangements (e.g., a lack of financial incentives for rewarding co-ordinated and proactive CDM) and governance arrangements (e.g., a lack of consumer and citizen voice in healthcare practices) may contribute to the lack of co-ordinated and proactive CDM in the province. Little research evidence is available about the proportion of primary healthcare practices in Ontario that adhere to the six features of the best known CDM model – the Chronic Care Model.

What do we know (from systematic reviews) about three viable options to address the problem?

- Option 1 - Enhance support for patient self-management
 - Peer support interventions, personal health records, and financial incentives for CDM patients have some beneficial effects on patient outcomes; and electronic health records (which enable providers to support patient self-management) have yielded savings in some settings.
- Option 2 - Co-ordinate (at the provincial level) continuing professional development for healthcare providers that enables team-based, process-oriented, just-in-time learning
 - More active or face-to-face continuing professional development interventions produce short-term improvements in care processes; and more complex or multi-faceted continuing professional development interventions improve guideline implementation.
- Option 3 - Support co-ordinated and proactive CDM models in healthcare settings
 - Incorporating most or all of the Chronic Care Model may improve quality of care and outcomes for patients with various chronic diseases, and incorporating one or more elements of the Chronic Care Model may improve processes of care and clinical outcomes for patients with asthma, congestive heart failure, depression, and diabetes. However, the quality of both systematic reviews supporting these statements is low.

What implementation considerations need to be borne in mind?

- Little research evidence is available about implementation barriers and strategies.
- All three of the options require a greater role for professional groups, government, or others in order to create the conditions that support CDM in Ontario.

REPORT

Chronic disease management (CDM) is a systematic approach for co-ordinating healthcare interventions and communication at the individual, organizational, regional (sub-provincial), or provincial levels. It includes:

- supporting self-care for people with a chronic disease who are at low risk of complications and hospitalization;
- proactive disease management for people who need regular routine follow-up and are at high risk; and
- case management for people with complex needs who are high-intensity users of unplanned secondary care.(1)

The first of these three CDM elements emphasizes the role of self-management in CDM. Self-management programs aim to: 1) help patients with medical management, maintaining life roles, and managing negative emotions; 2) provide patients with the necessary knowledge, skills, and confidence to deal with disease-related problems; and 3) prepare patients to collaborate with healthcare professionals and the healthcare system.(2) The second CDM element emphasizes both the long time horizons involved in CDM and the importance of proactively offering all effective programs and services to individuals who might not now be seeking out particular forms of care. The final point addresses the possibility that some individuals living with two or more chronic diseases or facing particular medical or life challenges may require the involvement of someone in a co-ordinator role who can ensure that all of the pieces of their care fit together into a seamless whole.

Another way to think about CDM uses an organizing framework. The framework used to describe the Chronic Care Model combines the following six features:

- self-management support (i.e., empowering and preparing patients to manage their health and healthcare);
- decision support (i.e., promoting clinical care that is consistent with scientific evidence and patient preferences through, for example, embedding evidence-based guidelines, as well as related patient decision aids, into daily clinical practice and supporting their implementation through continuing professional development);

Box 1: Background to the evidence brief

This evidence brief mobilizes both global and local research evidence about a problem, three options for addressing the problem, and key implementation considerations. Whenever possible, the evidence brief summarizes research evidence drawn from systematic reviews of the research literature and occasionally from single research studies. A systematic review is a summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select, and appraise research studies and to synthesize data from the included studies. The evidence brief does not contain recommendations.

The preparation of the evidence brief involved five steps:

- 1) convening a Steering Committee comprised of representatives from the partner organization (CPD-O) and the McMaster Health Forum;
- 2) developing and refining the terms of reference for the evidence brief, particularly the framing of the problem and three viable options for addressing it, in consultation with the Steering Committee and a number of key informants and with the aid of several conceptual frameworks that organize thinking about ways to approach the issue;
- 3) identifying, selecting, appraising, and synthesizing relevant research evidence about the problem, options, and implementation considerations;
- 4) drafting the evidence brief in such a way as to present concisely and in accessible language the global and local research evidence; and
- 5) finalizing the evidence brief based on the input of several merit reviewers.

The three options for addressing the problem were not designed to be mutually exclusive. They could be pursued simultaneously or elements could be drawn from each option to create a new (fourth) option.

The evidence brief was prepared to inform a stakeholder dialogue at which research evidence is one of many considerations. Participants' views and experiences and the tacit knowledge they bring to the issues at hand are also important inputs to the dialogue. One goal of the stakeholder dialogue is to spark insights – insights that can only come about when all of those who will be involved in or affected by future decisions about the issue can work through it together. A second goal of the stakeholder dialogue is to generate action by those who participate in the dialogue and by those who review the dialogue summary and the video interviews with dialogue participants.

- delivery system design (i.e., organizing programs and services to assure the proactive, culturally sensitive delivery of effective, efficient clinical care and self-management support by healthcare teams);
- clinical information systems (i.e., organizing patient and population data to facilitate more efficient care through, for example, an electronic health record that provides reminders for providers and patients and monitors the performance of healthcare teams and the system in which they work);
- health system changes (i.e., creating a culture, organization, and mechanisms that promote safe, high quality care, which can include visibly supporting comprehensive system change that moves beyond “silos” for acute care, primary healthcare, public health, home care, and mental healthcare); and
- community resources (i.e., mobilizing community resources to meet the needs of patients even though these resources are not formally part of healthcare systems).^(3;4)

While not explicit in the definition or organizing framework cited above, preventing complications, recurrences, and other conditions from emerging is an important aspect of CDM. Although primary prevention of chronic diseases is an important public health concern that must be addressed at the population level, this evidence brief considers only practice-based approaches to prevention (e.g., cervical cancer screening).

It is also important to note that although CDM has been practiced by healthcare providers as part of routine care for decades, it has only been the focus of significant attention in health system planning and policy over the past few years, in large part due to the increased incidence and prevalence of chronic diseases. Despite the attention and some apparent (albeit isolated) success stories in Canada and in other countries, co-ordinated and proactive CDM is not in widespread use in Ontario’s healthcare system. This evidence brief reviews the research evidence about this problem, three options for addressing it, and key implementation considerations.

The key features of the policy and system context for this evidence brief are as follows:

- Ontario’s publicly funded health system is distinguished by a long standing private delivery / public payment agreement between government on the one hand and hospitals and physicians on the other;
- the agreement with physicians has historically meant that most healthcare is delivered by physicians working in private practice with first-dollar (i.e., no deductibles or cost sharing), public (typically fee-for-service) payment;

Box 2: Equity considerations

A problem may disproportionately affect some groups in society. The benefits, harms, and costs of options to address the problem may vary across groups. Implementation considerations may also vary across groups.

One way to identify groups warranting particular attention is to use “PROGRESS,” which is an acronym formed by the first letters of the following eight ways that can be used to describe groups[†]:

- place of residence (e.g., rural and remote populations);
- race/ethnicity/culture (e.g., First Nations and Inuit populations, immigrant populations, and linguistic minority populations);
- occupation or labour-market experiences more generally (e.g., those in “precarious work” arrangements);
- gender;
- religion;
- educational level (e.g., health literacy); and
- socio-economic status (e.g., economically disadvantaged populations); and social capital / social exclusion.

The evidence brief strives to address all Ontarians, but (where possible) it also gives particular attention to two groups:

- people living in rural and remote (northern) communities, and
- people of low socio-economic status.

Many other groups warrant serious consideration as well, and a similar approach could be adopted for any of them.

[†] The PROGRESS framework was developed by Tim Evans and Hilary Brown (Evans T, Brown H. Road traffic crashes: operationalizing equity in the context of health sector reform. *Injury Control and Safety Promotion* 2003;10(1-2): 11–12). It is being tested by the Cochrane Collaboration Health Equity Field as a means of evaluating the impact of interventions on health equity.

- other healthcare providers, such as nurses and psychologists, are typically not eligible to receive public fee-for-service payment for leading independent healthcare practices (or at least not on terms that make these practices viable on a large scale);
- similarly, for many Ontarians, prescription drugs are not eligible for public payment and, if they are eligible, it is not with the same type of first-dollar coverage provided for hospital-based and physician-provided care; and
- the private practice element of the agreement has typically meant that physicians have been wary of potential infringements on their professional and commercial autonomy (e.g., directives about the nature of the care they deliver or the way in which they organize and deliver that care).(5)

THE PROBLEM

CDM is a complex issue in any healthcare system. In Ontario, the issue can be understood at a number of levels: 1) the nature and burden of chronic diseases that the healthcare system must manage; 2) the cost-effective programs, services, and drugs that the healthcare system must provide to meet the needs of those living with chronic disease; 3) the health system arrangements that determine access to and use of cost-effective CDM programs, services, and drugs; and 4) the current degree of implementation of existing policies and clinical practice guidelines for CDM.

Chronic diseases are a big and growing challenge in Ontario

Many Ontarians, like their counterparts in other provinces, live with one or more chronic diseases, particularly as they age, and these chronic diseases constitute the leading causes of death in the country. According to Statistics Canada, in the country as a whole:

- 23% of adults in 2008 had diabetes, heart disease, stroke, and/or high blood pressure;(6)
- 2% of those aged 20-29 years in 2005 had two or more chronic diseases, meaning (in this case) at least one of arthritis, cancer, chronic obstructive pulmonary disease (COPD), diabetes, heart disease, high blood pressure, and mood disorders, and 11% had one chronic disease;(7;8)
- among those aged 80 years or more in 2005, 48% had two or more chronic diseases and 34% had one chronic disease;(7;8) and
- cancer, heart disease, and stroke were the three leading causes of death and were together responsible for 58% of all deaths in 2005.(9)

The World Health Organization estimates that 89% of all deaths in Canada in 2005 were caused by chronic diseases.(10)

Box 3: Mobilizing research evidence about the problem

The available research evidence about the problem was sought from a range of published and “grey” research literature sources. Published literature that provided a comparative dimension to an understanding of the problem was sought using three health services research “hedges” in MedLine, namely those for appropriateness, processes, and outcomes of care (which increase the chances of us identifying administrative database studies and community surveys). Published literature that provided insights into alternative ways of framing the problem was sought using a fourth hedge in MedLine, namely the one for qualitative research. Grey literature was sought by reviewing the websites of a number of Canadian and international organizations, such as the Institute for Clinical Evaluative Sciences, Ontario Health Quality Council, Canadian Institute for Health Information, Health Council of Canada, European Observatory on Health Systems and Policies, Health Evidence Network, Health Policy Monitor, and Organisation for Economic Co-operation and Development.

Priority was given to research evidence that was published more recently, that was locally applicable (in the sense of having been conducted in Ontario or Canada), and that took equity considerations into account.

In Ontario specifically, Statistics Canada estimates that:

- 23% of Ontarians in 2008 had one or more of four chronic conditions: diabetes, heart disease, stroke, and high blood pressure;(6)
- 33% of Ontarians had at least one chronic disease in 2005, and 12% had two or more;(7;8)
- almost 80% of those over the age of 45 in Ontario in 2003 (3.7 million people) were living with a chronic disease, including 34% with arthritis, 30% with high blood pressure, 12% with osteoporosis, and 9% with diabetes;(11)
- although the prevalence of cancers in Ontario fell by 5% between 2001 and 2003, the prevalence increased for COPD (11%), arthritis (4%), and type 2 diabetes (7%);(11) and
- heart disease was the leading cause of death in Ontario in 2003 followed by cancers, stroke, and COPD.(11)

The challenge can be further illustrated by considering the epidemiology of specific chronic diseases. In Ontario, the prevalence of arthritis remains consistently high, with 17.2% of people over 12 years of age living with arthritis in 2005, 16.3% in 2007, and 16.9% in 2008.(12) The prevalence of asthma has increased slightly, from 8.0% in 2005 to 8.3% in 2008.(12) The proportion of Ontarians known to be living with diabetes has increased more significantly, from 4.8% in 2005 to 6.2% in 2008, and the number of people living with diabetes in Ontario is projected to grow from 900,000 in 2008 to 1.2 million by 2010.(13) Ontarians with diabetes have been estimated to account for 32% of heart attacks, 43% of heart failures, 30% of strokes, 51% of new dialysis, and 70% of amputations in the province,(14) which may suggest why diabetes results in more patient visits to family physicians and higher hospital admission rates than any other chronic disease.(15) Also, it is worth noting that these figures may be underestimates given that self-reporting of chronic diseases tends to underestimate their actual prevalence.(16) For example, the prevalence of diabetes was found to be under-reported in the Canadian Community Health Survey when compared to that recorded in the Ontario Diabetes Database.(16)

Cost-effective programs, services, and drugs are not always getting to those living with chronic disease

Estimating the proportion of Ontarians (or Canadians) who are proactively offered cost-effective CDM programs, services, and drugs, when they have an indication or need for them, can be difficult. A series of CDM indicators relevant to primary healthcare were examined using administrative (i.e., health insurance plan billing) data from Ontario, with examples including:

- 65% of women between 30 and 39 years of age who were eligible for cervical cancer screening received at least one Pap test between 1 April 2000 and 31 March 2003;
- 26% of those aged 11-40 years who were newly diagnosed with asthma between 1 April 2002 and 31 March 2003 received a spirometry test within one year of diagnosis; and
- 75% of those aged 65 years and older who were newly diagnosed with diabetes mellitus were prescribed metformin (the recommended first line therapy) as their first hypoglycemic therapy within one year of diagnosis.(17)

However, without comparative data or data from other sources, it is hard to determine the extent to which Ontario could be doing better.

A pair of illustrations suggests that Ontario could be doing somewhat better for some clinical services, and much better for others. First, in 2008 only 73% of Ontario adults with one or more select chronic conditions (diabetes, heart disease, stroke, and high blood pressure) reported having their body weight measured in the past year. This percentage is lower than in Saskatchewan (75%), Quebec (80%) or Manitoba (80%) but higher than in other provinces.(6) Second, in Canada in 2008, only 39% of adults with diabetes reported receiving all four commonly recommended clinical tests for adults with diabetes. This percentage is well below the percentages in the United Kingdom (67%), the Netherlands (59%), and New Zealand (55%).(18)

A second pair of illustrations suggests that the proportion of Ontarians (or Canadians) who are proactively engaged in self-management or reminded of their need for care is also lower than in comparator jurisdictions. First, in 2008 only 19% of Ontario adults with one or more of seven chronic conditions (arthritis, cancer, diabetes, emphysema or chronic obstructive pulmonary disease, heart disease, high blood pressure, and mood disorders) reported that they were “almost always” or “most of the time” given a written list of things to do to improve their health. This proportion was the lowest of all Canadian provinces. Second, in 2007 only 40% of Canadians with chronic disease reported receiving reminders when they were due for preventive care or follow-up care for their condition, with this proportion dropping to 29% for those without a “medical home” (defined as having a regular physician or place of care that is easy to contact, knows the patient’s medical history, and helps co-ordinate care).(19) This proportion was lower than in any of six comparator countries: United States (70%), The Netherlands (58%), United Kingdom (58%), Germany (57%), Australia (44%), and New Zealand (48%).(19)

Coming to grips with whether Ontarians can readily access care in general and cost-effective CDM programs, services, and drugs in particular, including self-management support, when they themselves identify the need, is slightly easier. Among Canadian adults with chronic disease, 21% reported having difficulty accessing immediate care and 20% reported having difficulty accessing routine or ongoing care, with the top reason for the latter reported as waiting too long for an appointment.(20) Ten percent of Canadian adults with chronic disease reported that there was a time in the previous year when they needed healthcare but did not get it.(20) Returning to diabetes as an example, only 28% of Ontarians with diabetes have access to structured diabetes education (i.e., standardized programs that focus on affecting behaviour change).(21)

More indirect evidence that there may be challenges in accessing and using cost-effective CDM programs and services in Ontario (and Canada) is the significant use of emergency rooms for chronic diseases, such as diabetes, asthma, and high blood pressure, that can be effectively managed in the community with appropriate screening, treatment, monitoring, and follow-up.(22) Ontarians with chronic disease who said they did not have a regular medical doctor were 1.2 times more likely to have visited an emergency department in the previous two years.(23) This translates to an estimated 17,741 “excess” visits.(23) In a study comparing experiences of people with chronic disease across seven countries, Canadian adults with chronic disease were more likely to have visited an emergency room in the past two years (45%) than the residents of the United States (44%), Australia (36%), United Kingdom (36%), New Zealand (34%), the Netherlands (24%), and Germany (23%).(19)

Health system arrangements typically do not support co-ordinated and proactive chronic disease management

A variety of delivery, financial, and governance arrangements within Ontario’s healthcare system may contribute to the lack of co-ordinated and proactive CDM in the province. Within the category of **delivery arrangements**, there is a lack of self-management supports targeted at patients with chronic disease, a lack of decision supports for teams that focus on the processes of care (not just the content of care), and a lack of clinical information systems that permit the monitoring and engagement of patients with chronic disease, among other challenges. In terms of self-management supports, Ontario has no single portal through which Ontarians can access digital resources and tools to support self-management, although one is currently being developed for those with diabetes. Peer-support programs are also not widely supported. Only 14% of Canadian physicians reported routinely giving written instructions to chronic disease patients to manage care at home, which is a much lower percentage than was reported in Germany (63%), the United States (33%), Australia (29%), The Netherlands (25), United Kingdom (21%), and New Zealand (18%).(24) Less than half (44%) of Canadian adults with chronic disease said that their primary care provider supported their self-management efforts by showing them (e.g., by explaining test results) whether what they did to take care of themselves had influenced their chronic disease.(20)

Turning to decision supports, the Ontario Chronic Disease Prevention and Management Framework identifies the following as key: 1) evidence-based practice guidelines embedded into daily practice; 2) continuing professional development, including education in collaborative team practice; 3) access to specialist expertise; 4) clinical care and client management tools; and 5) routine reporting feedback, measurement, and evaluation of care delivered.(25) With the steady growth in team-based models of primary healthcare operating in Ontario (150 new Family Health Teams have been created in Ontario since 2005(26)) team-based continuing professional development is likely to grow steadily more important. Co-ordinated and proactive CDM will require that continuing professional development (CPD) focus as much or more on the “how” (i.e., the processes of care) as on the “what” (i.e., what programs, services, and drugs to provide) and be able to respond in a timely way to emergent issues (e.g., preparing for H1N1) and to areas where practice changes are required (e.g., preparing for new screening tools).(27) However, little research evidence is available about whether and how continuing professional development programs are attempting to meet these needs and if they are using effective approaches to do so.

We do know there are challenges in the current learning environment for healthcare providers engaged in CDM. At the provider level, there are few incentives or other mechanisms (within or across disciplines involved in CDM) for aligning CPD activities with practice-based assessments of patients’ needs or practice-based disease patterns. At the organizational and system levels, the same value is not attached to public funding for continuing health education as is attached to undergraduate and postgraduate education.(28) For example, it is estimated that in 2006 the pharmaceutical industry funded 60% of continuing medical education in the United States (a similar estimate could not be found for Canada).(29) Pharmaceutical sponsorship could introduce bias (e.g., promotion of specific treatments that are not the most effective or cost-effective) into CPD activities. At the organizational and system levels there are also few incentives or other mechanisms for aligning CPD priorities with population needs (as opposed to aligning CPD priorities with the perceived preferences of healthcare providers and the resources offered by pharmaceutical companies, and obtained through research grants). Moreover, CPD is not co-ordinated across CPD providers, which would facilitate more collaborative planning, promotion, implementation, and evaluation of activities.(27) Although these challenges are well known and accepted within the CPD community, little research evidence is available to assess their relative importance.

Better research evidence is available about the lack of widespread use of clinical information systems (i.e., electronic health records) in Ontario and in Canada more generally. According to one survey conducted in 2007, less than 10% of physicians in Ontario reported using electronic reminder systems and less than 1.5 % of physicians reported having access to and using electronic patient registries to support CDM.(30) The Diabetes Registry has been planned but not yet implemented in Ontario.(31) According to another survey, conducted in 2007, 23% of primary healthcare practices in Canada use electronic health records, which is much lower than the percentage in the Netherlands (98%), New Zealand (92%), the United Kingdom (89%), and Australia (79%).(19) In the same year, only 5% of Canadians with a “medical home” reported being able to access their medical records by computer (including the internet), whereas 43% reported that they would like to do so.(18) Of six comparator countries, Germany had the highest proportion of patients being able to access medical records by computer (18%).(18) Without an electronic health record with a patient interface, it is difficult to fully support self-management by patients. It is also difficult for healthcare providers to monitor when patients are due for tests, whether they are getting the right drugs, and whether they are meeting targets for good disease control.(32) In order to support the collection of primary healthcare data through electronic medical records, content standards for 12 primary healthcare clinical quality of care indicators have been developed for use by a range of stakeholders, including provincial and territorial governments, healthcare providers and their professional colleges, Canada Health Infoway, provincial health quality councils, and the electronic medical record vendor community.(33)

Financial arrangements in Ontario’s healthcare system do not include rewarding patient self-management or supporting co-ordinated and proactive CDM, including for team-based care. Financial incentives (e.g., prizes or vouchers for specific behavioural changes) are not made available to Ontarians who effectively self-manage their chronic conditions. Changes to physician-remuneration arrangements in Ontario, on the other

hand, now reward at least some types of CDM practices for some chronic diseases. For example, primary healthcare physicians can now bill the Diabetes Management Incentive and receive a bonus for registering patients with the Diabetes Registry.(34) While a review of current capitation methods will examine the incorporation of the burden of illness of patients, at this point in Ontario there is no patient-ranking system that groups patients by risk category and permits targeted healthcare provider or team payments by risk category or by the resources required to offer co-ordinated and proactive CDM to patients in different risk categories.

Governance arrangements, as they pertain to CDM in Ontario's healthcare system, are in flux in one regard yet static in another. What will change if proposed new legislation is enacted are the scopes of practice of non-medical healthcare providers (which could but will not necessarily promote more dynamic team-based CDM, and which raises questions about who will play the co-ordination role in CDM) and the focus of professional regulatory colleges' quality assurance programs (which could give great focus to team-based care but, in so doing, could also complicate it significantly as a more collaborative approach among health regulators would be required).(35) What remains constant is the limited voice of patients, or citizens more generally, in the governance of healthcare practices that are responsible for CDM. Only the long-standing community health centres (of which there are only 54 in the province) and one of the two main types of Family Health Teams (Community Family Health Teams, of which there are only five in Ontario) provide an explicit role for patients and citizens in their governance.(36) However, giving a greater governance role to patients and citizens does not necessarily mean that they will prioritize co-ordinated and proactive CDM.

Taking a more holistic perspective on health system arrangements, little research evidence is available about the proportion of primary healthcare practices in Ontario that adhere to the six features of the best known CDM model – the Chronic Care Model. A recently published report of four Canadian case studies of effective CDM using primary healthcare teams found that none of the cases embraced all features of the model.(37) However, the case-selection process did not involve developing an inventory of Canadian primary healthcare practices that had adopted select features of the model and the case studies did not include an explicit assessment of the cases against the model. Furthermore, estimating the relative importance of the aforementioned gaps in health system arrangements is a guessing game.

Implementation of CDM policies and clinical practice guidelines is typically not supported

In keeping with the private practice/public payment agreement described in the introduction, the Ontario government has not developed or implemented directives about the actual delivery of healthcare or the way in which that care is organized and delivered, which includes CDM. Financial incentives (rather than directives) have been utilized. The Ontario Chronic Disease Prevention and Management Framework then remains just that – a framework – without an implementation plan or the resources to support it.(25)

When it comes to clinical practice guidelines developed by healthcare providers themselves, the story is not much different. Although there are currently more than 2000 guidelines available in the Canadian Medical Association's Infobase and more than 180 in the Ontario Guidelines Advisory Committee's database, many of which address CDM, there is no prioritization of these guidelines, no clear plan or resources to support their implementation, no mechanism to ensure the currency of the guidelines, and no monitoring system in place that would allow healthcare providers and teams to monitor their performance (a point also made earlier in relation to the lack of decision supports). Continuing professional development is one mechanism that could be used to support guideline implementation, however, the continuing professional development system in Ontario lacks a co-ordinated approach to doing so.(27)

Equity-related observations about the problem

Some evidence is available that suggests aspects of the problem are worse among individuals and communities with low socio-economic status. In terms of the growing burden of chronic diseases, it has long been known that chronic diseases are more prevalent among Canadians of lower socio-economic status.(38) In 2005, 40% of low-income Canadians reported having one or more chronic health conditions, compared to 27% of high-income Canadians, and the poorest Canadians are almost three times as likely as the highest-income Canadians to have multiple chronic diseases.(8) In Ontario, individuals living in lower-income communities have diabetes rates that are 50% higher than in high-income communities.(39) We also know from Canadian studies that diabetes tends to be highest among the poor and disadvantaged.(40) In Ontario, people with lower incomes are more likely to visit emergency rooms for asthma, diabetes, and heart disease.(32) Furthermore, a higher proportion of people with low incomes visited emergency rooms than those with higher incomes in all Local Health Integration Networks except one (Mississauga-Oakville).(41)

Aspects of the problem also appear to be worse among individuals living in rural and remote (northern) communities. Hospitalizations for hypertension are 22 per 100,000 population in rural areas of Canada compared to only 7 per 100,000 in urban areas.(42) In Ontario, people living in rural communities have higher rates of hospitalization for diabetes.(14) A higher prevalence of chronic diseases in these areas could explain why rural physicians are more likely than urban physicians to provide CDM(11).

Little is known about whether there are significant differences between rural and urban communities, or between communities of varying socio-economic status, in the extent to which cost-effective programs, services, and drugs are getting to residents living with chronic disease or in the gaps in existing health system arrangements. These individuals may not even be counted in some provincial or national surveys. For example, the Canadian Community Health Survey is a prominent national survey conducted by Statistics Canada to gather information on health status, the use of health services, and determinants of health from Canadians across the country. However, respondents are people who live in private households and it does not include people living in some remote areas or people with lower socio-economic status who are homeless or living on the street.

THREE OPTIONS FOR ADDRESSING THE PROBLEM

Many options could be selected to address the problem of a lack of co-ordinated, proactive CDM in the Ontario healthcare system. To promote discussion about the pros and cons of potentially viable options, three have been selected for more in-depth review. They include: 1) engaging patients more fully in their care by enhancing support for self-management through digital tools, peer support, provider support, and financial incentives for patients; 2) supporting healthcare providers more fully by co-ordinating (at the provincial level) continuing professional development that enables team-based, process-oriented, just-in-time learning; and 3) undertaking a major series of reforms to support co-ordinated and proactive CDM models in healthcare settings.

The focus in this section is on what is known about these options. In the next section the focus turns to the barriers to adopting and implementing these options and to possible implementation strategies to address the barriers.

Option 1 - Enhance support for self-management

This option has a number of elements, including:

- establishing digital tools, including in the short term a “portal” for one-stop access to self-management resources and tools (or expanding/adapting an existing portal, such as the one being developed for diabetes) and in the long term an internet-based personal health record that is shared and accessed by patients and their providers in order to link patient-entered data and healthcare system-generated data with appropriate self-management resources and tools;
- increasing access to peer-support programs for patients with chronic disease;
- enabling healthcare providers to support self-management by establishing an electronic health record system that identifies at-risk patients, monitors patients with chronic diseases, and links them with appropriate providers or community supports, as well as by funding clinical case management for patients who have multiple chronic diseases and need assistance in navigating the healthcare system; and
- establishing a financial incentive program for patients who successfully manage their own chronic disease(s).

Box 4: Mobilizing research evidence about options for addressing the problem

The available research evidence about options for addressing the problem was sought primarily from a continuously updated database containing more than 900 systematic reviews of delivery, financial, and governance arrangements within health systems: the Program in Policy Decision-Making (PPD) / Canadian Cochrane Network and Centre (CCNC) database. The reviews were identified by first searching the database for reviews containing CDM-related keywords in the title and/or abstract. The keywords included chronic disease*, chronic illness*, and chronic condition*. Additional reviews were identified by searching the database for reviews addressing features of the options that were not identified using chronic disease/illness/condition-related keywords.

The review authors’ key findings were extracted from the identified reviews. Each review was also assessed in terms of its quality (AMSTAR rating), local applicability (proportion of studies that were conducted in Ontario or Canada), equity considerations (proportion of studies that deal explicitly with prioritized groups) and the review’s degree of focus on the issue. The overall evidence about the options was then summarized and relevant caveats introduced about the review authors’ key findings based on the quality, local applicability, equity, and issue applicability assessments.

Attention was given to whether reviews contained no studies despite an exhaustive search (i.e., they were “empty” reviews) and whether reviews concluded that there was uncertainty about the option based on the identified studies. Being aware of what is not known can be as important as being aware of what is known. When faced with an empty review or with uncertainty or concerns about the reviews’ quality, local applicability of the reviews’ findings, or a lack of attention to equity considerations, primary research could be commissioned or an option could be pursued and a monitoring and evaluation plan designed as part of its implementation. When faced with a review that was published many years ago, an updating of the review could be commissioned if time allows.

No additional research evidence was sought beyond what was included in the systematic reviews. Those interested in pursuing a particular option may want to search for a more detailed description of the option or for additional research evidence about the option.

Synthesized research evidence is available about a number of strategies that address many of the elements of this option. A summary of the key findings from this synthesized research evidence is provided in Table 1. For those who want to know more about the systematic reviews contained in Table 1 (or obtain citations for the reviews), a fuller description of the systematic reviews is provided in Appendix 1.

Table 1: Summary of key findings from systematic reviews relevant to Option 1 – Enhance support for self-management

Category of finding	Key findings
Benefits	<ul style="list-style-type: none"> • Patient-held records did not have an effect on clinical outcomes.(43) • Specific peer-support interventions appear to have benefit. However, there are many methodological limitations of the studies included in the reviews.(44-46) • Telephone peer support can be effective for some health conditions; however, there does not appear to be an effect in patients with diabetes.(44) • Internet-based peer support for people with chronic disease appears to have positive effects on knowledge, behaviour change, social support, and clinical outcomes.(45) • Lay-led self-management education programs may lead to small, short-term improvements in participants’ self-efficacy, self-rated health, cognitive symptom management, and frequency of aerobic exercise.(47) • Electronic health records in the outpatient primary healthcare setting improved provider and patient compliance with screening interventions and active problem treatment rates. However, there was no direct evidence that they reduced patient morbidity and mortality, and the review was published in 2000.(48) • Rates of some processes of care (e.g., vaccinations) remain below desired standards, despite use of health information technology (HIT) systems.(49) • Case management showed a positive effect on reducing all-cause mortality. However, this finding was not statistically significant.(50) • Integrated care programs (which commonly include case management) appear to have a positive effect on quality of care. However, there is substantial variability across studies in the program components being examined.(51) • Competitions and incentives for smoking cessation,(52) dietary change,(53) and one-time preventive events (e.g., immunizations)(54) improved health-related behaviours in the short term, but less is known about their long-term effectiveness. • Where non-compliance may be related to income, financial incentives may improve equity. However, the review was published in 2000.(55)
Potential harms	<ul style="list-style-type: none"> • Financial incentives can have negative effects such as motivating unintended behaviours, ignoring tasks without incentives, gaming or cheating the system, widening the resource gap between rich and poor, and dependency on financial incentives.(55)
Resource use, costs and/or cost-effectiveness	<ul style="list-style-type: none"> • Some evidence supports the cost-savings of an electronic health record system.(49)
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the option were pursued)	<ul style="list-style-type: none"> • Uncertainty because no systematic reviews were identified <ul style="list-style-type: none"> ○ No reviews were identified that examined internet-based health records. • Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review <ul style="list-style-type: none"> ○ No “empty” reviews were identified. • No clear message from studies included in a systematic review <ul style="list-style-type: none"> ○ There is insufficient evidence to support nurse-led CDM for patients with chronic obstructive pulmonary disease.(56)
Key elements of the policy option if it was tried elsewhere	<ul style="list-style-type: none"> • Conditions for successful use of patient-held records are emerging, including agreement between patients and providers on their use(57) and suitability for use among different patient groups.(43)
Stakeholders’ views and experiences	<ul style="list-style-type: none"> • Patients with cancer indicate a high level of satisfaction with peer support models.(46) • Adoption of HIT is lower than desired and key barriers are cost, perceived difficulties using the system, and perceptions of adverse effects on work.(49)

Option 2 - Co-ordinate (at the provincial level) continuing professional development for healthcare providers that enables team-based, process-oriented, just-in-time learning

This option has one major element – continuing professional development -- but this can involve many strategies and the overall approach, as conceived here, has a number of nuances. The strategies that continuing professional development can use include:

- educational meetings (i.e., conferences, workshops, and lectures), which constitute the traditional approach to continuing professional development;
- educational materials (i.e., distributing published or printed recommendations for CDM, such as clinical practice guidelines, audio-visual materials, and electronic publications);
- audit and feedback (i.e., providing a summary of clinical performance over a specified period of time, which may or may not include recommendations for clinical action);
- reminders and prompts (i.e., verbal, written, or computer-generated information intended to prompt health professionals to recall information encountered in the past);
- educational outreach, which is sometimes called outreach visits or academic detailing (i.e., a trained person meets with a provider in their practice setting to give information with the intent of changing the provider's behaviour);
- local opinion leaders; (i.e., providers who are “educationally influential” are nominated by their peers in order to influence other individuals’ attitudes or behaviour informally in a desired way);
- patient-mediated interventions (i.e., clinical information is collected directly from patients and given to the provider); and
- multi-faceted interventions (i.e., any intervention including two or more components, which (potentially) target different barriers to system change).(58)

The nuances that distinguish the conception of continuing professional development identified here include:

- a team-focus, in addition to a single healthcare provider-focus, such that all team members (whether working collaboratively within a practice setting or sharing care remotely across practice settings) are equipped with the knowledge and skills needed to contribute to a team goal of co-ordinated and proactive CDM (in addition to the team’s other goals);
- a process-orientation, rather than just a content-orientation, such that all team members learn the “how” of co-ordinated and proactive CDM (i.e., the processes of care needed for a person-centred approach to CDM), not just the “what” (i.e., what cost-effective programs, services, and drugs are needed for each disease); and
- a just-in-time emphasis, such that all team members learn how to respond in a timely way to emergent issues (e.g., preparing for HIN1) and to areas where practice changes are required (e.g., preparing for the implementation of a new guideline about screening or treatment).

Synthesized research evidence is available about a number of the strategies identified above, as well as the nuances of continuing professional development as conceived for this option. A summary of the review authors’ key findings is provided in Table 2. For those who want to know more about the systematic reviews contained in Table 2 (or obtain citations for the reviews), a fuller description of the systematic reviews is provided in Appendix 2.

The key findings presented in Table 2 and in Appendix 2 were drawn from the Rx for Change website, rather than directly from the reviews, because the contributors to this site (led by a group at the University of Ottawa) had already used a consistent approach to identifying key messages. Key findings relevant to changing health provider behaviour for CDM were emphasized whenever they were available.

Table 2: Summary of key findings from systematic reviews relevant to Option 2 - Co-ordinate (at the provincial level) continuing professional development for healthcare providers that enables team-based, process-oriented, just-in-time learning

Category of finding	Key findings
Benefits	<ul style="list-style-type: none"> • Educational meetings had mixed effects or were generally effective for improving the appropriateness of care. • Audit and feedback may be effective alone and in combination with other interventions to improve the appropriateness of care. However, one of these reviews was published in 2000. • Mixed effects were observed when comparing clinical decision support systems with no such systems for improving the appropriateness of care. • Educational outreach visits were found to be generally effective for improving the appropriateness of care. • Opinion leaders, with or without another intervention, were generally effective for improving the appropriateness of care. • Patient-mediated interventions may have mixed effects or be generally effective for improving the appropriateness of care. • Inter-professional approaches to education meetings were generally shown to be effective, but few studies were included in the reviews, making it difficult to make conclusions.
Potential harms	<ul style="list-style-type: none"> • No key findings were identified.
Resource use, costs and/or cost-effectiveness	<ul style="list-style-type: none"> • No key findings were identified.
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the option were pursued)	<ul style="list-style-type: none"> • Uncertainty because no systematic reviews were identified <ul style="list-style-type: none"> ○ No reviews were identified that addressed process-oriented continuing professional development. ○ No reviews were identified that addressed just-in-time continuing professional development. ○ No reviews were identified that addressed establishing a system that links guideline development and dissemination with continuing professional development. • Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review <ul style="list-style-type: none"> ○ No “empty” reviews were identified. • No clear message from studies included in a systematic review <ul style="list-style-type: none"> ○ One review about educational meetings had insufficient evidence to form a conclusion about the effects on the appropriateness of care.(59) ○ The most relevant and highest quality reviews about educational materials had insufficient number of studies to draw conclusions about their overall effectiveness.(60-65) ○ Relatively few studies have assessed the effects of opinion leaders alone on professional behaviour and patient outcomes.(62;66) ○ Two high quality reviews about patient-mediated interventions (62;67) had an insufficient number of studies to draw any conclusions. ○ The variation among the multi-faceted interventions that have been examined makes it difficult to make conclusions on the effectiveness of specific combinations of strategies. ○ Very few reviews evaluated the effect of multi-faceted interventions versus single interventions. However, one review (64)found that effect sizes did not necessarily increase with increasing number of intervention components.
Key elements of the policy option if it was tried elsewhere	<ul style="list-style-type: none"> • No systematic reviews were identified.
Stakeholders’ views and experiences	<ul style="list-style-type: none"> • No systematic reviews were identified.

Option 3 - Support co-ordinated and proactive CDM models in healthcare settings

While a number of co-ordinated and proactive chronic disease models exist, the best known model is the Chronic Care Model, which combines the six features described previously – namely, self-management support (which was the focus of Option 1), decision support (an element of which was the focus of Option 2), delivery system design, clinical information systems, health system changes, and community resources.

As we have summarized elsewhere,(68) synthesized research evidence is available about the effects of using the Chronic Care Model in whole or in part. A summary of the key findings from this synthesized research evidence is provided in Table 3. For those who want to know more about the systematic reviews contained in Table 3 (or obtain citations for the reviews), a fuller description of the systematic reviews is provided in Appendix 3. Synthesized research evidence is also available about (typically the effects of) many of the Chronic Care Model’s sub-elements, including self-management support,(69) decision support,(70) delivery system design,(71) clinical information systems,(72) and health system changes, some of which have been described in relation to Options 1 and 2.(73)

Table 3: Summary of key findings from systematic reviews relevant to Option 3 - Support co-ordinated and proactive CDM models in healthcare settings

Category of finding	Key findings
Benefits	<ul style="list-style-type: none"> • Incorporating most or all of the Chronic Care Model improved quality of care and outcomes for patients with various chronic diseases. However, the quality of the systematic review supporting this statement is low. • Incorporating one or more elements of the Chronic Care Model improved processes of care and clinical outcomes for patients with asthma, congestive heart failure, depression, and diabetes. However, the quality of the systematic review supporting this statement is also low.
Potential harms	<ul style="list-style-type: none"> • No key findings were identified.
Resource use, costs and/or cost-effectiveness	<ul style="list-style-type: none"> • No key findings were identified.
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the option were pursued)	<ul style="list-style-type: none"> • Uncertainty because no systematic reviews were identified <ul style="list-style-type: none"> ○ No review was identified about other chronic care models. • Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review <ul style="list-style-type: none"> ○ No “empty” reviews were identified. • No clear message from studies included in a systematic review <ul style="list-style-type: none"> ○ No reviews were identified that did not contain a clear message.
Key elements of the policy option if it was tried elsewhere	<ul style="list-style-type: none"> • No systematic reviews were identified.
Stakeholders’ views and experiences	<ul style="list-style-type: none"> • No systematic reviews were identified.

Equity-related observations about the three options

As this research evidence suggests, very little is known about the three options in relation to people living in rural and remote (northern) areas, or people with low socio-economic status. This is consistent with a systematic review of strategies that could improve the quality of healthcare for ethnic minority populations that concluded that there was a lack of studies specifically targeting diseases and processes of care for which disparities had previously been documented.(74)

IMPLEMENTATION CONSIDERATIONS

Little empirical research evidence about implementation barriers and strategies could be identified in the systematic reviews addressing the three options. A preliminary assessment of the available evidence with respect to potential barriers is provided in Table 4, however, these and other potential barriers warrant further study in their own right.

Table 4: Potential barriers to implementing the options

Levels	Option 1: Enhance support for self-management	Option 2: Co-ordinate (at the provincial level) continuing professional development for healthcare providers that enables team-based, process-oriented, just-in-time learning	Option 3: Support co-ordinated and proactive CDM models in primary healthcare settings
Patient / individual	The demands of managing multiple chronic disease regimens hindered patients' ability to properly self-manage their diabetes specifically.(75)		Patients' preference for immediate healthcare has a major impact on achieving an efficient allocation of resources for CDM.(76) Some patients may be wary of potential disruptions in their relationship with their primary healthcare physician.(77)
Healthcare provider		Clinical practice guidelines for ten chronic diseases require services that take more time than primary healthcare physicians have available.(78) Many guidelines are available for the management of single chronic diseases, but not for team-based care or with a process orientation. Health professionals tend to seek continuing professional development from peers within their own discipline and may be disinclined to participate in interdisciplinary training.	Healthcare providers, particularly physicians, have to ensure that a CDM model can incorporate or exist alongside a model for acute-disease management.
Organization	Organizational scale for some face-to-face self-management supports may not be viable in many rural and remote (northern) communities.	Organizational scale for some face-to-face continuing professional development for teams and for just-in-time learning may not be viable in many rural and remote (northern) communities.	Organizational scale for some aspects of CDM models may not be viable in many rural and remote (northern) communities.
System		CPD providers have needed to seek funding from the same sources and have no structures and processes in place to work collaboratively.	Provincial government may be unwilling to broaden the breadth and depth of public payment for primary healthcare, particularly during a recession.

A possible implementation strategy would be to establish a central “hub” to support CDM knowledge development, management, and translation. This hub could support self-management (Option 1 and part of Option 3), liaisons with the continuing professional development community and specifically Continuing

Professional Development – Ontario (CPD-O) (Option 2), and decision supports for healthcare providers (another part of Option 3). The hub could take one of two forms.

First, the hub could be organized as a province-wide collaborative or in partnership with a group of collaboratives that gives registered healthcare providers and teams access to CDM self-management resources and tools and CDM guidelines and tools for implementation (including continuing professional development opportunities). For example, in British Columbia joining a collaborative gives healthcare providers access to an on-line CDM Toolkit – a web-based tool that includes the province’s clinical practice guidelines, patient flow sheets, current patient data, and the ability to compare performance with other providers. Newfoundland and Saskatchewan have developed similar systems.(20)

Alternatively the hub could be governed by a province-wide steering group. Kaiser Permanente, a healthcare delivery system in the United States, used a multidisciplinary steering group, a physician champion for each guideline, registries, reminders, outreach programs, and empowering of local healthcare providers to achieve a 30% reduction in heart disease mortality and a 15% decrease in death rates from congestive heart failure, compared to other healthcare delivery systems, between 1996-2001.(79) However, such US healthcare delivery systems exert much greater control over healthcare providers than Ontario’s provincial government has ever done. Ontario does have, in the form of Continuing Professional Development – Ontario, the beginnings of a hub dealing with continuing professional development at least.(27)

Further research would be required to establish the benefits, harms, and costs of this and other possible implementation strategies

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APPENDICES

The following tables provide detailed information about the systematic reviews identified for each option. Each row in a table corresponds to a particular systematic review. The focus of the review is described in the second column. Key findings from the review that relate to the option are listed in the third column while the fourth column presents a rating of the overall quality of the review. The quality of each review has been assessed using AMSTAR (A MeaSurement Tool to Assess Reviews), which rates overall quality on a scale of 0 to 11, where 11/11 represents a review of the highest quality. It is important to note that the AMSTAR tool was developed to assess reviews focused on clinical interventions, so not all criteria apply to systematic reviews pertaining to delivery, financial, or governance arrangements within health systems. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, a review that scores 8/8 is generally of comparable quality to a review scoring 11/11; both ratings are considered “high scores.” A high score signals that readers of the review can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the review should be discarded, merely that less confidence can be placed in its findings and that the review needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems*; in press).

The last three columns convey information about the utility of the review in terms of local applicability, equity, and issue applicability. The fifth column notes the proportion of studies that were conducted in Ontario or in Canada more generally while the sixth column comments on the proportion of studies included in the review that deal explicitly with one of the prioritized groups – that is, people living in rural and remote (northern) or low socio-economic status (SES) groups. The final column indicates the review’s issue applicability in terms of whether or not it addressed chronic disease.

All of the information provided in the appendix tables was taken into account by the evidence brief’s authors in compiling Tables 1-3 in the main text of the brief.

Appendix 1: Summary of systematic reviews relevant to Option 1 – Enhance support for patient self-management

Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
Establishing a “portal” for one-stop access to self-management resources and tools	No reviews were found.	n/a	n/a	n/a	n/a	n/a
Establishing an internet-based personal health record that is shared and accessed by patients and their providers in order to link patient-specific data with appropriate self-management information or tools	No reviews were identified that examined internet-based personal health records.	n/a	n/a	n/a	n/a	n/a
	The effectiveness of patient-held records on patient outcomes (43)	Patient-held records did not appear to have an effect on clinical outcomes. An emerging consideration for successful use of patient-held records is their suitability for use among different patient groups.	9/11	1/13 (Canada)	Not reported	Yes
	The effectiveness of patient-held records on patient outcomes(80)	Patient-held maternity records increase women's involvement in and control over their care.	6/11	0/11	Not reported	No
	The effectiveness of patient-held records on patient outcomes(81)	This review did not identify any relevant studies.	6/11	n/a	n/a	No
	The conditions associated with patients' use of electronic health records(57)	No relevant key findings	2/11	Not reported	Not reported	No
Increasing access to peer-support programs for patients with chronic disease	The effectiveness of internet-based peer-support(45)	Internet-based peer support for people with chronic disease appears to have positive effects on knowledge, behaviour change, social support, and clinical outcomes.	10/11	0/24	Not reported. However, the benefits of internet-based peer support in terms of equity was discussed.	Yes

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Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
	The effectiveness of lay-led self-management programs for people with chronic conditions(47)	Lay-led self-management education programs may lead to small, short-term improvements in participants' self-efficacy, self-rated health, cognitive symptom management, and frequency of aerobic exercise.	10/11	0/17	0/17	Yes
	The effectiveness of peer-support telephone calls(44)	Telephone peer support can be effective for some health conditions. However, there does not appear to be an effect in patients with diabetes.	9/11	2/7 (1 from Ontario and 1 from elsewhere in Canada)	Not reported	Yes
	The effectiveness of face-to-face (one-on-one and group) and internet-based peer-support(46)	Patients with cancer indicate a high level of satisfaction with peer-support programs. However, evidence of psychosocial benefit is not clear.	8/11	6/43 (Canada)	2/43 (rural groups)	Yes
	The effectiveness of social support interventions on self-care and health outcomes(82)	No relevant key findings	6/11	Not reported	Not reported	Yes
	The effectiveness of life-skills training when delivered through peer support (versus delivered by an occupational therapist and versus a control group)(83)	No outcomes were significantly different between life skills training delivered through peer support versus standard care.	10/11	Not reported	Not reported	Yes
Establishing an electronic health record system that identifies at-risk patients, monitors patients with chronic diseases, and links them with appropriate providers or community supports	The effects of electronic health records including electronic health record-generated reminders(48)	Electronic health records in the outpatient primary healthcare setting improved provider and patient compliance with screening interventions and active problem treatment rates. However, there was no direct evidence that they reduced patient morbidity and mortality, and the review was published in 2000.	8/10	5/16 (Ontario)	Not reported	No

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Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
	The costs and benefits of clinical health information technology (HIT) systems(49)	Rates of some processes of care (e.g., vaccinations) remain below desired standards, despite use of HIT systems. Some evidence supports the cost-effectiveness of an electronic health record system. Adoption of HIT is lower than desired and key barriers are cost, perceived difficulties using the system, and perceptions of adverse effects on work.	7/10	Not reported	4/180 (3 on rural groups and 1 on low SES groups)	Yes
Funding clinical case management for patients who have multiple chronic diseases and need assistance navigating the healthcare system	No reviews pertaining to case management funding models were found.	n/a				
	Packages of care for CDM programs that included case management(50)	Case management is associated with reduced all-cause mortality. However, this finding is not statistically significant and the effective components of the case management interventions were not clear.	9/11	1/16 (Canada)	Not reported	Yes
	Packages of care for CDM programs that included case management(56)	There is insufficient evidence to support nurse-led CDM for patients with chronic obstructive pulmonary disease.	9/11	1/9 (Canada)	Not reported	Yes
	Packages of care for CDM programs that included case management(84)	No relevant key findings	2/11	Not reported	Not reported	Yes

Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
	One overview of reviews examined packages of care for CDM that included case management.(51)	Integrated care programs (which commonly include case management) appear to have a positive effect on quality of care. However, program components are defined in varying ways, which leads to inappropriate conclusions or application of results.	n/a	n/a	n/a	Yes
Establishing a financial incentive program for patients who successfully manage their own chronic disease	The effects of financial incentives on patients' compliance with treatments(55)	Where non-compliance may be related to income, financial incentives may improve equity. Financial incentives can also have negative effects such as motivating unintended behaviours, ignoring tasks without incentives, gaming or cheating the system, widening the resource gap between rich and poor, and dependency on financial incentives.	8/11	0/11	Not reported	No
	The effects of financial incentives on patients' compliance with treatments(85)	No relevant key findings	10/11	0/9	1/9 (rural groups)	Yes
	The effects of financial incentives on patients' compliance with treatments for non-chronic disease-related illnesses (e.g., substance abuse)(86)	No relevant key findings	10/11	0/6	Not reported	No
	The effects of financial incentives on prevention/behaviour change(52)	Competitions and incentives for smoking cessation seem to be a promising strategy in the short term, but less is known about their long-term effectiveness.	9/11	1/17 (Ontario)	Not reported	Yes
	The effects of financial incentives on prevention/behaviour change(53)	Competitions and incentives for dietary change seem to be a promising strategy in the short term, but less is known about their long-term effectiveness.	7/11	0/5	1/5 (low SES groups)	No

Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
	The effects of financial incentives on prevention/behaviour change(54)	Competitions and incentives for one-time preventive events (e.g., immunizations) seem to be a promising strategy in the short term, but less is known about their long-term effectiveness.	4/11	Not reported	Not reported	Yes
	The effects of financial incentives on prevention/behaviour change implemented in low and middle-income countries(87)	No relevant key findings	10/11	1/9 (Canada but not from Ontario)	9/9 (low SES groups)	No
	Financial incentives implemented at the population level(88)	No relevant key findings	9/11	1/5 (Ontario)	Not reported	Yes
	Overview of reviews focused on financial incentives in low- and middle-income countries(89)	No relevant key findings	n/a	n/a	n/a	No
	Overview of reviews focused on financial incentives in low- and middle-income countries(90)	Financial incentives targeting patients are effective in the short term for well-defined behavioural goals, but there is less evidence of long-term effectiveness.	n/a	3/10 (Canada)	n/a	No

Appendix 2: Systematic reviews relevant to Option 2 - Co-ordinate (at the provincial level) continuing professional development for healthcare providers that enables team-based, process-oriented, just-in-time learning)

Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
Educational meetings	The effectiveness of educational meetings(59)	Insufficient evidence to form a conclusion about the effects on appropriateness of care	7/11	6/39 (5 from Ontario and 1 from elsewhere in Canada)	2/39 (rural groups)	No
	The effectiveness of multi-faceted interventions that include educational meetings(91)	Educational meetings combined with audit and feedback were generally effective for appropriateness of care.	8/11	9/118 (Canada)	3/118 (2 on rural groups and 1 on low SES groups)	No
	The effectiveness of multi-faceted interventions that include educational meetings(62)	Mixed effects for educational meetings on appropriateness of care	8/11	1/18 (Canada)	Not reported	No
	The effectiveness of multi-faceted interventions that include educational meetings(61)	Mixed effects for educational meetings on appropriateness of care	8/11	0/18	Not reported	No
	The effectiveness of multi-faceted interventions that include educational meetings(92)	Mixed effects for educational meetings on appropriateness of care	8/11	4/81 (Canada)	1/82 (low SES groups)	No
Educational materials	The effectiveness of multi-faceted interventions that include disseminating educational materials(62)	Insufficient number of studies to draw conclusions about the overall effectiveness of educational materials	8/11	1/18 (Canada)	Not reported	No
	The effectiveness of multi-faceted interventions that include disseminating educational materials(61)	Insufficient number of studies to draw conclusions about the overall effectiveness of educational materials	8/11	0/18	Not reported	No

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Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
	The effectiveness of multi-faceted interventions that include disseminating educational materials(60)	Educational interventions generally had an impact on clinician behaviour.	8/11	Not reported	Not reported	No
	The effectiveness of multi-faceted interventions that include disseminating educational materials(63)	No relevant key findings	7/11	4/66 (Canada)	3/66 (rural groups)	No
	The effectiveness of multi-faceted interventions that include disseminating educational materials(64)	Insufficient number of studies to draw conclusions about the overall effectiveness of educational materials	7/11	6/117 (Canada)	Not reported	No
	The effectiveness of multi-faceted interventions that include disseminating educational materials(65)	Insufficient number of studies to draw conclusions about the overall effectiveness of educational materials	7/11	2/15 (Canada)	Not reported	No
	The effectiveness of multi-faceted interventions that include disseminating educational materials(93)	No relevant key findings	6/11	4/56	4/56 (low SES groups)	Yes
	The effectiveness of multi-faceted interventions that include disseminating educational materials(94)	No relevant key findings	6/11	Not reported	Not reported	Yes
	The effectiveness of multi-faceted interventions that include disseminating educational materials(95)	No relevant key findings	5/11	Not reported	Not reported	No

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Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
Audit and feedback	The effectiveness of audit and feedback(91)	Audit and feedback may be effective alone and in combination with other interventions to improve appropriate care.	8/11	9/118 (Canada)	3/118 (2 on rural groups and 1 on low SES groups)	No
	The effectiveness of audit and feedback(63)	Audit and feedback may be effective alone and in combination with other interventions to improve appropriate care.	7/11	4/66 (Canada)	3/66 (rural groups)	No
Reminders and prompts	One review focused on computerized decision support systems (CDSS)(96)	Mixed effects were observed when comparing CDSS with none for improving appropriateness of care.	5/11	5/11 (Canada)	Not reported	Yes
Educational outreach	The effectiveness of educational outreach visits(59)	Mixed effects for educational outreach on appropriateness of care	7/11	6/39 (5 from Ontario and 1 from elsewhere in Canada)	2/39 (rural groups)	No
	The effectiveness of multi-faceted interventions that include educational outreach visits(97)	Educational outreach visits compared to control was found to be generally effective for appropriateness of care.	8/11	1/69 (Canada)	1/69 (rural groups)	Yes
Local opinion leaders	The effectiveness of local opinion leaders(66)	Relatively few studies have assessed the effects of opinion leaders alone on professional behaviour and patient outcomes. Opinion leaders with or without another intervention were generally effective for improving appropriate care.	7/11	2/12 (Canada)	Not reported	No

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Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
Patient-mediated interventions	The effectiveness of patient-mediated interventions(59)	Patient-mediated interventions may have mixed effects for appropriateness of care.	7/11	6/39 (5 from Ontario and 1 from elsewhere in Canada)	2/39 (rural groups)	No
	The effectiveness of patient-mediated interventions(64)	Patient-mediated interventions may be generally effective for appropriateness of care.	7/11	6/117 (Canada)	Not reported	No
	The effectiveness of multi-faceted interventions that include patient-mediated interventions(67)	Insufficient number of studies to draw any conclusions about patient-mediated interventions	9/11	0/16	1/16 (rural groups)	Yes
	The effectiveness of multi-faceted interventions that include patient-mediated interventions(62)	Insufficient number of studies to draw any conclusions about patient-mediated interventions	8/11	1/18 (Canada)	Not reported	No
Multi-faceted interventions	The effectiveness of multi-faceted interventions(98)	No relevant key findings	9/11	Not reported	Not reported	Yes
	The effectiveness of multi-faceted interventions(99)	No relevant key findings	9/11	0/6	Not reported	Yes
	The effectiveness of multi-faceted interventions(59)	Mixed effects of multi-faceted interventions on prescribing outcomes	8/11	6/39 (5 from Ontario and 1 from elsewhere in Canada)	2/39 (rural groups)	No
	The effectiveness of multi-faceted interventions(91)	No relevant key findings	8/11	9/118 (Canada)	3/118 (2 on rural groups and 1 on low SES groups)	Yes
	The effectiveness of multi-faceted interventions(62)	No relevant key findings	8/11	1/18 (Canada)	Not reported	No
	The effectiveness of multi-faceted interventions(61)	No relevant key findings	8/11	0/18	Not reported	No
	The effectiveness of multi-faceted interventions(63)	No relevant key findings	8/11	4/66 (Canada)	3/66 (rural groups)	No
	The effectiveness of multi-faceted interventions(60)	No relevant key findings	8/11	Not reported	Not reported	Yes

Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
	The effectiveness of multi-faceted interventions(64)	Effect sizes did not necessarily increase with increasing number of intervention components.	7/11	6/117 (Canada)	Not reported	Yes
	The effectiveness of multi-faceted interventions(97)	No relevant key findings	8/11	1/69 (Canada)	1/69 (rural groups)	Yes
	The effectiveness of multi-faceted interventions(67)	No relevant key findings	9/11	0/16	1/16 (rural groups)	Yes
	The effectiveness of multi-faceted interventions(100)	No relevant key findings	9/11	0/25	Not reported	No
	The effectiveness of multi-faceted interventions(101)	No relevant key findings	8/11	1/10 (Canada)	1/14 (low SES groups)	Yes
	The effectiveness of multi-faceted interventions(102)	No relevant key findings	8/11	0/20	Not reported	Yes
Team-focused continuing professional development	The effectiveness of inter-professional education (IPE)(98)	The studies in this review evaluated different IPE interventions and were not of high quality. Therefore, it is difficult to draw conclusions about the effectiveness of IPE.	9/11	0/6	Not reported	No
	The effectiveness of inter-professional education(103)	IPE interventions with staff involved in the care of adults with mental health problems indicate positive outcomes. However, the studies were not of high quality.	4/11	Not reported	Not reported	No
	The effectiveness of inter-professional education(104)	No relevant key findings	4/11	Not reported	0/4	No
	Problem-based learning in large and small groups(105)	No relevant key findings	4/11	Not reported	Not reported	No
Process-oriented continuing professional development	No reviews identified that focused explicitly on the effectiveness of process-oriented CPD interventions, but	n/a	n/a	n/a	n/a	n/a

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Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
	several (60;61;67;94;99;106) focused on evaluating the effectiveness of CPD interventions on practice routines.					
Just-in-time continuing professional development	No reviews were identified that focused explicitly on just-in-time learning, but several (64;65;92;101;105) focused on ways in which healthcare providers can respond more efficiently to patient needs.	n/a	n/a	n/a	n/a	n/a
Establishing a system that links guideline development and dissemination with continuing professional development.	No reviews were identified that focused on establishing a system that links guideline development and dissemination with continuing professional development.	n/a	n/a	n/a	n/a	n/a

Appendix 3: Summary of systematic reviews relevant to Option 3 - Support co-ordinated and proactive CDM models in healthcare settings

Option element	Focus of systematic review	Key findings	AMSTAR (quality) rating	Proportion of studies that were conducted in Ontario or Canada	Proportion of studies that deal explicitly with one of the prioritized groups	Focus on chronic disease
Use of the Chronic Care Model	The effects of incorporating most or all of the Chronic Care Model elements(107)	Incorporating most or all of the Chronic Care Model improved quality of care and outcomes for patients with various chronic diseases (published in 2009).	4/11	Not reported	Not reported	Yes
	Effects of incorporating one or more Chronic Care Model elements(108)	Incorporating one or more elements of the Chronic Care Model improved processes of care and clinical outcomes for patients with asthma, congestive heart failure, depression, and diabetes (published in 2005).	6/11	Not reported	Not reported	Yes