

EVIDENCE
BRIEF



OPTIMIZING
DIABETES MANAGEMENT
IN ONTARIO



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Evidence Brief:
Optimizing Diabetes Management in Ontario

5 November 2009

McMaster Health Forum

For concerned citizens and influential thinkers and doers, the McMaster Health Forum strives to be a leading hub for improving health outcomes through collective problem solving. Operating at the regional/provincial level and at national levels, the Forum harnesses information, convenes stakeholders, and prepares action-oriented leaders to meet pressing health issues creatively. The Forum acts as an agent of change by empowering stakeholders to set agendas, take well-considered actions, and communicate the rationale for actions effectively.

Authors

John N. Lavis, MD PhD, Director, McMaster Health Forum, and
Professor and Canada Research Chair in Knowledge Transfer and Exchange, McMaster University

Jennifer Boyko, MHSc, Lead, Evidence Synthesis and Evaluation, McMaster Health Forum
Jason Akerman, Research Assistant, McMaster Health Forum

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KEY MESSAGES

What's the problem?

- The overall problem is that all Ontarians cannot rely on the presence of an accessible and comprehensive diabetes management system.
 - The burden of diagnosed diabetes in Ontario is growing. The prevalence of diagnosed diabetes in Ontario increased from 5.2% in 1995 to 8.8% in 2005. Prevalence rates are particularly high among groups including South Asians and individuals with low socio-economic status (SES).
 - Components of comprehensive diabetes management programs are not available or accessible to all Ontarians. An indication of this problem is that in 2008 only 73% of adults in Ontario with one or more of four select chronic conditions (diabetes, high blood pressure, heart disease, and stroke) were assessed for blood pressure, cholesterol, blood sugar, and body weight in the previous 12 months.
 - Many aspects of how diabetes management is organized contribute to the problem. For example, most diabetes care in Ontario is provided by family physicians, yet some Ontarians do not have a regular primary healthcare provider and others cannot access care when they need it. In addition, provincial health insurance programs do not fully cover all necessary drugs and devices.
 - It is not clear to what extent a plan for the Ontario Diabetes Registry, which includes appropriate resources and strategies to support implementation, has been developed.

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

- Option 1 – Provide self-management support to diabetes patients and decision support to primary healthcare providers
 - High and medium quality reviews are available that support strategies for enabling effective self-management for patients including the use of personal health records, peer support programs, and financial incentives. However, uncertainty exists about the cost-effectiveness of telehealth programs, and the effectiveness of diabetes education and management centres in supporting self-management.
 - A medium quality review supports establishing a decision support system for providers that includes: connection to a broad electronic health record system; order entry used by all team members; and population-based reporting. Medium quality reviews are available that support the use of multi-faceted guideline dissemination and implementation interventions, as well as “single-faceted” interventions including audit and feedback and reminders and prompts. Financial incentives for providers generally result in small improvements in provider-level process outcomes.
- Option 2 – Expand multidisciplinary diabetes education and management centres
 - Although no systematic reviews were identified that relate directly to establishing additional diabetes centres, medium quality reviews do support the use of community health workers, teams, shared care, and revision of professional roles in improving patient outcomes. In addition, no systematic reviews were identified that specifically addressed: education for primary healthcare providers about tailoring programs to meet patient needs, linking diabetes centres to primary healthcare teams, appropriateness criteria for accessing diabetes clinics, diabetes clinics for high risk groups, and improving the management of diabetes across the primary-specialty interface.
- Option 3 – Support primary healthcare practices in using an integrated chronic disease management model
 - Two high quality systematic reviews found that disease management programs reduced glycosylated hemoglobin (HbA1c) levels, and improved screening for retinopathy and foot lesions. Two other medium quality reviews support incorporating most or all of the Chronic Care Model to improve quality of care and outcomes for patients with various chronic diseases (including diabetes), and incorporating one or more elements of the Chronic Care Model to improve processes of care and clinical outcomes.

What implementation considerations need to be kept in mind?

- More evidence is required about implementation barriers and strategies that are relevant to the Ontario context. However, one systematic review supports the use of learning collaboratives as a strategy for implementing change in primary healthcare, and primary research and tools are available to support the implementation of collaboratives.

REPORT

Diabetes is a serious disease that affects many individuals worldwide. The incidence and prevalence of diagnosed diabetes in Canada has been rising, and significant resources are being invested in provincial health systems to address the problem.(1) These investments focus on the management of care for all those diagnosed with:

- **type 1 diabetes**, which is usually diagnosed in children and adolescents and occurs when the pancreas is unable to produce insulin (a hormone that ensures body energy needs are met);
- **type 2 diabetes**, which occurs when the pancreas does not produce enough insulin or when the body does not effectively use the insulin that is produced; it usually develops in adulthood, although increasing numbers of children in high-risk populations are being diagnosed; and
- **gestational diabetes**, which is a temporary condition that can occur during pregnancy and involves an increased risk of developing diabetes for both mother and child.

These investments also focus on the prevention of type 2 diabetes.

In Ontario, effort has been made over the past six years to improve diabetes management and prevention. In 2003 the Ontario Ministry of Health and Long-Term Care (MOHLTC) established a task force to advise on priority areas for maximizing impact on outcomes for people with diabetes.(2) Based on recommendations from this task force, \$35 million was invested in 2006/07 to improve access to diabetes education and management (primarily through the establishment of diabetes education centres, which may be stand-alone centres in the community or part of a hospital-based diabetes-management clinic, that aim to support self-management). Changes to coverage were also made, including adding a new drug (ACTOS®) to the Ontario Drug Benefit Plan (ODSP) and improving access to insulin pumps and supplies. In 2006 the MOHLTC established the Diabetes Management Expert Panel to provide advice about ways to improve diabetes management and prevention in Ontario and to develop a plan to ensure all Ontarians have equitable, timely, and appropriate access to diabetes prevention and management services.(3) In 2008 the MOHLTC and the Ministry of Health Promotion announced a provincial diabetes strategy based on recommendations from the Expert Panel. The key parts of the Ontario Diabetes Strategy are:

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 organizations (and/or key stakeholder groups) and the McMaster Health Forum;
- 2) developing and refining the terms of reference for an 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.

- increasing access to team-based diabetes care that may include (depending on patient needs) a family physician, registered nurse, registered dietitian, and/or an endocrinologist;
- public education campaigns to raise awareness of diabetes risk factors in high risk populations including Aboriginals, Hispanics, Asians, African-Canadians, low-income families and older adults;
- a diabetes registry that will provide people with diabetes access to information and tools to help them manage their care, and providers with access to patient records, diagnostic information, and alerts to better manage patient care;
- improving coverage of insulin pump therapy;
- improving access to services available under Ontario's Chronic Kidney Program including dialysis and home renal replacement therapies; and
- improving access to bariatric surgery (a procedure that modifies the gastrointestinal tract to reduce food intake and improve weight loss).

In 2009 eHealth Ontario (a new organization that is leading the information technology aspects of the government's overall health plan) released Ontario's eHealth Strategy, which includes diabetes management as one of three clinical priorities for the next three years. The four main initiatives being worked on by eHealth include: 1) a baseline diabetes dataset initiative (BDDI); 2) the diabetes registry; 3) electronic medical record (EMR) interoperability with the registry; and 4) Ontario lab information system (OLIS) interoperability with the registry.⁽⁴⁾ In order to populate the diabetes registry with a baseline dataset, the BDDI is currently identifying Ontarians with diabetes, matching them to their primary healthcare providers, and measuring the current state of diabetes care in Ontario. The target for implementing the diabetes registry across Local Health Integration Networks (LHINs) is the end of 2011. By the end of 2010, eHealth Ontario is planning for 90% of primary healthcare providers to have received quality reports (based on data being collected as part of the registry) that support improved management of patients with diabetes. Quality improvement reports will initially include three indicators (HbA1c, blood lipid (LDL) levels, and retinal exam) with additional indicators added as they become available from the OLIS and other sources.

Although the changes the government has made over the past six years are helping to change diabetes management in Ontario, there is still much to be done. The purpose of this evidence brief is to review the research evidence about problems underlying the current organization of diabetes management in Ontario, three options for addressing the problems that might enhance what is currently being done, and key implementation considerations for moving any of the options forward. Its broader goals are to inform the

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 of low socio-economic status
- new immigrants.

Many other groups (such as South Asian immigrants) 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.

roll-out of the Ontario Diabetes Strategy and considerations of an integrated model of chronic disease management.

We have chosen to define the scope of this brief in three ways in order to spark insights about diabetes management and prevention in Ontario. First, this evidence brief does not consider population-based initiatives that aim to prevent and treat obesity or to encourage physical activity (e.g., public education, healthy public policy), although people at risk of developing type 2 diabetes can cut their risk in more than half by modifying certain risk factors (e.g., activity level, diet, weight control).(5) However, practice-based approaches to prevention such as screening or pharmacologic interventions in adults with pre-diabetes (i.e., impaired glucose intolerance and impaired fasting glucose) are considered. Second, this evidence brief only focuses on type 1 and type 2 diabetes while ensuring each type is appropriately distinguished from the other throughout the brief where appropriate. Although some similarities exist between type 1 and type 2 diabetes in terms of complications, each is a distinct disease and differences in management must occur. Third, although we recognise the importance of diabetes management for all Ontarians, the brief focuses on the adult population.

The following key features of the Ontario health policy and system context must also be taken into account for the purposes of this evidence brief:

- Ontario's publicly funded health system is distinguished by a long-standing private delivery / public payment agreement between government on the one hand and physicians and hospitals 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;
- other healthcare providers such as nurses and dietitians, and teams led by these providers, are typically not eligible for public fee-for-service payment (or at least not on terms that make independent healthcare practices viable on a large scale);
- the agreement with hospitals has historically meant that private not-for-profit hospitals deliver care with first-dollar, public (typically global budget) funding, and supplemental funds provided for specific targeted programs for diseases such as diabetes can be hard to monitor within these funding envelopes;
- for some Ontarians, prescription drugs, medical devices (e.g., blood glucose monitoring meters), and supplies (e.g., blood-testing strips) 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).(6)

THE PROBLEM

Problems underlying the current organization of diabetes management in Ontario that may be affecting the overall accessibility and comprehensiveness of effective diabetes management can be understood by considering: 1) the nature and burden of diabetes that the healthcare system must manage; 2) the effective (and cost-effective) programs, services, drugs, and devices that must be provided within the health system to meet the needs of those living with diabetes; 3) the health system arrangements that determine access to and use of effective diabetes programs, services, drugs, and devices; and 4) the degree of implementation of the current diabetes strategy.

The burden of diabetes is growing

A look at population disease patterns and changes over time provides a dynamic picture of the prevalence of diabetes among Ontarians. For example, a study by the Institute for Clinical and Evaluative Sciences (ICES) that used administrative data found that the age-adjusted and sex-adjusted prevalence of diabetes increased from 5.2% in 1995 to 8.8% in 2005.⁽⁷⁾ Similarly, Statistics Canada estimated that the prevalence of diabetes among Ontario adults (based on self-reported data) rose to 6.2% in 2008 from 4.8% in 2003. In 2003 the prevalence of diabetes in Ontario matched the national average (4.8%).⁽⁸⁾ However, by 2008 the prevalence of diabetes among Ontarians had risen to 6.2% while the national average climbed to 5.9%.⁽⁸⁾ Looking ahead to 2016, the number of Canadians with diabetes is expected to almost double to 2.4 million.⁽¹⁾ The rise in prevalence of diabetes in Canada and in Ontario has been attributed to (among other factors such as improved diagnostic tests) a rise in new cases of type 2 diabetes, which has been driven by increasing obesity rates and the aging of the population.⁽⁹⁾

The burden of diabetes must also be understood in terms of associated risks as it is often diagnosed alongside other chronic diseases.⁽¹⁰⁾ Evidence is also available about the relationship between diabetes and other specific chronic conditions. ICES used various data sources from 1995-1999 to estimate that, in Ontario, diabetes has been linked to 32% of heart attacks, 43% of heart failure cases, 30% of strokes, 51% of new kidney dialysis patients, and 70% of amputations.⁽¹¹⁾ Similarly, the Canadian Diabetes Association reports that diabetes is the leading cause of blindness, end-stage renal failure, and limb amputation in Canadian adults.⁽¹²⁾

The nature of diabetes in terms of risks can also be understood by considering prevalence rates among socio-economic and other groups, which are outlined in the equity section below.

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.

Effective (and cost-effective) diabetes management programs are not always available or accessible to all Ontarians

Determining the availability or accessibility of diabetes management programs can be difficult given the wide range of services that can comprise effective diabetes management programs. However, some data are available about specific program components. For example, effective diabetes management should include regular monitoring of blood glucose, blood pressure, and cholesterol levels.(12) Yet, in 2008 only 73% of adults in Ontario (and 74% of adults in Canada) with one or more of four select chronic conditions (diabetes, high blood pressure, heart disease, and stroke) reported measurements for blood pressure, cholesterol, blood sugar, and body weight in the previous 12 months.(13)

A look at data comparing Canada to other countries also illustrates the problem. An international survey, conducted in 2007, of adults with one of heart disease, diabetes, or hypertension found that 16% of Canadians did not have their cholesterol checked in the past year, which compared unfavourably to those living in Australia (17%), New Zealand (20%), and Netherlands (21%).(14) Specifically, this same study found:

- 90% of Canadians with diabetes had their HbA1c checked by a healthcare provider in the past year compared to persons with diabetes living in Germany (92%), the United Kingdom (92%), France (93%), the United States (94%), and the Netherlands (96%);
- 53% of Canadians with diabetes had their feet examined by a health professional for sores or irritations in the past year, compared to persons with diabetes living in the United States (61%), the Netherlands (67%), New Zealand (71%), and the United Kingdom (80%);
- 69% of Canadians with diabetes had their eyes examined for diabetes in the past year compared to persons with diabetes living in Germany (80%), the Netherlands (85%), and the United Kingdom (85%).(14)

Self-management education is another important component of diabetes care, which would ideally be available to all those with diabetes. Diabetes clinical practice guidelines recommend that the first priority for all people with diabetes is the prevention of complications through a comprehensive, multi-faceted approach that includes (among other elements) lifestyle modification. In line with this recommendation, people with diabetes should be taught how to change lifestyle behaviours.(12) Although data estimating the proportion of people with diabetes in Ontario that receive support for self-management are not available, a survey of Canadian adults in 2007 found that among those who visited a general practitioner at least once in the past 12 months:

- 35% “always” received help from their primary healthcare provider to change habits/lifestyles to improve health / prevent illness;
- 27% had primary healthcare providers that “always” talked about specific things to improve health / prevent illness; and
- 25% had primary healthcare providers that “always” helped patients reach or maintain a healthy body weight.(15)

Furthermore, this same study found that among Canadian adults who visited a general practitioner at least once in the past 12 months and had one or more select chronic conditions (arthritis, cancer, chronic obstructive pulmonary disease, diabetes, heart disease, high blood pressure, or mood disorders):

- 70% were “generally not / almost never” encouraged to attend programs in the community that could improve their health;
- 74% were “generally not / almost never” encouraged to attend a specific community group or class to cope with chronic conditions; and
- 71% were referred to a dietitian, health educator, or counselor that could provide additional support.(15)

Although comparable data are not available for Ontario (including data about the appropriateness of referrals and the availability of effective community programs to which to refer patients), no research or data suggest the situation is any different in Ontario than in Canada as a whole.

Current health system arrangements do not fully support accessible and comprehensive diabetes management programs

Specific health system delivery, financial, and governance arrangements may be affecting the overall accessibility and comprehensiveness of effective (and cost-effective) diabetes management in Ontario.

In terms of **delivery arrangements**, an overall problem is that some Ontarians do not have a regular primary healthcare provider and many are not receiving the primary healthcare they need. This is significant because components of effective diabetes management (e.g., screening, monitoring, education) take place within the context of primary healthcare.(12) To illustrate this problem, consider that in 2008:

- 9% of Canadian adults reported they had no place that they usually went to if they were sick or needed advice about their health;
- 12% of Canadian adults with no select chronic conditions, 4% of people with one or two select chronic conditions, and 5% of people with three or more select chronic conditions reported that they had no regular place of care;
- among 54% of adults who required routine or ongoing care (such as annual check-ups and blood tests) in the past 12 months, 13% experienced difficulties getting it.(13)

Similarly, in 2007, 14% of Canadian adults reported not having a regular medical doctor, 26% reported having difficulty accessing routine care, and 24% reported having difficulty obtaining immediate care for a minor health problem.(16) Lack of access to primary healthcare is important because people with diabetes without continuity of care from a primary healthcare provider experience higher rates of hospitalization for diabetes-related complications,(17) are less likely to attend a diabetes education centre,(18) and have a two-fold higher risk for being hospitalized or seen in an emergency department for uncontrolled diabetes.(19)

Another related problem is that those without a primary healthcare provider also do not have access to diabetes educators, nurses, or dietitians who may be part of primary healthcare teams and may not access a diabetes education centre (for which patients do not necessarily need a referral). This is a noteworthy aspect of the problem because a study conducted in Ontario in 2002 found that receiving regular primary healthcare is the strongest predictor of attending a diabetes education centre (which also suggests that these centres are not necessarily being substituted for the more expensive care being provided by family physicians).(18)

There are also individuals with diabetes who may or may not have a primary healthcare provider and want to access a diabetes educator or education centre, but cannot because educators or education centres are not available in their communities. The exact number of diabetes educators working in primary healthcare or MOHLTC-funded diabetes education and management centres is not known. However, based on an informal assessment of the Diabetes Ontario website (www.diabetesontario.org), diabetes education and management centres are not located in all geographical communities.

Although most diabetes care in Ontario is provided by family physicians, a survey conducted in 2002 found that family physicians are not fully aware of the resources and strategies available to help them undertake lifestyle counselling efficiently and effectively,(20) as just one element of diabetes management. This may be due in part to larger problems in the continuing professional development (CPD) learning environment. For example, there are neither provider-level incentives for engaging in CPD that aligns with practice-based assessments of patients' needs or practice-based disease patterns, nor other mechanisms to support providers in doing so. There are also no mechanisms for aligning CPD priorities with population needs. However, only limited data and research evidence are available to inform an assessment of this larger CPD problem.

In addition to lack of access to primary healthcare and diabetes education, access to specialty medical care is also problematic. A key theme from stakeholder consultations held as part of the 2007 Diabetes Policy Review was that seeing a specialist (e.g., an endocrinologist) requires referral by a general practitioner, and

people with diabetes struggle to access these services as a result.(21). Although no additional data or evidence could be identified about the extent to which this is a problem for diabetes management, data about access to specialty care in general provide some additional information. For example, in 2004, 2.4% of specialist physicians were located in rural and small-town Canada, where 21.1% of the population resided.(22) On the other hand specialist diabetes centres (e.g., the McMaster Diabetes Care and Research Program) do have referral bases that extend throughout rural areas, so it may be that access to specialist diabetes care is largely an issue in more remote locations.

Concerning **financial arrangements**, three notable issues underpin the problem. The first of these issues is that medical costs for people with diabetes are two to three times higher than for those without the disease(12) and the Ontario government does not cover all necessary drugs and devices for all groups. The Monitoring for Health Program (a publicly financed reimbursement program that is administered by the Canadian Diabetes Association on behalf of the MOHLTC) is designed to help Ontarians of any age who use insulin to pay for their supplies (test strips, lancets, and blood glucose meters). Yet, certain eligibility criteria (e.g., insulin pumps are only covered for type 1 diabetes), maximum reimbursement levels (e.g., up to a maximum of 65% for the cost of blood testing strips for low-income Ontarians) or the items covered (e.g., syringes and needles are not covered) may be limiting the help this program can provide to some people.(23) Although employer-based insurance programs may cover medical expenses related to diabetes management, many Ontarians do not have such insurance. Although data about the proportion of people with diabetes affected by limitations in current coverage arrangements could not be found, the Canadian Diabetes Association estimates that among participants in the Monitoring for Health Program 26% are young people who would just be entering the workforce; 23% are early retirees between 55 and 65 who may no longer be working with employers who provide benefit plans; and 12% are youth.(23)

The second notable issue is that financial incentives are not available to all providers. Although, primary healthcare physicians can now bill the Diabetes Management Incentive and receive a bonus for registering patients with the Diabetes Registry(24), similar incentives are not available for other healthcare providers or teams to offer co-ordinated diabetes management to patients. Finally, a third issue is that although diabetes education and management centres receive funding from the MOHLTC and are staffed by certified diabetes educators and registered dietitians, it is not clear to what extent these centres have the capacity to focus on a full range of self-management supports including peer support, telephone or web-based tools, and other educational resources.

In terms of **governance arrangements**, there is no standardized curriculum for diabetes educators (although efforts are underway) and there is no licensure or regulatory requirements to ensure adherence to a standardized curriculum (only a voluntary certification process). It is not clear, however, to what extent governance arrangements are contributing to the overall problem.

Implementation of the diabetes registry has progressed slowly

There is currently no treatment-monitoring system to identify what primary healthcare programs and services are being offered to whom (i.e., what types of patients), by whom (e.g., what disciplines), and how frequently (with appropriate attention to privacy concerns) to identify both under-utilization and over-utilization of services, and to monitor and evaluate efforts to optimize diabetes management. In order to provide healthcare providers with data to support effective diabetes management, the Ontario Diabetes Registry is being implemented. However, initially the registry will include only three indicators related to diabetes management. Moreover, its future remains unclear in the absence an implementation plan with resources to support implementation over the long term.

Additional equity-related observations about the problem

Certain equity considerations must be kept in mind in order to fully understand the issues underlying Ontario's current approach to diabetes management. According to Statistics Canada, in 2005 South Asians were Canada's second largest visible minority group.(10;25) Although recent data could not be identified, the Health Council of Canada published a report in 2007, which indicated that South Asian Canadians have a higher proportion of new cases of diabetes diagnosed each year than other Canadians.(25) In terms of risk factors, this same report indicated that Canadians of South Asian descent have lower rates than Canadians of European descent of smoking, obesity, high blood pressure, and high cholesterol, suggesting an interplay of genes and the environment is leading to increased prevalence in this group.(25) The higher than average prevalence of diabetes in this ethno-cultural group suggests this population requires a targeted approach to ensuring diabetes services are meeting needs. For example, diabetes guidelines recommend that individuals older than 40 years be screened for diabetes every three years, but more often for those who are also from a high risk group (such as South Asian Canadians).(12)

Another equity gap that exists in Ontario relates to socio-economic status. In Canada as a whole the rates of diabetes go up as incomes go down. In 2005 the Canadian Community Health Survey found that individuals residing in households in the lowest income groups were nearly three times more likely to have diabetes than the individuals residing in households in the highest income group.(10;25) Although recent data are not available for Ontario, we know that in 1999 the prevalence of diabetes ranged from 5.1 in the highest income neighbourhoods to 7.8 in the lowest income neighbourhoods.(26)

Healthcare utilization rates also highlight the equity gap in terms of socio-economic status. Across Canada's 15 metropolitan areas in 2008, hospitalization rates for diabetes were 102 per 100,000 among people in the low-SES group, 63 per 100,000 people in the average-SES group, and 43 per 100,000 people in the high-SES group.(28) This translates to hospitalization rates for diabetes that were 2.4 times higher among the low-SES group than the high-SES group across all 15 metropolitan areas.

The extent to which new immigrants and individuals of low socio-economic status are receiving the diabetes management and care (such as screening) they require is not known. It is also not clear to what extent current health system arrangements are affecting these groups disproportionately in terms of whether they receive appropriate diabetes management.

THREE OPTIONS FOR ADDRESSING THE PROBLEM

Many options could be selected to address the problems underlying the current organization of Ontario's diabetes management programs. To promote discussion about the pros and cons of potentially viable options, three have been selected as examples for more in-depth review. They include: 1) provide self-management support to diabetes patients and decision support to primary healthcare providers; 2) expand diabetes education and management centres, including additional programs for high-risk groups; and 3) support primary healthcare practices in using an integrated model of chronic disease management.

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 – Provide self-management support to diabetes patients and decision support to primary healthcare providers

This option can be understood by considering its two major elements, each comprising different strategies available to address them.

The first element involves enabling effective self-management for patients (and their families) through:

- establishing a personal health record that includes information to support informed decision-making about one's own health (e.g., performance in achieving lifestyle and clinical targets or links to educational materials in appropriate languages);
- enhancing access to peer support programs;
- enhancing diabetes education and management centres' capacity to support self-management; and
- introducing financial incentives for effective self-management (including behaviour change).

The second element involves establishing a decision support system for the full array of providers engaged in the management of diabetes in primary healthcare.

Establishing this system would involve:

- developing, disseminating, and implementing clinical practice guidelines and other resources and tools to support providers in optimizing diabetes management, as well as evaluating their impact;

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 "diabetes" in the title and/or abstract. A broader focus on chronic disease management was beyond the scope of this brief. Additional reviews were identified by searching the database for reviews addressing features of the options that were not identified using "diabetes" as a keyword. In order to identify evidence about costs and/or cost-effectiveness, the NHS Economic Evaluation Database (available through the Cochrane Library) was also searched using a similar strategy.

The authors' conclusions were extracted from the reviews whenever possible. Some reviews contained no studies despite an exhaustive search (i.e., they were "empty" reviews), while others concluded that there was substantial uncertainty about the option based on the identified studies. Where relevant, caveats were introduced about these authors' conclusions based on assessments of the reviews' quality, local applicability of the reviews' findings, equity considerations, and relevancy to the issue. (See Appendices for a complete description of these assessments.)

Being aware of what is not known can be as important as being aware of what is known. When faced with an empty review, substantial uncertainty or concerns about quality, local applicability, 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 review. 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.

- establishing a clinical information system that links patient information and guideline recommendations, and that provides the ability to compare performance with other providers, set reminders, and generate routine performance feedback (i.e., an electronic diabetes management system, the precursor for which is being put into place now, but with only three indicators initially (HbA1c, LDL, and retinal exam); and
- introducing/expanding financial incentives for primary healthcare providers who provide cost-effective programs, services, and drugs (e.g., those outlined in the Canadian Diabetes Association guidelines) and/or whose patients achieve and maintain targets (e.g., those related to glycemic control and vascular risk reduction).

Synthesized research evidence is available about a number of the strategies that address the elements of this option. A summary of 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 – Provide decision support to diabetes patients and providers in primary healthcare

Category of finding	Summary of key findings
Benefits	Enabling effective self-management for patients (and their families): • Personal health records: A medium quality review published in 2004 found that home glucose records have documented benefits in improving diabetes outcomes (i.e., HbA1c and blood glucose). • Telephone supports: A recently published (2005) high quality review found that home telemonitoring (compared to usual care) improved glycemic control in patients with diabetes.(29) Another high quality review concluded that telemedicine for diabetes is feasible and acceptable, but evidence about its effectiveness in improving HbA1c or improving other aspects of diabetes management is not strong.(30) • Web-based tools: A medium quality review about the effectiveness of information technologies on improving diabetes care and self-management for adults with type 2 diabetes found that most studies reported positive results for outcomes related to healthcare utilization, behaviours, attitudes, knowledge, and skills.(31) Another medium quality review found significant improvements in HbA1c for patients that used computerized home glucose monitoring. The same review found that computerized diabetes education showed significant outcome improvements for HbA1c, pre-lunch blood glucose level, and serum cholesterol level.(32) • Peer support programs: One recently published high quality review found that 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.(33) • Financial incentives for effective self-management: A recent (2005) and medium quality review found that monetary incentives have a positive effect on food purchasing patterns and weight loss. Establishing a decision support system for the full array of providers engaged in the management of diabetes in primary healthcare: • Interventions to support dissemination of clinical practice guidelines: Multi-faceted guideline dissemination and implementation interventions that target health professionals were generally effective for improving the appropriateness of care, as were a number "single-faceted" interventions including distribution of educational materials, educational meetings, audit and feedback, and reminders and prompts. • Clinical information systems that link patient information, guideline recommendations, etc., and that provide the ability to compare performance with other providers, set reminders, and generate routine performance feedback: A medium quality review found that components of information systems that correlated with positive results included: connection to a broad electronic health record system; order entry used by all team members; and population-based reporting.(34) • Financial incentives for primary healthcare providers who provide cost effective programs, services, and drugs: Financial incentives for physicians resulted in an increase in immunizations by primary healthcare physicians.(35)
Potential harms	• None identified

Costs and/or cost-effectiveness in relation to the status quo	• Telephone supports: A recently published high quality review found that home telemonitoring and telephone support reduced health service use for patients with diabetes.(29) However, another high quality review concluded that uncertainty remains about the cost-effectiveness of home telehealth programs.(30) A study conducted in San Francisco about the cost-effectiveness of an automated telephone self-management support with nurse care management (ATSM) intervention (compared to usual care) for patients with type 2 diabetes found that the per-patient cost to achieve a 10% increase in the proportion of intervention patients meeting American Diabetes Association exercise guidelines was estimated to be \$558 when all costs were considered and \$277 when only ongoing costs were considered.(36) • Interventions to support dissemination of clinical practice guidelines: While one study conducted in the Netherlands about the cost-effectiveness of multi-faceted guideline implementation strategies found patient-centred and professional-focused implementation strategies in secondary care to be cost effective,(37) another study conducted in Seattle, Washington found no changes in healthcare utilization or costs between multi-faceted interventions compared to control (usual care).(38)
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the option were pursued)	• Uncertainty because no systematic reviews were identified ○ No reviews were identified that addressed enhancing diabetes education and management centres' capacity to support self-management. • Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review ○ No "empty" reviews were identified. • No clear message from studies included in a systematic review ○ Peer support programs: One review found no clear evidence (positive or negative) to support consumer-led peer-to-peer communities and only 5/38 studies focused on diabetes.(39) ○ Enabling effective self-management for patients (and their families): A recent qualitative review of ten Canadian studies found that data on adoption and implementation strategies for diabetes self-management interventions in disadvantaged populations were almost never reported.(40)
Key elements of the policy option if it was tried elsewhere	• Clinical information systems that link patient information, guideline recommendations, etc., and that provide the ability to compare performance with other providers, set reminders, and generate routine performance feedback: A recently published medium quality review found that barriers to using informatics systems to improve care for chronic disease include costs, data privacy and security, and failure to consider workflow.(41)
Stakeholders' views and experience	• Patients that used computerized glucose monitoring were more satisfied with the care they received.(32)

Option 2 – Expand multidisciplinary diabetes education and management centres

Expanding access to multidisciplinary diabetes education and management centres can be accomplished by increasing the number of centres across the province (including appropriateness criteria to facilitate access for those most in need), ensuring that centres are linked to primary healthcare teams, as well as expanding effective diabetes programs for high-risk groups (offered through diabetes education and management centres) to other areas of the province with similar populations. Four key health system elements that need to be considered in order to understand this option include:

- Appropriateness criteria to facilitate access to diabetes education and management centres for those most in need;
- Diabetes education and management centres linked to primary healthcare teams;
- Training and education for primary healthcare providers about tailoring management programs to meet specific patient needs;
- Multidisciplinary diabetes programs for high-risk groups.

Although limited synthesized research evidence is available about these elements, a summary of 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

Table 2: Summary of key findings from systematic reviews relevant to Option 2 – Expand multidisciplinary diabetes education and management centres

Category of finding	Summary of key findings
Benefits	• A recently published high quality review supports the use of interventions among racial/ethnic minorities with diabetes that target patients (primarily through culturally tailored programs), providers (especially through one-on-one feedback and education), and health systems (particularly with nurse case managers and nurse clinicians) in order to improve health outcomes and/or reduce diabetes-related health disparities.(42) • A recently published medium quality review found that case management (led by community health workers and nurses) improved glycemic control among people from minority ethnic groups with diabetes.(43) • A medium quality review found that there are some preliminary data demonstrating improvements in participant knowledge and behaviour when diabetes programs include community health workers as team members.(44) Another medium quality review found that team changes associated with improved HbA1c values were multidisciplinary providers, shared care arrangements, and expansion or revision of professional roles.(45)
Potential harms	• None identified
Costs and/or cost-effectiveness in relation to the status quo	• A recently published study found that a specialist telemedicine intervention for improving diabetes care incurred lower costs (compared to control) but not in diabetes-related costs.(46) • One-year costs for personnel were higher in a chronic disease management program (including a nurse practitioner - physician team). However, patients experienced significant improvements in mean HbA1c and HDL.(47) • The cost-effectiveness of a multidisciplinary diabetes management program estimated the lifetime incremental cost per quality of life year (QALY) gained in the base case was \$5992.(48)
Uncertainty regarding benefits and potential harms (so monitoring and evaluation could be warranted if the option were pursued)	• Uncertainty because no systematic reviews were identified ○ No reviews were identified that specifically addressed: training and education for primary healthcare providers; diabetes education and management centres linked to primary healthcare teams; appropriateness criteria for accessing diabetes clinics; or multidisciplinary diabetes clinics for high risk groups. • Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review ○ No “empty” reviews were identified • No clear message from studies included in a systematic review ○ There were no consistent improvements in health outcomes, psychosocial measures, health service utilization, or patient satisfaction for interventions designed to improve the management of chronic conditions across the primary-specialty interface.(49)
Key elements of the policy	• None identified

option if it was tried elsewhere	
Stakeholders' views and experience	None identified

Option 3 – Support primary healthcare practices in using an integrated model of chronic disease management

This option would involve supporting the inclusion of diabetes in (or the piloting with diabetes of) integrated chronic disease management programs in primary healthcare, possibly using a collaborative learning model.

While a number of chronic disease management models exist, the best known model is the Chronic Care Model, which combines 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 into daily clinical practice and supporting their implementation through continuing professional development);
- delivery system design (i.e., assuring 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).(50;51)

As we have summarized elsewhere as well,(52) synthesized research evidence is available about the effects of using the Chronic Care Model in whole or in part. Synthesized research evidence is also available about the use of learning collaboratives. A summary of 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.

Table 3: Summary of key findings from systematic reviews relevant to Option 3 – Support primary healthcare practices in using an integrated model of chronic disease management

Category of finding	Summary of key findings
Benefits	- Two medium quality reviews found that disease management programs reduced HbA1c, and improved screening for retinopathy and foot lesions.(53;54) - A recently published medium quality review found that incorporating most or all of the Chronic Care Model elements improved quality of care and outcomes for patients with various chronic illnesses.(55) Another medium quality review found that chronic disease management appeared to improve patient satisfaction, patient adherence, and disease control.(56) - A recently published review found that quality improvement collaboratives showed moderate positive results on care processes and outcomes of care.(57)
Potential harms	None identified
Costs and/or cost-effectiveness in relation to the status quo	One medium quality review about the economic effects of disease management in patients with chronic diseases found that few studies demonstrated a notable reduction in costs.(56)
Uncertainty regarding benefits and potential harms	- Uncertainty because no systematic reviews were identified - No review was identified about other chronic care models

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(so monitoring and evaluation could be warranted if the option were pursued)	• Uncertainty because no studies were identified despite an exhaustive search as part of a systematic review ○ No “empty” reviews were identified • No clear message from studies included in a systematic review • No reviews were identified that did not contain a clear message
Key elements of the policy option if it was tried elsewhere	• None identified
Stakeholders’ views and experience	• None identified

Additional equity-related observations about the three options

This research evidence suggests that little is known about the three options in relation to people with lower SES. With respect to new immigrants, some reviews included a focus on diabetes among Asians,(42;43;58;59) and there does seem to be evidence about options that can be used to strengthen diabetes management among this group. Nevertheless, a systematic review of strategies that could improve the quality of healthcare for ethnic minority populations concluded that there was a lack of studies specifically targeting diseases and processes of care for which disparities had previously been documented.(60)

IMPLEMENTATION CONSIDERATIONS

Table 4: Potential barriers to implementing the options

Levels	Option 1 – Provide decision support to diabetes patients and providers in primary healthcare	Option 2 - Expand multidisciplinary diabetes education and management centres	Option 3 – Support primary healthcare practices in using an integrated model of chronic disease management
Patient/Individual	The demands of managing multiple chronic disease regimens hindered patients' ability to properly self-manage their diabetes specifically.(61) A cultural belief that a person with diabetes should take a passive role in healthcare relationships caused some people to avoid asking providers for information about self care.(61) Cultural barriers and social inequalities are barriers to greater patient engagement.(62) Data collected about type 2 diabetes to support care may compromise an individuals' privacy and lead to stigmatization.(63)	People of low socio-economic status and new immigrants may have difficulty accessing these centres if they are not located in their communities or sensitive to the needs of their communities	Patients' preference for immediate healthcare has a major impact on achieving an efficient allocation of resources for chronic disease management.(64) Some patients may be wary of potential disruptions in their relationship with their primary healthcare physician.(65)
Care provider	Primary healthcare providers may perceive decision supports (e.g., HbA1c reports) as a threat to their professional authority.(63)	Professional training and ongoing continuing professional development will need to address how to deliver culturally competent care. Sensitivity to and knowledge of the unique life circumstances of people living with diabetes is an important consideration for facilitating self care for people with diabetes.(61) A meta-synthesis of how culture influences diabetes self-management in the context of South Asian populations found that an appropriate approach for nurses practicing in diabetes care would be to view each person as an individual who holds his or her own fluid version of South Asian culture.(58)	Healthcare providers, particularly physicians, have to ensure that a chronic disease model (CDM) can incorporate or exist alongside a model for acute disease management.
Organization	All clinical and non-clinical members of healthcare teams need to be aware of the processes that need to be in place for effective use of information technologies. Organizations must be	Programs for specific high-risk groups (e.g., inner city, non-English speaking new immigrants from South Asia) may need to be delivered in community-based settings and be developed in partnership with target groups in keeping with	

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	sensitive to the personal health information being collected and how it is used.(63)	principles of community development.	
System	Resources must be in place to ensure sustainability of information technology in the longer term. The need for public health surveillance must be balanced against the need for individual privacy.(63)	There may be a lack of human resources to provide team-based care. Efforts to raise awareness of the connection between healthy living and chronic diseases like diabetes are not well linked between public health and health services. Although preventing complications and other problems is an important aspect of management, there has been little co-ordination and collaboration with non-health sectors, with the exception of education, in the development and implementation of healthy public policies, under the Healthy Living and Chronic Disease initiative.(21) Provincial government may be unwilling to broaden the breadth and depth of public payment for primary healthcare, particularly during a recession.	Provincial government may be unwilling to broaden the breadth and depth of public payment for primary healthcare, particularly during a recession. Too much focus on a process-oriented model of chronic disease management may hinder a focus on ensuring that planning is outcome-based as well.

In order to address many of the identified barriers, an overall approach to implementing the options could be utilized. One possible implementation strategy would be to work with the Ontario Quality Improvement Innovation Partnership (QIIP) to develop and implement a learning collaborative for diabetes management in primary healthcare. The purpose of QIIP is to assist Ontario's Family Health Teams (FHTs) as they move to a new model of primary health care. QIIP is a learning collaborative for FHTs and community health centres that includes: tools and resources to help them with the work they are doing, as well as opportunities for learning about achievements, activities, and where people working in FHTs can connect with each other and exchange ideas and suggestions. Using such an approach would support those involved in optimizing diabetes management in learning from one another as implementation proceeds.

Another possible implementation strategy would be to centralize access to all diabetes programs in Ontario (including clinical, education, and public health programs). For example, Capital Health in Edmonton introduced a single point of entry for diabetes patients and a consistent triage process for referral to diabetes services. Physicians can refer patients through a central booking office and patients can self-refer to standardized education modules. Since this program was introduced in Capital Health, wait times to see a specialist have been reduced from several months to several weeks or days, and the number of referrals has almost tripled as the capacity of the system has increased.(66) The Ontario Diabetes Registry may become one component of the centralized system. If so, lessons can also be learned from implementation of a diabetes registry and mandatory HbA1c reporting system in New York City about how to balance public health interests with personal privacy issues.(63) A centralized approach in Ontario could be piloted in one LHIN and then expanded.

Further research would be required to establish the benefits, harms, and costs of these 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 and the reviews are organized by option element (first column). 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 records the last year the literature was searched as part of the review.

The fifth 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, applicability concerning prioritized groups, and issue applicability. The third-from-last column notes the proportion of studies that were conducted in Ontario and Canada more generally, while the second-from-last column comments on the proportion of studies included in the review that deal explicitly with one of the prioritized groups. The last column indicates the review’s issue applicability in terms of the proportion of studies focused on diabetes.

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: Systematic reviews relevant to Option 1 - Provide self-management support to diabetes patients and decision support to primary healthcare providers

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
Personal health records	The effects of information system design, quality, components, setting, and other factors on care processes, quality outcomes, and health care costs(41)	Personal health records were correlated with positive experimental results.	2005	4/11	Not reported	Not reported	48/109
	The impact of automated information interventions on diabetes care and patient outcomes(32)	Home glucose records have documented benefits in improving diabetes outcomes (i.e., HbA1c and blood glucose).	Not reported	7/11	1/44 (Canada, but not from Ontario)	0/44	44/44
Telephone supports	The effect of telephone support for smoking cessation(69)	Telephone counselling helps smokers who are interested in quitting. The odds of quitting increases with the number of sessions.	2009	10/11	4/65 (Canada)	1/65 (low income groups)	0/65
	The clinical and cost-effectiveness of home telehealth for aging patients with multiple chronic conditions(29)	Compared with usual care, home telemonitoring improved glycemic control in patients with diabetes. Home telemonitoring and telephone support reduced health service use for patients with diabetes. Uncertainty remains about cost-effectiveness of home telehealth programs.	2008	10/10	Not reported	1/78 (low SES groups)	35/78

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The benefits and deficiencies of teleconsultation and videoconferences between patients and providers on clinical and behavioural outcomes, as well as processes of care(68)	Teleconsultation programs that focused on daily monitoring of clinical data, education, and personal feedback showed the most benefit in terms of behavioural change and reducing costs. The benefits of videoconferencing were mainly related to its effects on socio-economic factors such as education and cost reduction, but also on monitoring disease and maintaining quality of care while producing cost savings.	2007	6/11	1/39 (Canada)	Not reported	39/39
	The clinical effectiveness of interventions using information and communication technologies (ICTs) for managing and controlling chronic diseases(69)	ICT applications did not show an improvement in clinical outcomes. However, ICT systems used for improving education and social support were shown to be effective.	2005	5/11	Not reported	Not reported	7/24
	Summary of the effects of telehomecare on older patients with chronic illness(70)	Telehomecare appears to reduce healthcare costs due to savings from healthcare utilization and travel.	2005	2/11	Not reported	0/19	5/19
	To evaluate evidence for the feasibility, acceptability, and cost-effectiveness of diabetes telemedicine applications(30)	Telemedicine for diabetes is feasible and acceptable, but evidence about effectiveness in improving HbA1c or reducing costs while maintaining HbA1c levels, or improving other aspects of diabetes management is not strong.	2004	7/11	Not reported	Not reported	26/26
	The effectiveness of information technologies on improving care for adults with type 2 diabetes(31)	All telephone interventions (n=16) showed moderate to large declines in HbA1c. However, only three were statistically significant.	2004	6/11	Not reported	Not reported	26/26

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	To assess the effectiveness of computer telephony system (CTS)-based medical interventions(71)	CTS-based medical interventions improved HbA1c levels and processes of care in diabetes. However, the evidence was of poor quality.	2003	6/11	Not reported	Not reported	Not reported
	The application of telemedicine in the management of heart failure(72)	Telemonitoring (used alone or as part of multidisciplinary care) may improve early detection of deterioration and reduces hospital admissions, length of hospital stays, and mortality at 6 months.	2002	5/11	Not reported	Not reported	0/7
	The efficacy of distance medicine technologies in clinical practice on health care outcomes(73)	Significantly improved outcomes were demonstrated in studies of diabetes care.	1996	6/11	Not reported	Not reported	5/80
	The cost-effectiveness of an automated telephone self-management support with nurse care management (ATSM) intervention for patients with type 2 diabetes(36)	The per-patient cost to achieve a 10% increase in the proportion of intervention patients meeting American Diabetes Association exercise guidelines was estimated to be \$558 when all costs were considered and \$277 when only ongoing costs were considered.	n/a (cost-effectiveness study)	n/a	n/a	n/a	n/a
Web-based tools	The effectiveness of information technologies on improving care for adults with type 2 diabetes(31)	Most studies reported positive results for outcomes related to healthcare utilization, behaviours, attitudes, knowledge, and skills.	2004	6/11	Not reported	Not reported	26/26
	The impact of automated information interventions on diabetes care and patient outcomes(32)	Significant improvements in HbA1c were found for patients that used computerized home glucose monitoring. Computerized diabetes education showed significant outcome improvements for HbA1c, pre-lunch blood glucose level, and serum cholesterol level. Patients that used computerized glucose monitoring were more satisfied with the care they received.	Not reported (published in 2004)	7/11	1/44 (Canada, but not from Ontario)	0/44	44/44

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Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The effects of computer-based peer-to-peer communities and electronic self-support groups on health and social outcomes(39)	No clear evidence of consumer-led peer-to-peer communities. However, no evidence was found that suggests virtual communities harm people.	2003	6/11	Not reported	Not reported	5/38
	To review the reasons why health interventions have been delivered over the internet(74)	Reasons for delivering interventions over the internet included: low delivery costs, reducing cost and increasing convenience for users, reducing health system costs, overcoming isolation of users, timeliness of information, reducing stigma, and increasing user control of the intervention.	2003	5/10	3/28 (Canada)	0/28	3/28
Peer support programs	The influences of diabetes self-management in the context of a South Asian population(58)	Culture should not be thought of as a stand-alone factor as it is one of many interacting factors, which the individual negotiates when making self-management choices.	Not reported (published in 2009)	n/a (qualitative review)	0/10	11/11 (new immigrants)	11/11
	The effectiveness of lay-led self-management programs for people with chronic conditions(33)	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.	2006	10/11	0/17	0/17	5/17
	The effectiveness of patient, provider, and health system interventions to improve diabetes care among socially disadvantaged populations(34)	Features that appeared to have the most consistent positive effects included cultural tailoring of the intervention, community educators or lay people leading the intervention, one-on-one interventions with individualized assessment and reassessment, incorporating treatment algorithms, focusing on behaviour-related tasks, providing feedback, and high-intensity interventions delivered over a long duration.	Not reported (published in 2006)	8/11	0/17	17/17 (low SES groups)	17/17

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The effects of group based training on clinical, lifestyle, and psychosocial outcomes in people with type 2 diabetes(75)	Group based diabetes self-management training is effective in improving fasting blood glucose levels, glycosylated hemoglobin and diabetes knowledge, and reducing systolic blood pressure, body weight, and diabetes medications.	2003	9/11	0/14	1/14 (low SES groups)	14/14
	The effects of social support interventions on health outcomes in primary and outpatient care for type 2 diabetes(76)	Promising new forms of social support include: group consultations (better HbA1c and lifestyle); internet or telephone-based peer support (improved perceived support, increased physical activity, respectively); and social support groups (improved knowledge and psychosocial functioning).	2003	6/11	Not reported	0/6	6/6
	To evaluate dimensions of diabetes self-management interventions in disadvantaged populations(40)	Community interventions (e.g., group meetings) had encouraging short-term results. However, data on adoption and implementation strategies were almost never reported.	Not reported (published in 2002)	4/10	1/10 (Canada, but not from Ontario)	Not reported	10/10
Enhancing diabetes education and management centres' capacity to support self-management	No reviews were identified that addressed this option element specifically. However, enhancing capacity can be done in a variety of ways and we have identified some evidence about a few of these (e.g., changing the organization of care, modifying health professional roles, adding programs such as telephone or peer support).	n/a	n/a	n/a	n/a	n/a	n/a
	The effectiveness of lay-led self-management programs for people with chronic conditions(33)	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.	2006	10/11	0/18	0/18	1/18

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The benefits and deficiencies of teleconsultation and videoconferences between patients and providers on clinical and behavioural outcomes, as well as processes of care(68)	Teleconsultation programs that focused on daily monitoring of clinical data, education, and personal feedback showed the most benefit in terms of behavioural change and reducing costs. The benefits of videoconferencing were mainly related to its effects on socio-economic factors such as education and cost reduction, but also on monitoring disease and maintaining quality of care while producing cost savings. Teleconsultation improved self care (checked blood glucose more often, better understanding of disease, and better able to manage their illness overall) outcomes.	2006	6/11	1/39 (Canada)	Not reported	39/39
	The effects of interventions targeting professionals or the organization of care on the management of patients with diabetes in primary healthcare, outpatient, and community settings(77)	Arrangements for follow up (e.g., computer tracking systems or nurse follow up) improved diabetes management process outcomes. Multi-faceted professional interventions in which patient education is added or the role of the nurse is enhanced improved patient health outcomes.	2000	7/11	0/48	Not reported	48/48
Financial incentives for effective self-management	The effectiveness of monetary incentives in modifying dietary behaviour(78)	Incentives have a positive effect on food purchasing patterns and weight loss.	2005	7/11	0/5	1/5 (low SES groups)	0/5
	The effects of cost sharing on vulnerable populations(79)	Cost sharing (co-payment or caps) leads to decreases in prescription drugs among vulnerable populations.	2002	6/11	5/24 (1 from Ontario and 4 from elsewhere in Canada)	21/24 (low SES groups)	0/24

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The effect of financial incentives on patients' compliance with healthcare treatments(80)	Uptake or compliance is lower when there is a financial charge versus when health care is free to the patient. Even when medical care is free, the use of some form of financial incentive increases compliance.	1997	10/11	0/2	0/2	0/2
Interventions to support dissemination of clinical practice guidelines:							
a) Educational materials	The effects of psychiatric guideline implementation on provider performance and patient outcomes(81)	Distribution of educational materials was found to be generally ineffective for improving the appropriateness of care. Studies comparing multi-faceted with distribution of educational materials had mixed effects.	2006	5/11	3/18 (Canada)	Not reported	0/18
	Effectiveness and efficiency of guideline dissemination and implementation strategies(82)	The distribution of educational materials was generally effective for improving the appropriateness of care with medium effect sizes.	1998	7/11	15/235 (Canada)	Not reported	1/235
	The effects of introducing clinical practice guidelines in nursing, midwifery, and other professions allied to medicine(83)	Mixed effects were observed for educational meetings.	1996	8/11	1/18 (Canada)	Not reported	1/18
b) Educational meetings	The effect of guidelines on compliance with care processes, as well as clinical or economic outcomes in the treatment of pneumonia(84)	There was insufficient evidence to assess the effects of educational meetings on outcomes related to prescribing.	2006	5/11	Not reported	Not reported	0/30
	The effectiveness of evidence-based strategies for implementing guidelines in obstetrics on quality of obstetric care(85)	Two studies found that educational meetings were generally ineffective on appropriateness of care.	2005	4/11	Not reported	0/32	0/32

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Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	Effectiveness and efficiency of guideline dissemination and implementation strategies(82)	Insufficient evidence exists for educational meetings.	1998	7/11	15/235 (Canada)	Not reported	1/235
	The effects of introducing clinical practice guidelines in nursing, midwifery, and other professions allied to medicine(83)	Mixed effects were observed for educational meetings improving the appropriateness of care.	1996	8/11	1/18 (Canada)	Not reported	1/18
c) Educational outreach visits	The effectiveness of evidence-based strategies for implementing guidelines in obstetrics on quality of obstetric care(85)	Insufficient evidence exists for educational outreach visits.	2005	4/11	Not reported	0/32	0/32
	The effects of introducing clinical practice guidelines in nursing, midwifery, and other professions allied to medicine(83)	Insufficient evidence exists for educational outreach visits.	1996	8/11	1/18 (Canada)	Not reported	1/18
d) Local opinion leaders	The effectiveness of evidence-based strategies for implementing guidelines in obstetrics on quality of obstetric care(85)	Insufficient evidence exists for local opinion leaders.	2005	4/11	Not reported	0/32	0/32
	The effects of introducing clinical practice guidelines in nursing, midwifery, and other professions allied to medicine(83)	Insufficient evidence exists for local opinion leaders.	1996	8/11	1/18 (Canada)	Not reported	1/18
e) Local consensus processes	No relevant reviews were identified.	n/a	n/a	n/a	n/a	n/a	n/a
f) Audit and feedback	The effects of psychiatric guideline implementation on provider performance and patient outcomes(81)	Insufficient evidence was found for audit and feedback.	2006	5/11	1/18 (Canada)	Not reported	0/18

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	Effectiveness and efficiency of guideline dissemination and implementation strategies(82)	Audit and feedback was generally effective for improving appropriateness of care with medium effect sizes.	1998	7/11	15/235 (Canada)	Not reported	1/235
	The effect of different intervention strategies for implementing clinical guidelines at hospitals(86)	Generally effective results were found for audit and feedback vs. control	1998	5/11	Not reported	Not reported	4/53
g) Reminders and prompts	The effectiveness of evidence-based strategies for implementing guidelines in obstetrics on quality of obstetric care(85)	There was insufficient evidence to determine results of reminders.	2005	4/11	Not reported	0/32	0/32
	Effectiveness and efficiency of guideline dissemination and implementation strategies(82)	Reminders were generally effective for improving appropriateness of care with medium effect sizes.	1998	7/11	15/235 (Canada)	Not reported	1/235
	The effect of different intervention strategies for implementing clinical guidelines at hospitals(86)	Generally effective results were found for reminders vs. control.	1998	5/11	Not reported	Not reported	4/53
	The effects of introducing clinical practice guidelines in nursing, midwifery, and other professions allied to medicine(83)	Insufficient evidence was found for reminders.	1996	8/11	1/18 (Canada)	Not reported	1/18
h) Tailored interventions	No relevant reviews were identified.	n/a	n/a	n/a	n/a	n/a	n/a
i) Patient-mediated interventions	Effectiveness and efficiency of guideline dissemination and implementation strategies(82)	Patient-mediated interventions were generally effective for improving the appropriateness of care with medium effect sizes.	1998	7/11	15/235 (Canada)	Not reported	1/235
	The effects of introducing clinical practice guidelines in nursing, midwifery, and other professions allied to medicine(83)	Insufficient evidence exists for patient-mediated interventions.	1996	8/11	1/18 (Canada)	Not reported	1/18

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
j) Multi-faceted interventions	The effects of psychiatric guideline implementation on provider performance and patient outcomes(81)	Multi-faceted interventions were found to be generally ineffective for appropriateness of care. Studies comparing multi-faceted interventions with distribution of educational materials had mixed effects.	2006	5/11	1/18 (Canada)	Not reported	0/18
	The effectiveness of evidence-based strategies for implementing guidelines in obstetrics on quality of obstetric care(85)	Multi-faceted interventions were generally effective for improving appropriateness of care, as compared with no intervention.	2005	4/11	Not reported	0/32	0/32
	The effects of interventions targeting professionals or the organization of care on the management of patients with diabetes in primary healthcare, outpatient, and community settings(77)	Combinations of professional interventions improved health professional performance outcomes.	2000	7/11	0/48	Not reported	48/48
	Effectiveness and efficiency of guideline dissemination and implementation strategies(82)	Multi-faceted interventions compared with no intervention were generally effective for improving the appropriateness of care with medium effect sizes. Multi-faceted interventions compared with intervention controls were generally effective for improving the appropriateness of care with small effect sizes.	1998	7/11	15/235 (Canada)	Not reported	1/235

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The effect of different intervention strategies for implementing clinical guidelines in hospitals(86)	Generally effective results were demonstrated for comparisons of multi-faceted interventions vs. control, multi-faceted interventions vs. distribution of educational materials, multi-faceted interventions vs. educational meetings and multi-faceted interventions vs. multi-faceted interventions for improving appropriateness of care.	1998	5/11	Not reported	Not reported	4/53
	The effects of introducing clinical practice guidelines in nursing, midwifery, and other professions allied to medicine(83)	There was insufficient evidence for multi-faceted interventions.	1996	8/11	1/18 (Canada)	Not reported	1/18
	The cost-effectiveness of two implementation strategies (patient-directed and professional-directed) compared with usual hospital outpatient care(37)	Both guideline implementation strategies in secondary care are cost-effective compared with current care, by Dutch standards, for these patients.	n/a (cost-effectiveness study)				
	A controlled trial of a multi-faceted intervention versus usual care for managing diabetes(38)	There were no changes in healthcare utilization or costs between the two firms.	n/a (cost-effectiveness study)				

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
Clinical information systems that link patient information, guideline recommendations, etc., and that provide the ability to compare performance with other providers, set reminders, and generate routine performance feedback.	The effects of information system design, quality, components, setting, and other factors on care processes, quality outcomes, and health care costs(41)	Components of systems correlated with positive results included: connection to a broad electronic health record system; order entry, especially when focused on the care team, specific to disease and allowing longitudinal care planning (such as specialist or case manager referrals); and population-based reporting and feedback (such as reporting back unfinished care plan elements). Decision support in the form of computerized prompts was found to be important but was significantly less likely than other technologies to bring success. Barriers to using informatics systems to improve care for chronic disease include costs, data privacy and security, and failure to consider workflow.	2005	4/11	Not reported	Not reported	48/109
	How emerging interactive information technology has been used to enhance care for adults with type 2 diabetes(31)	Information technology may assist with improving health outcomes related to diabetes by improving processes of care for type 2 diabetes patients, as indicated by the significant improvements in health care utilization.	2004	6/11	Not reported	Not reported	26/26

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The impact of automated information interventions on diabetes care and patient outcomes(32)	Computer-generated information for use during clinician-patient encounters improved compliance with recommended diabetes care for rates of routine diabetes care, HbA1c determinations, eye and foot examination, and other procedures. Three of four studies showed significant improvement on an overall compliance measure.	Not reported (published in 2004)	7/11	1/44 (Canada but not in Ontario)	0/44	44/44
	The effect of the use of computer-based systems on the metabolic control of patients with diabetes(87)	The results showed a significant reduction in HbA1c from baseline to follow-up in the treatment group compared to control.	2000	3/11	Not reported	Not reported	Not reported
	The effects of computerized clinical decision support systems(88)	Many computerized clinical decision support systems improve practitioner performance. However, the effects on patient outcomes remain understudied and, when studied, are inconsistent.	1998	5/11	5/100 (Canada)	Not reported	10/100
	The impact of the electronic health record on cost (i.e., payments to providers) and process measures of quality of care(89)	No measurable impact on the short-term cost per episode was found.	n/a (cost-effectiveness study)	n/a	n/a	n/a	n/a
	To determine the cost-benefit of the Intelligent Control Assistant for Diabetes (INCA), which is a project aimed at improving diabetes therapy by creating a personal closed-loop system interacting with telemedical remote control(90)	Using INCA based on the clinical study setting would raise yearly costs by euro 2233. Twenty-four percent of the INCA costs are generated by the continuous blood glucose measurement device and 5% by IT devices and services.	n/a (cost-effectiveness study)	n/a	n/a	n/a	n/a

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
Financial incentives for primary healthcare providers who provide cost effective programs, services, and drugs	The effects of target payments in primary healthcare(35)	The use of target payments in the remuneration of primary healthcare physicians was associated with improvements in immunization rates, but the increase was statistically significant in only one of the two studies.	2006	10/11	0/6	0/6	0/6
	The effects of results-based financing in low- and middle-income countries(91)	Financial incentives targeting recipients of healthcare and individual healthcare providers are effective in the short term. However, there is less evidence that financial incentives can sustain long-term changes. Risks associated with results-based financing include: motivating unintended behaviours, ignoring important tasks that are not rewarded with incentives, improving or cheating on reporting rather than improving performance, widening the resource gap between rich and poor, and dependency on financial incentives.	2006	n/a (overview of reviews)	3/10 (Canada)	Not reported	0/10
	The effects of physician-level and provider-level financial incentives(92)	Physician-level financial incentives had partial or positive effects on measures of quality in five of six studies and provider-level financial incentives had similar effects in seven of nine studies. Financial incentives had unintended effects in four studies. No studies examined the optimal duration of financial incentives or the persistence of their effects after termination.	2005	6/11	Not reported	Not reported	1/17

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The effects of performance-based payment for prescription drug prescribing(93)	No studies on the effects of performance-based payments or other policies were found despite an exhaustive search.	2004		0/16	Not reported	0/16
	The effects of pay-for-performance(94)	Pay-for-performance yielded no effects in all but two well-designed studies and positive effects in the two well-designed studies.	2003	5/10	Not reported	Not reported	0/7
	The effects of financial incentives on cost, process, and outcomes of care(96)	There is preliminary evidence to suggest that financial incentives may be effective when used in combination with specific physician payment and health system financing arrangements.	1999	4/11	Not reported	Not reported	0/89
	The effects of target payments on primary healthcare physician behaviour(94)	The evidence of the impact of target payment on immunization rates was inconclusive.	1997	7/11	1/4 (Ontario)	Not reported	0/4

Appendix 2: Systematic reviews relevant to Option 2 – Expand multidisciplinary diabetes education and management centres

Option element	Focus of systematic review / cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
Appropriateness criteria to facilitate access to diabetes education and management centres for those most in need	No reviews of effects were found that specifically addressed appropriateness criteria. However, one review was identified that examined ways to deliver care to people from under-served, low-income, and ethnic minority populations and overcome barriers to attending group-based meetings (e.g., phone calls).	n/a	n/a	n/a	n/a	n/a	n/a
	To evaluate dimensions of diabetes self-management interventions in disadvantaged populations(40)	Diabetes self-management interventions were effective in the short-term for behavioural and psychological outcomes in half the studies. However, fewer differences between intervention and control groups were found at follow-up (12 months or more).	Not reported	4/10	1/10 (Canada, but not from Ontario)	10/10 (low SES groups)	10/10
Diabetes education and management centres linked to primary healthcare teams	No reviews were identified that specifically address diabetes education and management centres linked to primary healthcare teams. However, the authors identified evidence about a few potential ways linkages can be made (e.g., community health workers, quality improvement strategies, and continuity of care interventions).	n/a	n/a	n/a	n/a	n/a	n/a
	The effectiveness of quality improvement strategies on glycemic control in adults with type 2 diabetes(45)	Team changes and case management were associated with significant reductions in HbA1c. Specific team changes associated with improved HbA1c values were multidisciplinary teams, shared care, and expansion or revision of professional roles.	2006	8/11	2/66 (Canada)	1/66 (low SES groups)	66/66
	The effectiveness of interventions designed to improve the management of	There were no consistent improvements in health outcomes,	2006	8/11	0/20	Not reported	5/20

Option element	Focus of systematic review /cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	chronic conditions across the primary-specialty interface(49)	psychosocial measures, health service utilization, or patient satisfaction.					
	The effectiveness of community health workers in supporting the care of persons with diabetes(44)	There are some preliminary data demonstrating improvements in participant knowledge and behaviour when diabetes programs include community health workers as team members.	2004	9/11	Not reported	0/25	18/25
	The effect of sustained continuity of care (SCOC) on the quality of patient care(97)	SCOC is associated with patient satisfaction, decreased hospitalizations and emergency department visits, and improved receipt of preventive services. No studies documented negative effects of increased SCOC on quality of care.	2002	7/11	0/18	Not reported	2/18
	The effect of a specialist telemedicine intervention for improving diabetes care using the chronic care model.(46)	The intervention group incurred lower costs but not in diabetes-related costs.	n/a (cost-effectiveness study)	n/a	n/a	n/a	n/a
Training and education for primary healthcare providers about tailoring management programs to meet specific patient needs	No reviews were identified that specifically address training and education for primary healthcare providers about tailoring management programs to meet specific patient needs. However, the evidence presented in Appendix 1 about tools to support dissemination of clinical practice guidelines will be relevant here as well.	n/a	n/a	n/a	n/a	n/a	n/a
Multidisciplinary diabetes programs for high-risk groups	No reviews were identified that specifically addressed multidisciplinary diabetes programs for high risk groups. However, some evidence was identified about diabetes programs/interventions for high risk groups.	n/a	n/a	n/a	n/a	n/a	n/a

Option element	Focus of systematic review /cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	The effectiveness of healthcare interventions on improving health outcomes and/or reducing diabetes health disparities among racial/ethnic minorities with diabetes(42)	Evidence supports the use of interventions for improving health outcomes and/or reducing diabetes health disparities among racial/ethnic minorities with diabetes that target patients (primarily through culturally tailored programs), providers (especially through one-on-one feedback and education), and health systems (particularly with nurse case managers and nurse clinicians).	2006	10/11	Not reported	42/42 (low SES groups)	42/42
	The effectiveness of primary healthcare interventions on glycemic control and cardiovascular risk factors in minority ethics groups(43)	Case management (including community health workers and nurses) improved glycemic control and small reductions in other cardiovascular risk factors were reported for case management and the use of link workers to guide individuals with diabetes.	2006	6/11	0/9	9/9 (9 on low SES groups including 5 on new immigrants)	9/9
	To compare selected outcomes for a new chronic disease management program involving a nurse practitioner - physician team with those of an existing model of care.(47)	Although 1-year costs for personnel were higher in the team-treated group, participants experienced significant improvements in mean HbA1c (- 0.7%, p = 0.02) and HDL-c (+ 2.6 mg dL(- 1), p = 0.02). Additionally, satisfaction with care improved significantly for team-treated subjects in several sub-scales whereas the mean change over time in HRQoL did not differ significantly between groups.	n/a (cost-effectiveness study)	n/a	n/a	n/a	n/a

Option element	Focus of systematic review /cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
	To estimate the cost-effectiveness of a multidisciplinary diabetes management program using the Ontario Diabetes Economic Model (ODEM)(48)	The ODEM estimated that improvements in risk factors prevented 16.2/1000 deaths and 15.5/1000 myocardial infarctions, and led to a 50% relative risk reduction in first amputations. The lifetime incremental cost per QALY gained in the base case was \$5992.	n/a (cost-effectiveness study)	n/a	n/a	n/a	n/a

Appendix 3: Systematic reviews relevant to Option 3 - Support primary healthcare practices in using an integrated model of chronic disease management

Option element	Focus of systematic review/cost-effectiveness study	Key findings	Year of last search	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	Proportion of studies that focused on diabetes
Integrated chronic disease management programs in primary healthcare (including diabetes)	The effects of incorporating most of the Chronic Care Model elements(55)	Incorporating most or all of the Chronic Care Model elements improved quality of care and outcomes for patients with various chronic illnesses.	2008	6/11	Not reported	Not reported	Not reported
	The clinical and economic effects of disease management in patients with chronic diseases(56)	Disease management appeared to improve patient satisfaction, patient adherence, and disease control. Few studies demonstrated a notable reduction in costs.	2001	6/11	Not reported	1/102 (low SES groups)	21/102
	The effect of disease management programs for patient with diabetes on processes and outcomes of care(53)	Disease management program effects included reduced HbA1c levels, and improved screening for retinopathy and foot lesions.	2001	6/11	0/24	Not reported	24/24
	The effectiveness and economic efficiency of disease management for adults with diabetes(54)	Disease management programs were found to be effective for: managing glycemic control; screening for retinopathy, foot lesions, and peripheral neuropathy and proteinuria; and on monitoring of lipid concentrations.	2000	5/11	Not reported	Not reported	Not reported
Learning collaboratives for diabetes management	The effectiveness of quality improvement collaboratives on quality of care(57)	Quality improvement collaboratives showed moderate positive results on care processes and outcomes of care.	2006	7/11	Not reported	Not reported	Not reported