



1. Strategies for Improving Care

American Diabetes Association

Diabetes Care 2016;39(Suppl. 1):S6–S12 | DOI: 10.2337/dc16-S004

Recommendations

- A patient-centered communication style that incorporates patient preferences, assesses literacy and numeracy, and addresses cultural barriers to care should be used. **B**
- Treatment decisions should be timely and based on evidence-based guidelines that are tailored to individual patient preferences, prognoses, and comorbidities. **B**
- Care should be aligned with components of the Chronic Care Model to ensure productive interactions between a prepared proactive practice team and an informed activated patient. **A**
- When feasible, care systems should support team-based care, community involvement, patient registries, and decision support tools to meet patient needs. **B**

DIABETES CARE CONCEPTS

In the following sections, different components of the clinical management of patients with (or at risk for) diabetes are reviewed. Clinical practice guidelines are key to improving population health; however, for optimal outcomes, diabetes care must be individualized for each patient. The American Diabetes Association highlights the following three themes that clinicians, policymakers, and advocates should keep in mind:

1. **Patient-Centeredness:** Practice recommendations, whether based on evidence or expert opinion, are intended to guide an overall approach to care. The science and art of medicine come together when the clinician is faced with making treatment recommendations for a patient who would not have met eligibility criteria for the studies on which guidelines were based. Recognizing that one size does not fit all, these Standards provide guidance for when and how to adapt recommendations. Because patients with diabetes have greatly increased risk for cardiovascular disease, a patient-centered approach should include a comprehensive plan to reduce cardiovascular risk by addressing blood pressure and lipid control, smoking prevention and cessation, weight management, physical activity, and healthy lifestyle choices.
2. **Diabetes Across the Life Span:** An increasing proportion of patients with type 1 diabetes are adults. For less salutary reasons, the incidence of type 2 diabetes is increasing in children and young adults. Patients with type 1 diabetes and those with type 2 diabetes are living well into older age, a stage of life for which there is little evidence from clinical trials to guide therapy. All these demographic changes highlight another challenge to high-quality diabetes care, which is the need to improve coordination between clinical teams as patients transition through different stages of the life span.
3. **Advocacy for Patients With Diabetes:** Advocacy can be defined as active support and engagement to advance a cause or policy. Advocacy is needed to improve the lives of patients with (or at risk for) diabetes. Given the tremendous toll that obesity, physical inactivity, and smoking have on the health of patients with diabetes, efforts are needed to address and change the societal determinants at the root of these problems. Within the narrower domain of clinical practice guidelines, the application of evidence level grading to practice recommendations can help to identify areas that require more research (1). Refer to Section 14 “Diabetes Advocacy.”

Suggested citation: American Diabetes Association. Strategies for improving care. Sec. 1. In Standards of Medical Care in Diabetes—2016. Diabetes Care 2016;39(Suppl. 1):S6–S12

© 2016 by the American Diabetes Association. Readers may use this article as long as the work is properly cited, the use is educational and not for profit, and the work is not altered.

CARE DELIVERY SYSTEMS

There has been steady improvement in the proportion of patients with diabetes treated with statins and achieving recommended levels of A1C, blood pressure, and LDL cholesterol in the last 10 years (2). The mean A1C nationally has declined from 7.6% (60 mmol/mol) in 1999–2002 to 7.2% (55 mmol/mol) in 2007–2010 based on the National Health and Nutrition Examination Survey (NHANES), with younger adults less likely to meet treatment targets compared with older adults (2). This has been accompanied by improvements in cardiovascular outcomes and has led to substantial reductions in end-stage microvascular complications.

Nevertheless, 33–49% of patients still do not meet targets for glycemic, blood pressure, or cholesterol control, and only 14% meet targets for all three measures and nonsmoking status (2). Evidence also suggests that progress in cardiovascular risk factor control (particularly tobacco use) may be slowing (2,3). Certain patient groups, such as young adults and patients with complex comorbidities, financial or other social hardships, and/or limited English proficiency, may present particular challenges to goal-based care (4–6). Even after adjusting for patient factors, the persistent variation in quality of diabetes care across providers and practice settings indicates that there is potential for substantial system-level improvements.

Chronic Care Model

Numerous interventions to improve adherence to the recommended standards have been implemented. However, a major barrier to optimal care is a delivery system that is often fragmented, lacks clinical information capabilities, duplicates services, and is poorly designed for the coordinated delivery of chronic care. The Chronic Care Model (CCM) has been shown to be an effective framework for improving the quality of diabetes care (7).

Six Core Elements

The CCM includes six core elements for the provision of optimal care of patients with chronic disease:

1. Delivery system design (moving from a *reactive* to a *proactive* care delivery system where planned visits are coordinated through a team-based approach)

2. Self-management support
3. Decision support (basing care on evidence-based, effective care guidelines)
4. Clinical information systems (using registries that can provide patient-specific and population-based support to the care team)
5. Community resources and policies (identifying or developing resources to support healthy lifestyles)
6. Health systems (to create a quality-oriented culture)

Redefining the roles of the health care delivery team and promoting self-management on the part of the patient are fundamental to the successful implementation of the CCM (8). Collaborative, multidisciplinary teams are best suited to provide care for people with chronic conditions such as diabetes and to facilitate patients' self-management (9–11).

Key Objectives

The National Diabetes Education Program (NDEP) maintains an online resource (www.betterdiabetescare.nih.gov) to help health care professionals to design and implement more effective health care delivery systems for those with diabetes. Three specific objectives, with references to literature outlining practical strategies to achieve each, are as follows:

Objective 1: Optimize Provider and Team Behavior

The care team should prioritize timely and appropriate intensification of lifestyle and/or pharmacological therapy for patients who have not achieved beneficial levels of glucose, blood pressure, or lipid control (12). Strategies such as explicit goal setting with patients (13); identifying and addressing language, numeracy, or cultural barriers to care (14–17); integrating evidence-based guidelines and clinical information tools into the process of care (18–20); and incorporating care management teams including nurses, pharmacists, and other providers (21,22) have each been shown to optimize provider and team behavior and thereby catalyze reductions in A1C, blood pressure, and LDL cholesterol.

Objective 2: Support Patient Behavior Change

Successful diabetes care requires a systematic approach to supporting patients' behavior change efforts, including

1. Healthy lifestyle choices (physical activity, healthy eating, tobacco cessation, weight management, and effective coping)
2. Disease self-management (taking and managing medications and, when clinically appropriate, self-monitoring of glucose and blood pressure)
3. Prevention of diabetes complications (self-monitoring of foot health; active participation in screening for eye, foot, and renal complications; and immunizations)

High-quality diabetes self-management education (DSME) has been shown to improve patient self-management, satisfaction, and glucose control. National DSME standards call for an integrated approach that includes clinical content and skills, behavioral strategies (goal setting, problem solving), and engagement with psychosocial concerns (23).

Objective 3: Change the Care System

An institutional priority in most successful care systems is providing high quality of care (24). Changes that have been shown to increase quality of diabetes care include basing care on evidence-based guidelines (18); expanding the role of teams to implement more intensive disease management strategies (6,21,25); redesigning the care process (26); implementing electronic health record tools (27,28); activating and educating patients (29,30); removing financial barriers and reducing patient out-of-pocket costs for diabetes education, eye exams, self-monitoring of blood glucose, and necessary medications (6); and identifying/developing/engaging community resources and public policy that support healthy lifestyles (31).

Initiatives such as the Patient-Centered Medical Home show promise for improving outcomes through coordinated primary care and offer new opportunities for team-based chronic disease care (32). Additional strategies to improve diabetes care include reimbursement structures that, in contrast to visit-based billing, reward the provision of appropriate and high-quality care (33), and incentives that accommodate personalized care goals (6,34).

Optimal diabetes management requires an organized, systematic approach

and the involvement of a coordinated team of dedicated health care professionals working in an environment where patient-centered high-quality care is a priority (6).

WHEN TREATMENT GOALS ARE NOT MET

In general, providers should seek evidence-based approaches that improve the clinical outcomes and quality of life of patients with diabetes. Recent reviews of quality improvement strategies in diabetes care (24,35,36) have not identified a particular approach that is more effective than others. However, the Translating Research Into Action for Diabetes (TRIAD) study provided objective data from large managed care systems demonstrating effective tools for specific targets (6). TRIAD found it useful to divide interventions into those that affected **processes of care** and **intermediate outcomes**.

Processes of Care

Processes of care included periodic testing of A1C, lipids, and urinary albumin; examining the retina and feet; advising on aspirin use; and smoking cessation. TRIAD results suggest that providers control these activities. Performance feedback, reminders, and structured care (e.g., guidelines, formal case management, and patient education resources) may influence providers to improve processes of care (6).

Intermediate Outcomes and Treatment Intensification

For intermediate outcomes, such as A1C, blood pressure, and lipid goals, tools that improved processes of care did not perform as well in addressing barriers to treatment intensification and adherence (6). In 35% of cases, uncontrolled A1C, blood pressure, or lipids were associated with a lack of treatment intensification, defined as a failure to either increase a drug dose or change a drug class (37). Treatment intensification was associated with improvement in A1C, hypertension, and hyperlipidemia control (38). A large multicenter study confirmed the strong association between treatment intensification and improved A1C (39).

Intermediate Outcomes and Adherence

In 23% of cases, poor adherence was associated with uncontrolled A1C, blood

pressure, or lipids (40). Although there are many ways to measure adherence (40), Medicare uses percent of days covered (PDC), which is a measure of the number of pills prescribed divided by the days between first and last prescriptions. "Adequate" adherence is defined as 80% (40). This metric can be used to find and track poor adherence and help to guide system improvement efforts to overcome the barriers to adherence. Barriers to adherence may include patient factors (remembering to obtain or take medications, fears, depression, or health beliefs), medication factors (complexity, multiple daily dosing, cost, or side effects), and system factors (inadequate follow-up or support).

Improving Adherence

Simplifying a complex treatment regimen may improve adherence. Nurse-directed interventions, home aides, diabetes education, and pharmacy-derived interventions improved adherence but had a very small effect on outcomes, including metabolic control (41). Success in overcoming barriers may be achieved if the patient and provider agree on a targeted treatment for a specific barrier. For example, one study found that when depression was identified as a barrier, agreement on antidepressant treatment subsequently allowed for improvements in A1C, blood pressure, and lipid control (10). Thus, to improve adherence, systems should continually monitor and prevent or treat poor adherence by identifying barriers and implementing treatments that are barrier specific and effective.

A systematic approach to achieving intermediate outcomes involves three steps:

1. **Assess adherence.** Adherence should be addressed as the first priority. If adherence is 80% or above, then treatment intensification should be considered (e.g., up-titration). If medication up-titration is not a viable option, then consider initiating or changing to a different medication class.
2. **Explore barriers** to adherence with the patient/caregiver and find a mutually agreeable approach to overcoming the barriers.
3. **Establish a follow-up plan** that confirms the planned treatment change and assess progress in reaching the target.

TAILORING TREATMENT TO VULNERABLE POPULATIONS

Health Disparities

The causes of health disparities are complex and include societal issues such as institutional racism, discrimination, socioeconomic status, poor access to health care, and lack of health insurance. Disparities are particularly well documented for cardiovascular disease.

Ethnic/Cultural/Sex/Socioeconomic Differences

Ethnic, cultural, religious, and sex differences and socioeconomic status may affect diabetes prevalence and outcomes. Type 2 diabetes develops more frequently in women with prior gestational diabetes mellitus (42), in individuals with hypertension or dyslipidemia, and in certain racial/ethnic groups (African American, Native American, Hispanic/Latino, and Asian American) (43).

Access to Health Care

Ethnic, cultural, religious, sex, and socioeconomic differences affect health care access and complication risk in people with diabetes. Recent studies have recommended lowering the BMI cut point for testing for Asian Americans to ≥ 23 kg/m² (44). Women with diabetes, compared with men with diabetes, have a 40% greater risk of incident coronary heart disease (45). Socioeconomic and ethnic inequalities exist in the provision of health care to individuals with diabetes (46). As a result, children with type 1 diabetes from racial/ethnic populations with lower socioeconomic status are at risk for poor metabolic control and poor emotional functioning (47). Significant racial differences and barriers exist in self-monitoring and outcomes (48).

Addressing Disparities

Therefore, diabetes management requires individualized, patient-centered, and culturally appropriate strategies. To overcome disparities, community health workers (49), peers (50,51), and lay leaders (52) may assist in the delivery of DSME and diabetes self-management support services (53). Strong social support leads to improved clinical outcomes, reduced psychosocial symptomatology, and adoption of healthier lifestyles (54). Structured interventions, tailored to ethnic populations that integrate culture, language, religion, and literacy skills, positively influence patient outcomes (55).

To decrease disparities, all providers and groups are encouraged to use the National Quality Forum's National Voluntary Consensus Standards for Ambulatory Care—Measuring Healthcare Disparities (56).

Lack of Health Insurance

Not having health insurance affects the processes and outcomes of diabetes care. Individuals without insurance coverage for blood glucose monitoring supplies have a 0.5% higher A1C than those with coverage (57). The affordable care act has improved access to health care; however, many remain without coverage. In a recent study of predominantly African American or Hispanic uninsured patients with diabetes, 50–60% were hypertensive, but only 22–37% had systolic blood pressure controlled by treatments to under 130 mmHg (58).

Food Insecurity

Recommendations

- Providers should evaluate hyperglycemia and hypoglycemia in the context of food insecurity and propose solutions accordingly. **A**
- Providers should recognize that homelessness, poor literacy, and poor numeracy often occur with food insecurity, and appropriate resources should be made available for patients with diabetes. **A**

Food insecurity (FI) is the unreliable availability of nutritious food and the inability to consistently obtain food without resorting to socially unacceptable practices. Over 14% (or one out of every seven people in the U.S.) are food insecure. The rate is higher in some racial/ethnic minority groups including African American and Latino populations, in low-income households, and in homes headed by a single mother. FI may involve a tradeoff between purchasing nutritious food for inexpensive and more energy- and carbohydrate-dense processed foods.

In people with FI, interventions should focus on preventing diabetes and, in those with diabetes, limiting hyperglycemia and preventing hypoglycemia. The risk for type 2 diabetes is increased two-fold in those with FI. The risks of uncontrolled hyperglycemia and severe hypoglycemia are increased in those with diabetes who are also food insecure.

Providers should recognize that FI complicates diabetes management and seek local resources that can help patients and the parents of patients with diabetes to more regularly obtain nutritious food (59).

Food Insecurity and Hyperglycemia. Hyperglycemia is more common in those with diabetes and FI. Reasons for this include the steady consumption of carbohydrate-rich processed foods, binge eating, not filling antidiabetes medication prescriptions owing to financial constraint, and anxiety/depression that lead to poor diabetes self-care behaviors. Providers should be well versed in these risk factors for hyperglycemia and take practical steps to alleviate them in order to improve glucose control.

Food Insecurity and Hypoglycemia

Type 1 Diabetes. Individuals with type 1 diabetes and FI may develop hypoglycemia as a result of inadequate or erratic carbohydrate consumption following insulin administration. Long-acting insulin, as opposed to shorter-acting insulin that may peak when food is not available, may lower the risk for hypoglycemia in those with FI. Short-acting insulin analogs, preferably delivered by a pen, may be used immediately after consumption of a meal, whenever food becomes available. Unfortunately, the greater cost of insulin analogs should be weighed against their potential advantages. Caring for those with type 1 diabetes in the setting of FI may mirror “sick day” management protocols.

Type 2 Diabetes. Those with type 2 diabetes and FI can develop hypoglycemia for similar reasons after taking certain oral hypoglycemic agents. If using a sulfonylurea, glipizide is the preferred choice due to the shorter half-life. Glipizide can be taken immediately before meal consumption, thus limiting its tendency to produce hypoglycemia as compared with longer-acting sulfonylureas (e.g., glyburide).

Homelessness. Homelessness often accompanies the most severe form of FI. Therefore, providers who care for those with FI who are uninsured and homeless and individuals with poor literacy and numeracy should be well versed or have access to social workers to facilitate temporary housing for their patients as a means to prevent and control diabetes.

Additionally, homeless patients with diabetes need secure places to keep their diabetes supplies and refrigerator access to properly store their insulin.

Literacy and Numeracy Deficiencies. FI and diabetes are more common among non-English speaking individuals and those with poor literacy and numeracy skills. Therefore, it is important to consider screening for FI, proper housing, and diabetes in this population. Programs that see such patients should work to develop services in multiple languages with the specific goal of preventing diabetes and building diabetes awareness in people who cannot easily read or write in English.

Cognitive Dysfunction

Recommendations

- Intensive glucose control is not advised for the improvement of poor cognitive function in hyperglycemic individuals with type 2 diabetes. **B**
- In individuals with poor cognitive function or severe hypoglycemia, glycemic therapy should be tailored to avoid significant hypoglycemia. **C**
- In individuals with diabetes at high cardiovascular risk, the cardiovascular benefits of statin therapy outweigh the risk of cognitive dysfunction. **A**
- If a second-generation antipsychotic medication is prescribed, changes in weight, glycemic control, and cholesterol levels should be carefully monitored and the treatment regimen should be reassessed. **C**

Dementia

The most severe form of cognitive dysfunction is dementia. A recent meta-analysis of prospective observational studies in people with diabetes showed a 73% increased risk of all types of dementia, a 56% increased risk of Alzheimer dementia, and 127% increased risk of vascular dementia compared with individuals without diabetes (60). The reverse is also true: people with Alzheimer dementia are more likely to develop diabetes than people without Alzheimer dementia.

Hyperglycemia. In those with type 2 diabetes, the degree and duration of hyperglycemia are related to dementia. More rapid cognitive decline is associated with both increased A1C and longer duration of diabetes (61). The Action to Control Cardiovascular Risk in Diabetes (ACCORD) study found that each 1%

higher A1C level was associated with lower cognitive function in individuals with type 2 diabetes (62). However, the ACCORD study found no difference in cognitive outcomes between intensive and standard glycemic control, supporting the recommendation that intensive glucose control should not be advised for the improvement of cognitive function in individuals with type 2 diabetes (63).

Hypoglycemia. In type 2 diabetes, severe hypoglycemia is associated with reduced cognitive function, and those with poor cognitive function have more severe hypoglycemia. In a long-term study of older patients with type 2 diabetes, individuals with one or more recorded episode of severe hypoglycemia had a stepwise increase in risk of dementia (64). Likewise, the ACCORD trial found that as cognitive function decreased, the risk of severe hypoglycemia increased (65). Tailoring glycemic therapy may help to prevent hypoglycemia in individuals with cognitive dysfunction.

Nutrition. In one study, adherence to the Mediterranean diet correlated with improved cognitive function (66). However, a recent Cochrane review found insufficient evidence to recommend any dietary change for the prevention or treatment of cognitive dysfunction (67).

Statins. Given the controversy over a potential link between statins and dementia, it is worth noting that a Cochrane systematic review has reported that data do not support an adverse effect of statins on cognition. The U.S. Food and Drug Administration (FDA) postmarketing surveillance databases have also revealed a low reporting rate for cognitive-related adverse events, including cognitive dysfunction or dementia, with statin therapy, similar to rates seen with other commonly prescribed cardiovascular medications (68). Therefore individuals with diabetes and a high risk for cardiovascular disease should be placed on statin therapy regardless of cognitive status.

Mental Illness

Severe mental disorder that includes schizophrenia, bipolar disorder, and depression is increased 1.7-fold in people with diabetes (69). The prevalence of type 2 diabetes is two–three times higher in people with schizophrenia, bipolar disorder, and schizoaffective disorder than in the general population (70). A meta-

analysis showed a significantly increased risk of incident depression (relative risk [RR] = 1.15), and, in turn, depression was associated with a significantly increased risk of diabetes (RR = 1.6) (71). Depression and psychosocial issues are discussed more extensively in Section 3 “Foundations of Care and Comprehensive Medical Evaluation.”

Medications

Diabetes medications are effective, regardless of mental health status. Treatments for depression are effective in patients with diabetes, and treating depression may improve short-term glycemic control (72). If a second-generation antipsychotic medication is prescribed, changes in weight, glycemic control, and cholesterol levels should be carefully monitored and the treatment regimen should be reassessed if significant changes are noted (73). Awareness of an individual’s medication profile, especially if an individual takes psychotropic medications, is key to effective management.

Diabetes Care in Patients With HIV

Recommendation

- Patients with HIV should be screened for diabetes and prediabetes with a fasting glucose level before starting antiretroviral therapy and 3 months after starting or changing it. If initial screening results are normal, checking fasting glucose each year is advised. If prediabetes is detected, continue to measure levels every 3–6 months to monitor for progression to diabetes. **E**

Diabetes risk is increased with certain protease inhibitors (PIs) and nucleoside reverse transcriptase inhibitors (NRTIs). New-onset diabetes is estimated to occur in more than 5% of HIV-infected patients on PIs, whereas more than 15% may have prediabetes (74). PIs are associated with insulin resistance and may also lead to apoptosis of pancreatic β -cells. NRTIs also affect fat distribution (both lipohypertrophy and lipodystrophy), which is associated with insulin resistance.

Individuals with HIV are at higher risk for developing prediabetes and diabetes on antiretroviral (ARV) therapies, so a proper screening protocol is recommended (75). In those with prediabetes, weight loss through healthy nutrition and physical activity may reduce the

progression toward diabetes. Among HIV patients with diabetes, preventive health care using an approach similar to that used in patients without HIV is critical to reduce the risks of microvascular and macrovascular complications.

For patients with HIV and ARV-associated hyperglycemia, it may be appropriate to consider discontinuing the problematic ARV agents if safe and effective alternatives are available (76). Before making ARV substitutions, carefully consider the possible effect on HIV virological control and the potential adverse effects of new ARV agents. In some cases, antidiabetes agents may still be necessary.

References

1. Grant RW, Kirkman MS. Trends in the evidence level for the American Diabetes Association’s “Standards of Medical Care in Diabetes” from 2005 to 2014. *Diabetes Care* 2015;38:6–8
2. Ali MK, Bullard KM, Saaddine JB, Cowie CC, Imperatore G, Gregg EW. Achievement of goals in U.S. diabetes care, 1999–2010. *N Engl J Med* 2013;368:1613–1624
3. Wang J, Geiss LS, Cheng YJ, et al. Long-term and recent progress in blood pressure levels among U.S. adults with diagnosed diabetes, 1988–2008. *Diabetes Care* 2011;34:1579–1581
4. Kerr EA, Heisler M, Krein SL, et al. Beyond comorbidity counts: how do comorbidity type and severity influence diabetes patients’ treatment priorities and self-management? *J Gen Intern Med* 2007;22:1635–1640
5. Fernandez A, Schillinger D, Warton EM, et al. Language barriers, physician-patient language concordance, and glycemic control among insured Latinos with diabetes: the Diabetes Study of Northern California (DISTANCE). *J Gen Intern Med* 2011;26:170–176
6. TRIAD Study Group. Health systems, patients factors, and quality of care for diabetes: a synthesis of findings from the TRIAD study. *Diabetes Care* 2010;33:940–947
7. Stelfox M, Dipnarine K, Stopka C. The Chronic Care Model and diabetes management in US primary care settings: a systematic review. *Prev Chronic Dis* 2013;10:E26
8. Coleman K, Austin BT, Brach C, Wagner EH. Evidence on the Chronic Care Model in the new millennium. *Health Aff (Millwood)* 2009;28:75–85
9. Piatt GA, Anderson RM, Brooks MM, et al. 3-year follow-up of clinical and behavioral improvements following a multifaceted diabetes care intervention: results of a randomized controlled trial. *Diabetes Educ* 2010;36:301–309
10. Katon WJ, Lin EHB, Von Korff M, et al. Collaborative care for patients with depression and chronic illnesses. *N Engl J Med* 2010;363:2611–2620
11. Parchman ML, Zeber JE, Romero RR, Pugh JA. Risk of coronary artery disease in type 2 diabetes and the delivery of care consistent with the chronic care model in primary care settings: a STARNet study. *Med Care* 2007;45:1129–1134

12. Davidson MB. How our current medical care system fails people with diabetes: lack of timely, appropriate clinical decisions. *Diabetes Care* 2009;32:370–372
13. Grant RW, Pabon-Nau L, Ross KM, Youatt EJ, Pandiscio JC, Park ER. Diabetes oral medication initiation and intensification: patient views compared with current treatment guidelines. *Diabetes Educ* 2011;37:78–84
14. Schillinger D, Piette J, Grumbach K, et al. Closing the loop: physician communication with diabetic patients who have low health literacy. *Arch Intern Med* 2003;163:83–90
15. Rosal MC, Ockene IS, Restrepo A, et al. Randomized trial of a literacy-sensitive, culturally tailored diabetes self-management intervention for low-income Latinos: Latinos en Control. *Diabetes Care* 2011;34:838–844
16. Osborn CY, Cavanaugh K, Wallston KA, et al. Health literacy explains racial disparities in diabetes medication adherence. *J Health Commun* 2011;16(Suppl. 3):268–278
17. Rothman R, Malone R, Bryant B, Horlen C, DeWalt D, Pignone M. The relationship between literacy and glycemic control in a diabetes disease-management program. *Diabetes Educ* 2004;30:263–273
18. O'Connor PJ, Bodkin NL, Fradkin J, et al. Diabetes performance measures: current status and future directions. *Diabetes Care* 2011;34:1651–1659
19. Garg AX, Adhikari NKJ, McDonald H, et al. Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review. *JAMA* 2005;293:1223–1238
20. Smith SA, Shah ND, Bryant SC, et al.; Evidens Research Group. Chronic Care Model and shared care in diabetes: randomized trial of an electronic decision support system. *Mayo Clin Proc* 2008;83:747–757
21. Jaffe MG, Lee GA, Young JD, Sidney S, Go AS. Improved blood pressure control associated with a large-scale hypertension program. *JAMA* 2013;310:699–705
22. Stone RA, Rao RH, Sevick MA, et al. Active care management supported by home telemonitoring in veterans with type 2 diabetes: the DiaTel randomized controlled trial. *Diabetes Care* 2010;33:478–484
23. Powers MA, Bardsley J, Cypress M, et al. Diabetes self-management education and support in type 2 diabetes: a joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *Diabetes Care* 2015;38:1372–1382
24. Tricco AC, Ivers NM, Grimshaw JM, et al. Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis. *Lancet* 2012;379:2252–2261
25. Peikes D, Chen A, Schore J, Brown R. Effects of care coordination on hospitalization, quality of care, and health care expenditures among Medicare beneficiaries: 15 randomized trials. *JAMA* 2009;301:603–618
26. Feifer C, Nemeth L, Nietert PJ, et al. Different paths to high-quality care: three archetypes of top-performing practice sites. *Ann Fam Med* 2007;5:233–241
27. Reed M, Huang J, Graetz I, et al. Outpatient electronic health records and the clinical care and outcomes of patients with diabetes mellitus. *Ann Intern Med* 2012;157:482–489
28. Cebul RD, Love TE, Jain AK, Hebert CJ. Electronic health records and quality of diabetes care. *N Engl J Med* 2011;365:825–833
29. Battersby M, Von Korff M, Schaefer J, et al. Twelve evidence-based principles for implementing self-management support in primary care. *Jt Comm J Qual Patient Saf* 2010;36:561–570
30. Grant RW, Wald JS, Schnipper JL, et al. Practice-linked online personal health records for type 2 diabetes mellitus: a randomized controlled trial. *Arch Intern Med* 2008;168:1776–1782
31. Pullen-Smith B, Carter-Edwards L, Leathers KH. Community health ambassadors: a model for engaging community leaders to promote better health in North Carolina. *J Public Health Manag Pract* 2008;14(Suppl.):S73–S81
32. Bojdziewski T, Gabbay RA. Patient-centered medical home and diabetes. *Diabetes Care* 2011;34:1047–1053
33. Rosenthal MB, Cutler DM, Feder J. The ACO rules—striking the balance between participation and transformative potential. *N Engl J Med* 2011;365:e6
34. Washington AE, Lipstein SH. The Patient-Centered Outcomes Research Institute—promoting better information, decisions, and health. *N Engl J Med* 2011;365:e31
35. Shojania KG, Grimshaw JM. Evidence-based quality improvement: the state of the science. *Health Aff (Millwood)* 2005;24:138–150
36. Shojania KG, Ranji SR, Shaw LK, et al. Closing the quality gap: a critical analysis of quality improvement strategies (vol. 2: diabetes care). Rockville, MD, Agency for Healthcare Research and Quality, 2004 (Report no. 04-0051-2. AHRQ Technical Reviews)
37. Schmittiel JA, Uratsu CS, Karter AJ, et al. Why don't diabetes patients achieve recommended risk factor targets? Poor adherence versus lack of treatment intensification. *J Gen Intern Med* 2008;23:588–594
38. Selby JV, Uratsu CS, Fireman B, et al. Treatment intensification and risk factor control: toward more clinically relevant quality measures. *Med Care* 2009;47:395–402
39. Raebel MA, Ellis JL, Schroeder EB, et al. Intensification of antihyperglycemic therapy among patients with incident diabetes: a Surveillance Prevention and Management of Diabetes Mellitus (SUPREME-DM) study. *Pharmacoepidemiol Drug Saf* 2014;23:699–710
40. Raebel MA, Schmittiel J, Karter AJ, Konieczny JL, Steiner JF. Standardizing terminology and definitions of medication adherence and persistence in research employing electronic databases. *Med Care* 2013;51(Suppl. 3):S11–S21
41. Vermeire E, Wens J, Van Royen P, Biot Y, Hearnshaw H, Lindenmeyer A. Interventions for improving adherence to treatment recommendations in people with type 2 diabetes mellitus. *Cochrane Database Syst Rev* 2005;2:CD003638
42. Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes: a systematic review. *Diabetes Care* 2002;25:1862–1868
43. Hutchinson RN, Shin S. Systematic review of health disparities for cardiovascular diseases and associated factors among American Indian and Alaska Native populations. *PLoS One* 2014;9:e80973
44. Hsu WC, Araneta MRG, Kanaya AM, Chiang JL, Fujimoto W. BMI cut points to identify at-risk Asian Americans for type 2 diabetes screening. *Diabetes Care* 2015;38:150–158
45. Peters SA, Huxley RR, Woodward M. Diabetes as risk factor for incident coronary heart disease in women compared with men: a systematic review and meta-analysis of 64 cohorts including 858,507 individuals and 28,203 coronary events. *Diabetologia* 2014;57:1542–1551
46. Ricci-Cabello I, Ruiz-Pérez I, Olry de Labry-Lima A, Márquez-Calderón S. Do social inequalities exist in terms of the prevention, diagnosis, treatment, control and monitoring of diabetes? A systematic review. *Health Soc Care Community* 2010;18:572–587
47. Borschuk AP, Everhart RS. Health disparities among youth with type 1 diabetes: a systematic review of the current literature. *Fam Syst Health* 2015;33:297–313
48. Campbell JA, Walker RJ, Smalls BL, Egede LE. Glucose control in diabetes: the impact of racial differences on monitoring and outcomes. *Endocrine* 2012;42:471–482
49. Shah M, Kaselitz E, Heisler M. The role of community health workers in diabetes: update on current literature. *Curr Diab Rep* 2013;13:163–171
50. Heisler M, Vijan S, Makki F, Piette JD. Diabetes control with reciprocal peer support versus nurse care management: a randomized trial. *Ann Intern Med* 2010;153:507–515
51. Long JA, Jahnle EC, Richardson DM, Loewenstein G, Volpp KG. Peer mentoring and financial incentives to improve glucose control in African American veterans: a randomized trial. *Ann Intern Med* 2012;156:416–424
52. Foster G, Taylor SJC, Eldridge SE, Ramsay J, Griffiths CJ. Self-management education programmes by lay leaders for people with chronic conditions. *Cochrane Database Syst Rev* 2007;4:CD005108
53. Siminerio L, Ruppert KM, Gabbay RA. Who can provide diabetes self-management support in primary care? Findings from a randomized controlled trial. *Diabetes Educ* 2013;39:705–713
54. Strom JL, Egede LE. The impact of social support on outcomes in adult patients with type 2 diabetes: a systematic review. *Curr Diab Rep* 2012;12:769–781
55. Zeh P, Sandhu HK, Cannaby AM, Sturt JA. The impact of culturally competent diabetes care interventions for improving diabetes-related outcomes in ethnic minority groups: a systematic review. *Diabet Med* 2012;29:1237–1252
56. National Quality Forum. National Voluntary Consensus Standards for Ambulatory Care—Measuring Healthcare Disparities [Internet], 2008. Available from https://www.qualityforum.org/Publications/2008/03/National_Voluntary_Consensus_Standards_for_Ambulatory_Care%20E2%80%94Measuring_Healthcare_Disparities.aspx. Accessed 2 September 2015
57. Bowker SL, Mitchell CG, Majumdar SR, Toth EL, Johnson JA. Lack of insurance coverage for testing supplies is associated with poorer

- glycemic control in patients with type 2 diabetes. *CMAJ* 2004;171:39–43
58. Baumann LC, Chang M-W, Hoebcke R. Clinical outcomes for low-income adults with hypertension and diabetes. *Nurs Res* 2002;51:191–198
59. Seligman HK, Schillinger D. Hunger and socioeconomic disparities in chronic disease. *N Engl J Med* 2010;363:6–9
60. Gudala K, Bansal D, Schifano F, Bhansali A. Diabetes mellitus and risk of dementia: a meta-analysis of prospective observational studies. *J Diabetes Investig* 2013;4:640–650
61. Rawlings AM, Sharrett AR, Schneider AL, et al. Diabetes in midlife and cognitive change over 20 years: a cohort study. *Ann Intern Med* 2014;161:785–793
62. Cukierman-Yaffe T, Gerstein HC, Williamson JD, et al.; Action to Control Cardiovascular Risk in Diabetes-Memory in Diabetes (ACCORD-MIND) Investigators. Relationship between baseline glycemic control and cognitive function in individuals with type 2 diabetes and other cardiovascular risk factors: the action to control cardiovascular risk in diabetes-memory in diabetes (ACCORD-MIND) trial. *Diabetes Care* 2009;32:221–226
63. Launer LJ, Miller ME, Williamson JD, et al.; ACCORD MIND investigators. Effects of intensive glucose lowering on brain structure and function in people with type 2 diabetes (ACCORD MIND): a randomised open-label substudy. *Lancet Neurol* 2011;10:969–977
64. Whitmer RA, Karter AJ, Yaffe K, Quesenberry CP Jr, Selby JV. Hypoglycemic episodes and risk of dementia in older patients with type 2 diabetes mellitus. *JAMA* 2009;301:1565–1572
65. Punthakee Z, Miller ME, Launer LJ, et al.; ACCORD Group of Investigators; ACCORD-MIND Investigators. Poor cognitive function and risk of severe hypoglycemia in type 2 diabetes: post hoc epidemiologic analysis of the ACCORD trial. *Diabetes Care* 2012;35:787–793
66. Scarmeas N, Stern Y, Mayeux R, Manly JJ, Schupf N, Luchsinger JA. Mediterranean diet and mild cognitive impairment. *Arch Neurol* 2009;66:216–225
67. Ooi CP, Loke SC, Yassin Z, Hamid T-A. Carbohydrates for improving the cognitive performance of independent-living older adults with normal cognition or mild cognitive impairment. *Cochrane Database Syst Rev* 2011;4:CD007220
68. Richardson K, Schoen M, French B, et al. Statins and cognitive function: a systematic review. *Ann Intern Med* 2013;159:688–697
69. Osborn DPJ, Wright CA, Levy G, King MB, Deo R, Nazareth I. Relative risk of diabetes, dyslipidaemia, hypertension and the metabolic syndrome in people with severe mental illnesses: systematic review and metaanalysis. *BMC Psychiatry* 2008;8:84
70. Correll CU, Detraux J, De Lepeleire J, De Hert M. Effects of antipsychotics, antidepressants and mood stabilizers on risk for physical diseases in people with schizophrenia, depression and bipolar disorder. *World Psychiatry* 2015;14:119–136
71. Mezuk B, Eaton WW, Albrecht S, Golden SH. Depression and type 2 diabetes over the lifespan: a meta-analysis. *Diabetes Care* 2008;31:2383–2390
72. Baumeister H, Hutter N, Bengel J. Psychological and pharmacological interventions for depression in patients with diabetes mellitus and depression. *Cochrane Database Syst Rev* 2012;12:CD008381
73. American Diabetes Association; American Psychiatric Association; American Association of Clinical Endocrinologists; North American Association for the Study of Obesity. Consensus development conference on antipsychotic drugs and obesity and diabetes. *Diabetes Care* 2004;27:596–601
74. Dubé MP. Disorders of glucose metabolism in patients infected with human immunodeficiency virus. *Clin Infect Dis* 2000;31:1467–1475
75. Schambelan M, Benson CA, Carr A, et al.; International AIDS Society-USA. Management of metabolic complications associated with antiretroviral therapy for HIV-1 infection: recommendations of an International AIDS Society-USA panel. *J Acquir Immune Defic Syndr* 2002;31:257–275
76. Wohl DA, McComsey G, Tebas P, et al. Current concepts in the diagnosis and management of metabolic complications of HIV infection and its therapy. *Clin Infect Dis* 2006;43:645–653