American Geriatrics Society (AGS) Guidelines for Improving the Care of the Older Adult with Diabetes Mellitus: 2013 Update

DRAFT FOR COMMENTING

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BACKGROUND AND SIGNIFICANCE

Approximately 10.9 million people aged 65 years and older have diabetes mellitus (DM). The prevalence of DM continues to increase in the United States, and older adults have the highest prevalence of any age group. Between 2001 and 2010, the percentage of people with DM increased by 127% (9.1% to 20.7%) for those aged 65–74 years, and 126% (8.9% to 20.1%) for those aged 75 years and older.[1] Of concern is also that rapidly growing segments of the population, older adults who belong to ethnic minority groups, have a high prevalence of DM and a high risk of DM complications.

Older adults with DM have a higher risk of premature death, coronary heart disease, and stroke than those without DM. Consequently, older adults with DM have higher prevalence of poor physical function and quality of life, disability, and frailty. They also commonly have comorbidities, including hypertension or dyslipidemia, that are also risk factors for cardiovascular disease. Care for DM is complex with many self-care recommendations; it is further complicated for older adults with DM because of higher prevalence of several common geriatric syndromes, such as depression, cognitive impairment, urinary incontinence, injurious falls, and persistent pain.[2] Geriatric syndromes can interfere with recommended self-care activities and contribute to loss of independence and frailty. Diabetes mellitus is also believed to lead to accelerated aging that can contribute to decline in functional status and frailty, and may lead to premature disability. Indeed, geriatric syndromes have been found to be common among middle aged and older adults with DM, which makes the screening and detection of geriatric syndromes important for primary care providers.[2] Despite the higher prevalence of geriatric syndromes among older adults with DM, there are few studies of interventions designed to reduce the incidence of many of these syndromes and mitigate their symptoms. Identification and management of these syndromes by primary care providers may improve the management of DM and will help tailor goals of care to individual patients.

Ten years ago, the California Health Care Foundation (CHCF)/American Geriatrics Society (AGS) Panel published one of the first patient-centered clinical guidelines to assist

clinicians with the complex and individualized care of the older adult with DM.[3] Since then, recent DM guidelines from other organizations endorse principles from the CHCF/AGS and recommend that clinicians consider a patient's comorbidities, functional status, and life expectancy to individualize DM care goals such as glycemic control.[4-8] This updated Guideline for Improving the Care of the Older Adult with Diabetes Mellitus aims to continue to assist clinicians with tailoring diabetes care to the needs of individual persons with DM. The need for this update was the result of high-quality new evidence available since 2003 that significantly impacts DM care recommendations. The purpose of this publication is to update the "Guidelines for Improving the Care of the Older Person with Diabetes Mellitus" published in 2003. The goal of the updated guidelines remains to improve the care of the older person with DM by providing an updated set of evidence-based recommendations individualized to adults with DM who are aged 65 and older.

Patient-centered care and individualized goals

Care for older adults with DM is complex and heterogeneous because of the risk of geriatric syndromes and variation in life expectancy, comorbidities, health status, and personal and caregiver choices related to health care. Since the original publication in 2003 of the Guidelines for Improving the Care of the Older Person with Diabetes Mellitus, there have been important randomized controlled clinical trials that provide new evidence for management of DM. These trials provide strong evidence that the conventional belief for tighter control of glycemia and blood pressure does not apply to many older adults with DM. This new information makes it critically important for clinicians to tailor and prioritize DM management goals. To assist with this effort, the updated recommendations are grouped under the original 2003 DM components of care: aspirin, tobacco use, glucose control, blood pressure management, lipids management, eye care, foot care, and diabetes self-management education and support (DSME/S). Because outcomes for geriatric syndromes beyond just outcomes for cardiovascular disease (CVD) are important for older adults with DM, the guideline addresses polypharmacy, cognitive impairment, depression, urinary incontinence, injurious falls, and persistent pain.

The goals of DM care in older adults, as in younger persons, include control of hyperglycemia and its symptoms; prevention, evaluation, and treatment of macrovascular and microvascular complications of DM; DSME/S; and maintenance or improvement of general health status. Although these goals are similar in older and younger persons, the care of older

adults with DM is complicated by their clinical and functional heterogeneity. Some older adults developed DM in middle age and face years of comorbidity; others who are newly diagnosed may have had years of undiagnosed comorbidity or few complications from the disease. Some older adults with DM are frail and have other underlying chronic conditions, substantial DM-related comorbidity, or limited physical or cognitive functioning, but other older adults with DM have little comorbidity and are active. Life expectancies are also highly variable for this population, and many of those with limited life expectancy may not live to benefit from intensive treatment. Clinicians caring for older adults with DM must consider this heterogeneity when setting and prioritizing treatment goals.

Diabetes self-management education and support is another important element of care for older adults with DM and their caregivers. For many patients, particularly those who are clinically complex, referral to a DM educator for one-on-one counseling or group classes, a comprehensive DSME/S program, or specialty physician care may improve control. It is important to note that annual DSME/S is a covered benefit under Medicare Part B. Diabetes self-management education and support programs may be particularly important when addressing the needs of older adults with DM from minority and immigrant communities. There are many well-established DSME/S programs that are appropriate for the needs of culturally and linguistically diverse populations. An additional element of DSME/S that is important for the frail or cognitively impaired older adult, persons with limited English proficiency or health literacy, and racial and ethnic minorities is the involvement and education of family members or caregivers. Patients and, in some cases, family members and caregivers should have their health literacy, and knowledge and information needs assessed, so that DSME/S efforts can be tailored to these needs. Finally, regular reassessment of treatment goals and management skills is integral to DSME/S, and reinforcement may be necessary to make and sustain behavior change. This is particularly true for older adults, whose functional and cognitive status may change over short periods of time.

For older adults, whose life expectancy may be shorter than the time needed to benefit from an intervention, a key clinical issue is the expected time horizon for benefit from specific interventions. Approximately 10–19 years are needed to see reductions in macrovascular endpoints (myocardial infarction) and mortality with intensive glycemic control.[9] Clinical trials have also demonstrated that approximately 8 years are needed before the benefits of glycemic

control are reflected in a reduction in microvascular complications such as diabetic retinopathy or renal disease and that only 2–3 years are required to see benefits from better control of blood pressure and lipids. For this reason, this updated guideline continues to place special emphasis on domains particularly important to the reduction of macrovascular endpoints for older adults with DM—blood pressure management and lipid management—for which data from randomized controlled trials (RCTs) and systematic reviews provide strong evidence in favor of treatment. It is likely that there is an association between moderate glycemic control and enhancement of wound healing, reduction of symptoms associated with hyperglycemia such as polyuria and fatigue, and possibly maximization of cognitive function. However, the available data suggest that many of these shorter-term benefits may be achieved with less-aggressive glycemic targets than those recommended in most of the national DM guidelines.

Quality of life is another important consideration in caring for older adults with DM. Although several treatment interventions significantly reduce morbidity and mortality, the potential benefits may be associated with reduced quality of life in older adults, particularly for those with chronic conditions. Specifically, complicated, costly, or uncomfortable treatment regimens may result in deleterious side effects, reduction in adherence to recommended therapies, and a decrement in overall well-being. The possible effects on quality of life should be taken into account in any treatment plan.

APPLYING THE EVIDENCE

Strong evidence supports the effectiveness of several components of DM care, including control of glycemia, lipids, and blood pressure; smoking cessation; appropriate eye and foot care; and prevention and management of nephropathy. However, for some DM domains, limited RCT data supporting these interventions were obtained from research studies of older adults with DM. For example, studies of hypertension and glycemic control have mostly focused on middle-aged adults, and few trials had participants older than 75 years of age. Although it is likely that many guidelines can be generalized to many older adults with DM, intensive management of all these conditions simultaneously may not be feasible for a proportion of older patients, and clinicians may have to prioritize reduction of some risks over others. Moreover, it is clear that there may be some groups of older adults with DM for whom aggressive management of these conditions will not provide the same benefit as observed in younger persons. In other words, for some,

aggressive management can instead result in harm, such as hypoglycemia with tight blood glucose control, hypotension with aggressive blood pressure control, or bleeding with aspirin.

For some older adults with DM without significant functional disability, all or most of the guidelines may be appropriate, but for other, frail older adults with DM and a high burden of comorbid conditions, short life expectancy, or significant difficulty adhering to treatment recommendations, choices between therapies may have to be made. Instead of treating these patients by using aggressive target levels for blood pressure, lipids, or glucose, the clinician may instead choose to prioritize therapeutic goals to enhance quality of life, treating symptoms associated with DM and its related conditions and addressing common geriatric syndromes such as polypharmacy, depression, urinary incontinence, and injurious falls.

CHANGES SINCE THE 2003 GUIDELINES

Overall, there is stronger evidence to support many of the original recommendations made by the expert panel in 2003. Important changes to highlight in this update of the Guidelines for Improving the Care of the Older Adult with Diabetes Mellitus include:

- No longer recommending aspirin for the primary prevention of CVD. More studies are needed to clarify its role for older adults with DM.
- Renewed emphasis in treating dyslipidemias with statins, but not treating to target levels.
- Glycemic control recommendations continue to be tailored to burden of comorbidity, functional status, and life expectancy.
- Increased evidence of the importance of lifestyle modification has informed stronger, more prescriptive and patient-centered recommendations in this area for healthy older adults with DM.

INCLUSION OF SPECIFIC GERIATRIC SYNDROMES

Another important component of this update of the evidence base for the Guidelines for Improving the Care of the Older Adult with Diabetes Mellitus is the continued inclusion and emphasis of six relevant geriatric syndromes that when detected by primary care providers, assist with improving DM care. The syndromes were included in the original guideline because there was population-based evidence that these syndromes were more prevalent in persons with DM or, in the absence of clear prevalence estimates, there was a strong pathophysiological reason to

believe that persons with DM might be at greater risk for the syndrome or expert consensus that the syndrome should be included. In this update, we continue to recommend that primary care providers screen older adults with DM for a number of the established geriatric syndromes with continued emphasis on those that are more prevalent among older adults with DM and that have been shown when left untreated to decrease a patient's ability to care for DM and or lead to decrements in quality of life. For treatment recommendations, readers are referred to guidelines from the American Diabetes Association (ADA), AGS, and other sources used in the updated DM care guideline. Most of the recommendations to screen for common treatable geriatric syndromes in older adults with DM continue to be based on expert opinion because of little RCT evidence supporting screening recommendations in any age group. The updated guideline continue to take into consideration the logistical complexity of providing comprehensive care to all older adults with DM by using a window of time that is 3–6 months into the initial evaluation. Throughout the updated guideline, this window is referred to as the "initial evaluation period."

Depression. Older adults with DM are at increased risk of depression,[10, 11] and there is evidence of underdetection and undertreatment in the primary care setting. On initial presentation of an older adult with DM, the clinician should assess the patient for symptoms of depression using a single screening question or consider using a standardized screening tool. If an older adult with DM presents with new-onset or recurrent depression, medications should be evaluated to determine whether any of them are associated with depression. If therapy is initiated, targeted symptoms should be identified and documented in the record.

Polypharmacy. Older adults with DM are at risk of drug side effects and drug-drug and drug-disease interactions.[12, 13] Polypharmacy is a major problem for older adults with DM, who may require several medications to manage glycemia, hyperlipidemia, hypertension, and other comorbidities. Clinicians should perform a careful review of each medication currently being used by the patient during the initial visit and at each subsequent visit and document whether the patient is taking each medication properly. The indication(s) for all drugs identified during the initial review and each new drug prescribed should be clearly documented in the record, and patients and their caregivers should receive information describing the expected benefits, risks, and potential side effects of each medication.

Cognitive impairment. Older adults with DM are at increased risk of cognitive impairment.[14, 15] Unrecognized cognitive impairment may interfere with the patient's ability to implement lifestyle modifications and take recommended medications. Therefore, it is important that the clinician screen for cognitive impairment during the initial evaluation period and with any change in the patient's clinical status, particularly if increased difficulty with self-care and self management is noted. A variety of validated screening tools exist for assessing cognitive impairment. Involvement of a caregiver in DM education and management can be critical to the successful management of the cognitively impaired older adult with DM.

Urinary incontinence. Older women with DM are at increased risk of urinary incontinence.[16-18] A targeted history and physical examination should be performed, focusing on conditions associated with older age or DM. Examples are polyuria (glycosuria), neurogenic bladder, fecal impaction, prolapse, cystoceles, atrophic vaginitis, vaginal candidiasis, and urinary tract infection, which can cause or exacerbate urinary incontinence.

Injurious falls. Falls by older adults are associated with high rates of morbidity, mortality, and functional decline. Older adults with DM are at increased risk of injurious falls. [19-21] Possible risk factors for injurious falls in older adults with DM include high rates of frailty and functional disability, impairment of gait and balance, visual impairment, peripheral neuropathy, hypoglycemia, and polypharmacy.[12, 19-21] Older adults with DM should therefore be screened for their risk of falls and for opportunities to prevent falls.

Persistent pain. Older adults with DM are at risk of neuropathic pain,[22] and those with pain are often undertreated. Older adults with DM should be screened for persistent pain by using a targeted history and physical examination. If there is evidence of persistent pain in an older adult with DM, further evaluation should be performed, appropriate therapy should be offered, and the patient should be monitored, as recommended by the AGS guideline on persistent pain.

GUIDELINE DEVELOPMENT PROCESS AND METHODS

The guidelines were updated by first reviewing the existing peer-reviewed literature (2002–2012) and guidelines on each DM topic. Table 1 summarizes the DM domains included in this update and the number of RCTs and systematic evidence reviews that were part of the evaluation

for the updated care recommendations. We searched PubMed for relevant studies published in the peer-reviewed literature and limited this search to the English language literature from 2002 to 2012. Terms searched included "diabetes mellitus," "diabetes geriatrics," "diabetes complications," and "hypertension and diabetes" with the search limits to "randomized controlled trials," "meta-analysis," and "systematic reviews." To update the original 2003 evidence-based Guidelines for Improving the Care of the Older Person with Diabetes Mellitus, we reviewed randomized clinical trials and systematic reviews or meta-analyses for aspirin use, glycemic control, hypertension management, lipid management, depression, lifestyle modification, and relevant geriatric syndromes (depression, polypharmacy, cognitive impairment, urinary incontinence, injurious falls, and persistent pain). For many of the topic areas reviewed and updated, limited data that were specific to older adults with DM were found, but for some of the domains under consideration, there were data from studies of older adults or of persons of all ages with DM. For a number of these domains, the expert panel decided whether it was reasonable to extrapolate the findings to older adults with DM. Existing published clinical guidelines from all relevant societies, the Cochrane Collaboration, and the Adult Treatment Panel III report from the National Cholesterol Education Program were also carefully reviewed for each DM domain. The references in the guidelines and peer-reviewed papers were also searched and reviewed. Two research associates conducted the literature review under the direct supervision of two panel members (GM, CMM). Evidence tables (available at http://www.americangeriatrics.org) were then constructed that summarize the new evidence from RCTs and systematic reviews for each DM topic and that provide an updated overview of some of the most important aspects of care that either differ significantly or deserve special emphasis compared with the care provided to younger persons with diabetes.

The next step in the development of this guideline update was to convene an expert panel consisting of general internists, family practitioners, geriatricians, clinical pharmacists, health services researchers, and certified DM educators. Many members of the original 2003 expert panel were also part of this panel. To ensure that potential conflicts of interest were disclosed and addressed appropriately, panelists disclosed potential conflicts of interest with the panel at the beginning. Each panelist's potential conflict of interests are provided toward the end of this article. Expert panel members followed the United States Preventive Services Task Force (USPTF) scale for rating the evidence. The Guidelines for Improving the Care of the Older

Person with Diabetes Mellitus was then modified, and new care recommendations were developed on the basis of the literature review. The candidate updated diabetes care recommendations were reviewed by working groups in one meeting and the full expert panel in three meetings, which used the ratings for quality and strength of evidence described in Table 2. Like other guidelines, some of the recommendations are based on clinical experience and the consensus of members of the expert panel.

After consensus was reached within the expert panel, the updated guidelines were circulated for peer review to relevant organizations and societies and were posted to the AGS website for public comment. Organizations that participated in peer review are listed in the Acknowledgments section of this article. The panel reviewed and addressed all comments. This updated Guidelines for Improving the Care of the Older Person with Diabetes Mellitus is not meant to be an exhaustive review of diabetes care for the older adult, but rather an updated overview of some of the most important aspects of care that either differ significantly or deserve special emphasis compared with care provided to younger persons with diabetes. Some areas of DM care and geriatric syndromes are beyond the scope of these guidelines and are not addressed in this publication. The recent ADA/AGS consensus statement also covers other DM issues in older adults.[23]

THE GUIDELINES

Guiding Principles for Care of Older Adults with Diabetes Mellitus

Clinicians should establish, in collaboration with patients, families, or caregivers, specific goals of care or target outcomes for persons with DM. Such targets should be identified and documented for all aspects of care, such as management of hypertension, hyperlipidemia, hyperglycemia, mood disorder if present, and screening and treatment of geriatric syndromes if present. These targets or goals of treatment should be identified and documented in the medical record.

When the goals of care are not being met, the patient should be evaluated for contributing causes. Efforts should also be made to assess patient and care giver preferences to keep care simple and inexpensive. The clinician should consider referral to a specialist experienced in the care of older adults when target outcomes are not being met even after attempts to simplify care and treatment regimens. Specialists who may assist with the management of these conditions

include endocrinologists or diabetologists, geriatricians, hypertension specialists, mental health specialists, clinical pharmacists, DM educators, and nutritionists.

Aspirin

1. If an older adult has diabetes and known cardiovascular disease, daily aspirin therapy 81–325 mg/day is recommended, unless contraindicated or the patient is on other anticoagulant therapy. (IA)

There is insufficient evidence to recommend the use of aspirin for primary CVD prevention for older adults with type 2 DM. Two recent large RCTs of aspirin in patients with type 2 DM failed to show reductions in CVD endpoints.[24, 25] These trials were designed specifically for adults with type 2 DM. Meta-analysis of aspirin for the primary prevention of CVD in patients with DM provided mixed results. [26-30] More research is needed to clarify the role of aspirin for older adults with type 2 DM, because the risk of adverse side effects and bleeding may outweigh the potential benefits of aspirin. [31-33] The ongoing Aspirin in Reducing Events in the Elderly (ASPREE) study will help clarify the risks and benefits of aspirin in reducing cardiovascular events for adults aged 65 and older without a serious illness or serious impairment in mental or physical function. For adults older than 80 years of age, aspirin should be used with caution.[13]

There is strong evidence to recommend aspirin for secondary prevention of cardiovascular outcomes (ie, myocardial infarction [MI] and stroke). Several RCTs[33-36] and systematic reviews[37-40] have shown an association between aspirin use and reduction in acute MI and other cardiovascular events as well as cardiovascular mortality for older adults or persons with diabetes and previous MI or stroke (secondary prevention). The dose of aspirin used in these studies ranged from 75 mg to 325 mg and there is no evidence that a higher dose is more effective than a 75-mg daily dose.[40]

Smoking

1. The older adult who has DM and smokes should be assessed for readiness to quit and should be offered counseling and pharmacologic interventions to assist with smoking cessation. (IIA)

Smoking is associated with DM [41] and roughly 8–12% of adults with DM aged 65 and older smoke. This is a lower prevalence of tobacco use compared with younger persons with

DM. [42] Of people with DM, smokers have a higher risk than nonsmokers of morbidity and premature death, [43, 44] but within 2–3 years of smoking cessation, the former smoker's risk of coronary heart disease appears to decline to levels comparable to those of persons who never smoked. [45, 46] Several RCTs and systematic reviews have demonstrated the efficacy and cost effectiveness of counseling and pharmacologic interventions for smoking cessation in the general population. In addition, five studies [47-51] have evaluated smoking cessation programs in persons with DM, and two of these studies reported some success. [47, 51] Regardless, the detrimental effects of smoking are clear, and substantial benefit may be obtained through smoking cessation,[52] for older adults and for persons with DM. (Source Guideline: 2, 10)

Hypertension

General Recommendations

1. If an older adult has DM and requires medical therapy for hypertension, then the target blood pressure should be < 140/90 mmHg if it is tolerated. (IA)

There is potential harm in lowering systolic blood pressure to < 120 mmHg in older adults with type 2 DM. (1B)

There is strong evidence from a number of RCTs and systematic reviews[53] that drug therapy for blood pressure management reduces cardiovascular events and mortality in middle-aged and older adults.[54, 55] Several studies included large numbers of older participants or persons with DM.[56-67] In the majority of these studies, target blood pressure levels were less than 140/90 mmHg, but other studies conducted primarily in younger adults found a reduction in cardiovascular endpoints using a target of less than 150/80[61, 62, 64] or systolic blood pressure less than 160 mmHg.[68]

Today, there is even stronger evidence to support the primary hypertension control recommendation made in the original 2003 Guidelines for Improving the Care of the Older Person with Diabetes Mellitus. Results from two analyses of RCTs found that a systolic blood pressure of < 130 mmHg was not associated with improved CVD outcomes compared with blood pressure control between 130 and 140 mmHg. [69, 70]

Notably, the Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial compared the CVD benefits of targeting a blood pressure < 120 mmHg versus < 140 mmHg in patients with type 2 DM. The study reported that an achieved blood pressure of 119.3/64.4

versus 133.5/70.5 mmHg conferred no significant reduction in the primary outcome of fatal and non-fatal major cardiovascular events. [71] Although there was a reduction in strokes, a secondary outcome, serious adverse events such as hyperkalemia and syncope were more common in the intensive blood pressure control group. Other studies also suggest that intensive blood pressure control is associated with increased risks of serious adverse events[72] and confers only limited reductions in cardiovascular events. Additionally, in an analysis of an RCT, those that achieved a systolic blood pressure of < 115 mmHg had increased rates of CVD events.[70] A recent meta-analysis of 13 RCTs of adults with type 2 DM/impaired fasting glucose comparing blood pressure targets found lower rates of stroke with blood pressures < 130 mmHg but no benefits in other macro- or microvascular events, and an increase in serious adverse events.[73] Similarly, a Cochrane (2009) review of 7 RCTs of hypertensive patients with and without DM found no benefits in mortality or morbidity of lowering blood pressure below 135/85 mmHg.[74] Because of the strength of this evidence, the ADA (2013) clinical practice guidelines recommend that people with DM and hypertension should be treated to a blood pressure goal of < 140/80 mmHg. (Source Guidelines: 1, 2, 10)

Recent evidence comparing classes of antihypertensive medications for persons with DM indicates that many, such as diuretics, angiotensin-converting enzyme (ACE) inhibitors, beta-blockers, and calcium channel blockers, have comparable effectiveness in reducing cardiovascular morbidity and mortality.[62, 75, 76] There are also data to suggest that angiotensin-receptor blockers (ARBs) have cardiovascular and renal benefit for persons with DM.[59]

2. The older adult who has DM and hypertension should be offered a therapeutic intervention to lower blood pressure within 3 months if systolic blood pressure is 140–160 mmHg or diastolic blood pressure is 90 –100 mmHg or within 1 month if blood pressure is greater than 160/100 mmHg. (IIIB)

There are no data on the optimal timing for initiation of treatment for hypertension, but expert opinion supports the recommendation that the severity of blood pressure elevation should influence the urgency of initiating therapy. (Source guidelines: 1, 2, 3, 10)

Medication

4. The older adult with DM who is on an ACE inhibitor or ARB should have renal function and serum potassium levels monitored after approximately 1–2 weeks of initiation of therapy, with each dosage increase, and at least yearly. (IIIA)

Although one specific medication for managing blood pressure in older adults with DM is not recommended, special attention should be paid to some commonly used medications. ACE inhibitors have been associated with a reduction in renal function. One RCT found that a moderate to high dosage of an ACE inhibitor (eg, captopril 75 mg/d, enalapril 10 mg/d, or lisinopril 10 mg/d) is significantly associated with the development of hyperkalemia.[77] Additionally, a prospective study found a significant increase in serum potassium in patients with type 2 DM on captopril compared with those on other antihypertensive medications[78], and data from several uncontrolled studies suggest that older adults are more susceptible to the ACE inhibitor-related reductions in renal function.[79]

In comparisons of classes of medications, ACE inhibitors have been shown to be more effective than calcium channel blockers at reducing cardiovascular events;[57, 80] however, there appears to be similar reduction in cardiovascular morbidity and mortality with the use of ACE inhibitors, beta-blockers, and diuretics.[62] Recent evidence suggests that ARBs also have cardiovascular and renal benefit.[59] (Source guidelines: 1, 2)

5. The older adult with DM who is prescribed a thiazide or loop diuretic should have electrolytes checked after approximately 1–2 weeks of initiation of therapy, with each dosage increase, and at least yearly. (IIIA)

No studies have evaluated the effect of monitoring electrolytes or appropriate monitoring intervals in persons using diuretics. However, an RCT found that the use of thiazide diuretics was associated with hypokalemia and ventricular arrhythmias,[81] while a case-control study found that hypertensive patients on higher doses of thiazide diuretics had an increased risk of cardiac arrest.[82] These data suggest that monitoring of potassium levels with initiation of therapy and at regular intervals will reduce the risk of hypokalemia and its complications.[83] (Source guidelines: 2)

Glycemic Control

General Recommendations

1. Target goal for A1C in older adults generally should be 7.5%–8%. An A1C between 7% and 7.5% may be appropriate if it can be safely achieved in healthy older adults with few comorbidities and good functional status. Higher A1C targets (8%–9%) are appropriate for older adults with multiple comorbidities, poor health, and limited life expectancy. (IIA)

There is potential harm in lowering A1C to < 6.5% in older adults with type 2 DM. (11A)

Lowering A1C is one goal of a diabetes treatment program.[84-86] There is no evidence that using medications to achieve tight glycemic control in older adults with type 2 DM is beneficial. Three recent large RCTs[87-89] did not find any reductions in cardiovascular events with intensive glycemic control in persons with DM. Among non-older adults, except for reductions in MI and mortality with metformin, using medications to achieve glycated hemoglobin levels less than 6.5% is associated with harms, including hypoglycemia and higher mortality rates.[88] The high risk of harm with intensive glucose lowering in patients with type 2 DM was previously unknown and significantly alters the risk-benefit equation for older adults. Given the long timeframe to achieve a reduction in microvascular complications, glycemic goals should reflect patient goals, health status, and life expectancy. An A1C of < 9% is generally not associated with symptoms of hyperglycemia. Additionally, in a longitudinal study of older adults with DM and limited life expectancy, an A1C of 8.0%–8.9% was associated with better functional outcomes at 2 years than an A1C of 7.0%–7.9%.[90]

According to the ADA (2013) recommendations, for frail older adults, persons with limited life expectancy or extensive comorbid conditions, and others in whom the risks of intensive glycemic control appear to outweigh the potential benefits, a less stringent target such as 8.0% is appropriate.[6] (Source guidelines: 2)

Monitoring

2. The older adult who has DM and whose individual targets are not being met should have his or her A1C levels measured at least every 6 months and more frequently, as needed or indicated. For older adults with stable A1C over several years, measurement every 12 months may be appropriate. (IIIB)

Monitoring blood glucose levels may enhance glycemic control. There are no clinical trials that have evaluated the routine measurement of A1C on outcomes for persons with type 2 DM. An RCT conducted in Denmark found that routine measurement and reporting of A1C (four times a year) in persons with type 1 diabetes was associated with lower A1C levels and fewer hospitalizations (ARR 11%) at one year than persons whose A1C levels were not reported.[91] More frequent monitoring may be appropriate for persons in whom there is a clinical indication to achieve tight glycemic control (eg, symptomatic patients with elevated A1C levels). (Source guidelines: 2)

3. For the older adult with DM, a schedule for self-monitoring of blood glucose should be considered, depending on functional and cognitive abilities. The schedule should be based on the goals of care, target A1C levels, potential for modifying therapy, and risk of hypoglycemia. (IIIB)

The optimal frequency and timing of self-monitoring is not known. Some people do not need to self-monitor and may need to balance self-monitoring with the intensity of therapy, quality of life, and risk of hypoglycemia. There is no evidence that self monitoring is harmful. Self-monitoring of blood glucose is central to management of type 1 DM.[85] Self-monitoring for persons with type 2 DM who are on insulin is recommended based on expert opinion.[6] In a Cochrane review of 12 RCTs that evaluated self-monitoring in persons with type 2 DM who were not using insulin, only a small 6-month impact on glycemic control was found.[92] A recent meta-analysis found a 0.25% reduction in A1C at 6 months,[93] but other reviews and studies have not found similar improvements.[94-97] In addition, epidemiologic evidence suggests that frail older adults with DM are at increased risk of hypoglycemic coma[98] and increased rates of hospitalization.[99] Self-monitoring may reduce the risk of serious hypoglycemia in older adults with DM who use insulin or oral antidiabetic agents. The ADA recommends that self-monitoring "should be dictated by the particular needs and goals of the patient" and frequency should be increased when adding to or modifying therapy.[6]

4. The management plan for the older adult with DM who has sever or frequent hypoglycemia should be evaluated; the patient should be offered referral to a DM educator, endocrinologist, or diabetologist, and the patient and any caregivers should have more frequent contacts with the healthcare team (eg, physicians, certified DM educators, pharmacists, nurse case manager) while therapy is being readjusted. (IIIB)

Epidemiologic evidence suggests that frail older adults are at greater risk of serious hypoglycemia than younger persons[98-100] One small RCT found that automated calls with nurse follow-up significantly reduced the risk for hypoglycemia in patients with DM on oral antidiabetic medications (adjusted difference in number of symptoms -0.5, P=.001).[101] This study, with mean age of 56 in the intervention arm, excluded adults aged 75 or older. Older adults with DM who have frequent or severe episodes of hypoglycemia are likely to benefit from more intensive management to determine the precipitants of hypoglycemia and to attempt to reduce the risk of recurrence. This recommendation is based on a recommendation from the ADA.[6]

Medications

5. If an older adult is prescribed an oral antidiabetic agent, metformin, unless contraindicated, is the preferred first-line agent in combination with lifestyle therapy. (IA)

Metformin confers a low risk of hypoglycemia and appears to be more effective than other antidiabetic medications in CVD risk reduction.[102] In two large observational studies in Denmark and the Department of Veterans Affairs with over 350,000 patients, treatment with sulfonylureas was associated with 20%–30% increased hazard of cardiovascular outcomes compared with treatment with metformin. [103, 104] Further, a 3-year RCT of metformin and glipizide showed that patients randomized to metformin had a 46% decreased hazard of cardiovascular events. [105]

After the use of metformin,[6, 106] glucose-lowering medication therapy should be individualized.[107] Sulfonylureas have been associated with increased risk of hypoglycemia, and the risk increases with age. Glyburide should generally not be prescribed to older adults with type 2 DM due to its high risk of hypoglycemia.[13] Chlorpropramide also has a prolonged half-life, particularly in older adults and should be avoided.[108-111] (Source Guideline: 2, 8, 11)

6. Use eGFR rather than serum creatinine levels to guide metformin use. Specifically, do not use metformin in patients with eGFR < 30 mL/min/1.73 m^2. For patients with eGFR between 30 and 60 mL/min/1.73m^2, check renal function more frequently and use lower dosages. (IIB)

Lactic acidosis is a rare but serious complication of phenformin use and ultimately led to phenformin being withdrawn from the market. The concern about lactic acidosis resulted in a "black box" warning for metformin and recommendations that metformin be stopped in men with serum creatinine >1.5 mg/dL and in women with serum creatinine >1.4 mg/dL. However, recent data suggest that the risk of lactic acidosis in metformin is extremely low. A recent Cochrane review found that in 126,000 patient-years of observation, patients taking metformin did not have a higher rate of lactic acidosis than patients using other medications or placebo. [112] The substantial benefits of metformin combined with little data regarding the risk of lactic acidosis has led numerous guidelines and consensus statements to recommend metformin use in patients with eGFR >30 mL/min/1.73 m^2. [6, 23, 107, 113, 114] (Source Guideline: 2, 8, 11)

Lipids

General Recommendations

1. For the older adult with DM who has dyslipidemia, efforts should be made to correct the lipid abnormalities if feasible after overall health status is considered. (IA)

Epidemiologic evidence suggests that persons with DM without prior MI have similar elevated risk of MI as persons without DM who have had an MI.[115] Evidence supports the use of lipid-lowering agents, particularly statins, in older adults with DM. Several RCTs and meta-analyses have shown that a reduction in LDL-cholesterol reduces the risk of cardiovascular events in older adults or persons with DM. The beneficial effects of lipid lowering have been seen primarily with HMG-CoA reductase inhibitors (statins)[116-135] A recent meta-analysis of 14 statin RCTs of persons with DM found similar reductions in cardiovascular events for those younger and older than 65 years of age. [136]

2. Pharmacologic therapy with a statin is recommended in addition to medical nutrition therapy and increased physical activity, unless contraindicated or not tolerated.

The benefits of reducing CVD events argues for making efforts to lower LDL-cholesterol and supports pharmacologic interventions (eg, the use of lipid-lowering agents). The evidence for reduction of CVD endpoints with drugs other than statins is limited in all age groups[135] and combination therapy with a statin and niacin or fenofibrate is generally not supported by the evidence. Further, the risk of serious adverse side effects may be greater with combination therapy.[137] In the ACCORD lipid trial, the combination of fenofibrate and simvastatin did not reduce the rate of fatal cardiovascular events, nonfatal MI, or nonfatal stroke, as compared with simvastatin alone, in patients with type 2 DM.[138] Another recent RCT also showed a lack of efficacy of combination therapy with a statin plus niacin compared with placebo.[139] Three large RCTs have investigated fibrates for prevention of CVD in adults with DM.[135, 140-143] An analysis of older adults (≥ 65 years) in one of these RCTs did not show significant reductions in total cardiovascular disease events.[140]

Medical nutrition therapy (MNT), enhanced physical activity, and weight loss have also been shown to play a role in improving cardiovascular risk profiles in older adults with DM. Eleven RCTs have evaluated MNT[144-151] or MNT and physical activity[152-154] in the clinical management of dyslipidemia in older adults with DM.

Because there are no large trials for lipid-lowering interventions specifically for older adults with type 2 DM, evidence on optimal LDL-cholesterol targets have not been established. Expert opinion supports the selection of specific LDL-cholesterol levels as prompts for specific actions. The RCTs of statins and CVD outcomes were not designed to compare different recommended LDL-cholesterol targets or goals. [155]These trials instead tested one statin against placebo, other statin doses, or other statins.

It is recommended that goals for HDL and triglycerides be consistent with ADA recommendations of HDL > 50 mg/dL in men, HDL > 40 mg/dL in women, and triglycerides < 150 mg/dL (ADA 2013). There are no data to support the length of the interval during which lipid levels should be checked. Expert consensus suggests that persons with low-risk lipid values (LDL < 100 mg/dL; HDL > 40 mg/dL, triglycerides < 150 mg/dL) on an initial assessment may have lipids checked every 2 years; in most persons with DM, measurement of a fasting lipid profile is recommended at least annually and more frequently if targets are not being met.[6]

Monitoring

3. The older adult with DM who is newly prescribed a statin should have alanine aminotransferase level measured before treatment with the new medication begins and as clinically indicated thereafter. (IIIB)

Data describing the benefit of monitoring liver function for patients using lipid-lowering medications are limited. Clinical trials suggest that use of statins is associated with elevations in liver transaminases in some patients,[156] but RCT evidence from studies of persons with type 2 DM found no increase in liver enzymes 12 weeks after initiation of therapy with a statin.[157] There is no clinical trial evidence supporting the monitoring of liver enzymes.

Eye Care

1. The older adult who has new-onset DM should have an initial screening dilated-eye examination with funduscopy performed by an eye-care specialist. (IB)

Two large RCTs have shown that early detection and treatment of diabetic retinopathy reduces progression of diabetic eye disease and visual loss.[158, 159] These trials remain the main evidence base behind screening for diabetic retinopathy. Evidence suggests that sensitivity of screening for diabetic retinopathy is highest among eye-care specialists.[160, 161] This recommendation is based on a recommendation from the ADA.[6] (Source Guidelines: 2, 10)

2. The older adult who has DM and who is at high risk of eye disease (symptoms of eye disease present; evidence of retinopathy, glaucoma, or cataracts on an initial dilated-eye examination or subsequent examinations during the prior 2 years; A1C ≥ 8.0%; type 1 DM; or blood pressure ≥140/90 mmHg) on the prior examination should have a screening dilated-eye examination performed by an eye-care specialist with funduscopy training at least annually. Persons at lower risk or following one or more normal eye examinations may have a dilated-eye examination at least every 2 years. (IIB)

Data from the United Kingdom Prospective Diabetes Study (UKPDS) indicates that incidence of retinopathy was associated with, among other things, glycemic control over 6 years and higher blood pressure, while progression of retinopathy was associated with older age, male sex, and hyperglycemia.[162] While few type 2 DM patients without diabetic retinopathy on baseline examination required photocoagulation in the subsequent 3 to 6 years (0.2% and 1.1% respectively), over the same period, people with microaneurysms in one eye at initial evaluation needed photocoagulation at rates of 0.0% and 1.9% at 3 and 6 years, people with microaneurysms in both eyes, 1.2% and 3.6% respectively, and people with more severe retinopathy, 15.3% and 25.2% respectively. At 12 years, significant differences between groups in time to photocoagulation were observed ($P<.0001$).[163] Notably, this analysis did not record or examine the prevalence of other common age-related eye disorders such as glaucoma, cataract, and macular degeneration, which are also more common among persons with DM.

Blood pressure control is associated with decreased progression of retinopathy.[164] More recently, the ACCORD study found that intensive glycemic control and intensive combination treatment of dyslipidemia, but not intensive blood pressure control (systolic blood pressure < 120 mmHg compared with < 140mmHg), reduced the rate of progression of diabetic retinopathy.[165]

Decision analytic models suggest that screening for diabetic retinopathy is cost-effective. However in persons at low risk of retinopathy, annual screening is not cost effective in comparison with less frequent screening intervals.[166] Less frequent examinations, every 2–3 years, may be cost-effective after one or more normal eye examinations. [167] There is consensus among experts that data from previous examinations, DM-related considerations, and blood pressure should all be considered when determining the need for photocoagulation. None of the existing decision analytic models for the timing of eye care have considered the potential health benefits of detecting other age-related vision problems, such as cataract, glaucoma, and uncorrected refractive errors in older adults with DM.

Foot Care

1. The older adult who has DM should have a careful foot examination at least annually to check skin integrity and to determine whether there is loss of sensation or decreased perfusion and more frequently if there is evidence of any of these findings. (IIIA)

There are no RCT data to support examination of the feet at regular intervals to prevent lower-extremity ulceration or amputation. [168] However, a randomized trial of an intervention comprised of patient and provider foot care education and a team approach to foot care found an increase in rates of foot examinations at routine office visits and a reduction in serious foot lesions (OR=0.41, *P*=.05).[169] In addition, several uncontrolled studies have found a reduction in rates of amputation after implementation of comprehensive foot care programs.[170]

Studies estimate that up to 50% of older patients with type 2 DM have one or more risk factors for foot ulceration.[171, 172] Regular foot examinations permit identification of diabetic neuropathy and foot lesions and may, in turn, prevent progression to ulcers and amputation. However, there are no data to support the optimal interval for evaluation. Most current recommendations specify that the foot examination should be done at all non-urgent outpatient visits. Components of the comprehensive foot examination are described by the ADA elsewhere.[173]

Quality of evidence is level II for more frequent examinations for persons at high risk of foot problems and level III for routine annual screening. This recommendation is based on recommendations from the ADA.[6] (Source Guideline: 2)

Nephropathy

1. A test for the presence of albuminuria should be performed in patients at diagnosis of type 2 DM. After the initial screening and in the absence of previously demonstrated macro- or microalbuminuria, a test for the presence of microalbuminuria should be performed annually. (IIIA)

Diabetes Self-Management Education and Support

1. Persons with DM and, if appropriate, family members and caregivers should be receive diabetes self-management education and support (DSME/S) with reassessment and reinforcement periodically as needed. (IA)

Older adults with diabetes should receive diabetes self-management education and on-going diabetes self-management support (DSME/S) according to the National Standards for Diabetes Self-Management Education and Support.[174] (Source Guideline: 2, 6)

In addition, RCT evidence from middle-aged and older adults suggests that multidisciplinary interventions that provide education on medication use, monitoring, and recognizing hypo- and hyperglycemia can significantly improve glycemic control.[175, 176]

Multiple reviews and meta-analyses have found that DSME is associated with improved clinical, psychosocial, behavioral, and knowledge outcomes.[177-182] Older adults who participate in diabetes education are more likely to follow best practice treatment recommendations, and have lower Medicare and commercial claim costs.[183, 184] In a study by Duncan et al evaluating a national payer database of commercial and Medicare Advantage health plans, participating Medicare members who received DSME had significantly less cost (14%, $P < .0001$) than those who did not receive DSME.[185] Improved outcomes for DSME are reported for programs that are longer and include follow-up diabetes self-management support (DSMS)[186-190] and are culturally [191, 192] and age-appropriate.[193, 194] Both individual and group approaches to DSME/S have been shown to be effective.[185, 195] Because health literacy is a stronger predictor of health status than age, income, education level, and ethnicity, DSME/S also needs to be provided at the appropriate literacy level.[196-201]

Although older adults are less likely than their younger counterparts to experience diabetes-related distress, it has been shown in over 45% of adults with type 2 DM (mean age 57.8) and is linked with poor self-management and treatment outcomes.[202] Therefore psychosocial issues and quality of life should be assessed and addressed as an essential part of DSME and DSMS.[6, 174]

2. The monitoring technique of the older adult with DM who self-monitors blood glucose levels should be routinely reviewed. (IIIB)

Self-monitoring blood glucose (SMBG) was an important component of two RCTs of education programs for middle-aged and older adults that found improved glycemic control in the intervention arms of the studies.[203] In addition, one carefully conducted meta-analysis of education programs for adults (younger and older) found that SMBG instruction had a significant positive effect on adherence to a prescribed regimen (7 studies, effect size=+0.49 [standard deviation = .41]).[204] Finally, one well-conducted RCT found that 30 minutes of instruction on

SMBG significantly decreased measurement errors compared with 30 minutes of self-instruction using the directions included with an SMBG device ($P<.01$).[205] Nevertheless, no clinical trials have evaluated the benefit of reviewing SMBG technique on DM outcomes. This recommendation is based on recommendations from ADA.[6]

3. The older adult who has DM and intact cognition and functional status should perform at least 150 min/week of moderate-intensity aerobic physical activity.(1A) Unless there are contraindications, the older adult with DM should be advised to perform aerobic and resistance exercises to the best of their ability under the direction of their healthcare provider. (IA)

Older adults with DM should also receive structured lifestyle counseling based on the Diabetes Prevention Program strategies and should be recommended to engage in physical activity at least 3 days/week.[206] Evidence from RCTs indicates that increased physical activity in combination with nutrition education can significantly reduce weight and enhance blood pressure, lipid, and glycemic control.[152, 207, 208] Two of these RCTs [152, 208] dealt specifically with older adults (older than 55 and 60 years, respectively), but some older adults are too functionally or cognitively impaired to successfully increase their level of physical activity. The evidence base of the benefits of exercise for person with type 2 DM are summarized elsewhere.[209]

4. The older adult with DM should be evaluated regularly for diet and nutritional status and, if appropriate, should be offered referral for culturally appropriate MNT and counseled on the content of his or her diet (e.g., intake of high-cholesterol foods and appropriate intake of carbohydrates) and on the potential benefits of weight reduction. (IA)

Meal planning should be based on a personalized plan developed collaboratively between the patient and registered dietitian as part of MNT counseling. The meal plan should incorporate personal preferences and cultural and religious practices and accommodate other chronic and acute conditions, living situation, and any activities of daily living (ADL) or other impairments. Eight RCTs [144, 146, 148-150, 210, 211] have evaluated dietary education or MNT in the clinical management of older adults with DM and found that weight, blood pressure, lipid levels, and glycemic control can be improved significantly. Most of these RCTs focused primarily on middle-aged adults, but one[210] specifically targeted adults aged 65 and older and produced similar results. Data on the effect of weight loss on morbidity and mortality in older adults with DM are limited; thus, weight reduction may not be an appropriate goal in all cases.

5. The older adult with diabetes who is prescribed a new medication and any caregiver should receive education about the purpose of the drug, how to take it, and the common side effects and important adverse reactions, with reassessment and reinforcement as needed. (IA)

Health literacy has a significant impact on medication adherence and other self-management behaviors.[212] Package inserts that accompany prescription medications often do not meet the readability needs of older adults, with many printed on poor quality paper and in small fonts.[213] Furthermore, language and health literacy can be barriers to obtaining vital information about side effects and adverse reactions from package inserts or labels, because many are written solely in English or in a form easily misunderstood by patients. In one study, interviews with 325 older adults revealed that 39% could not read their medication labels and 67% did not fully understand the labels.[214] Although trials directly testing the effects of education on new prescriptions alone are lacking, two RCTs [175, 176] investigated the effect of DM education programs that included education on medication use in middle-aged and older adults and found that the programs had a significant effect on glycemic control. Additionally, a meta-analysis of 153 studies involving adults of various ages indicated that one-on-one interventions significantly improved medication adherence.[215]

6. The older adult who has DM and any caregiver should receive education about risk factors for foot ulcers and amputation. Physical ability to provide proper foot care should be evaluated, with reassessment and reinforcement periodically as needed. (IB)

Older adults are at higher risk of conditions that may reduce the ability to conduct proper foot surveillance and care (eg, cognitive impairment, visual impairment, osteoarthritis, and other physical limitations in functioning that prevent movement). One RCT that evaluated a multidisciplinary intervention that included patient education on foot care with middle-aged and older adults (mean age was 59) found lower rates of serious foot lesions (OR=0.41; *P*=.05).[169] Another RCT found that patients of various ages exposed to an educational program on foot care experienced lower rates of amputation (*P*=.03) and ulceration (*P*=.005).[216] This recommendation is based on a recommendation from the ADA.[6]

Depression

1. The older adult who has DM is at increased risk of major depression and should be screened for depression during the initial evaluation period (first 3 months) and if there is any unexplained decline in clinical status. (IIB)

On initial presentation of an older adult with DM, a health care professional should assess the patient for symptoms of depression using a single screening question or consider using a standardized screening tool such as the Geriatric Depression Scale.[217] This tool is available in several languages (http://www.stanford.edu/~yesavage/GDS.html).

Depression is more common in persons with DM [10, 11, 218] and may impede diabetes self-management [219-221] and medication adherence.[222] Patients with diabetes and depression are also at increased risk of mortality and morbidity.[223-226] One recent retrospective study found that, controlling for age, sex, and race/ethnicity, older adults with DM were significantly more likely to develop major depression than other older adults, and that depressed older adults with DM incurred higher non-mental health costs than those who are not depressed.[227] Older adults have high rates of under-diagnosis and under-treatment of their depressive symptoms, with less than 10% of depressed older adults and less than 5% of older adults with high levels of depressive symptoms receiving antidepressant medications.[228, 229]

The data on the relationship between screening for depression in the clinical setting and patient outcomes are mixed. One RCT found that middle-aged patients screened with either a single question or a longer survey were significantly more likely to recover from depression, but mean improvement in depressive symptoms was not significantly different from that of the controls.[230] Another partially randomized controlled trial found no improvement in depression among patients aged 70 or older who were screened by office staff before to their initial visit.[231] Recent studies have demonstrated poorer outcomes of DM care for patients with unrecognized depression,[232-235] and psychosocial interventions modestly improve both A1C and mental health outcomes.[236] Therefore, screening and treatment of depression may influence outcomes of DM care in older adults.

Psychosocial problems other than depression are also important for the older adult with type 2 DM. Other psychosocial issues that are associated with self-management and health-related outcomes include attitudes about DM, quality of life, diabetes-related distress, and lack of financial resources. [202, 237-239] A systematic review and meta-analysis of psychosocial interventions for patients with type 1 and 2 DM found a modest improvement in A1C (standardized mean difference –0.29 [95% CI –0.37 to –0.21]) and mental health outcomes (–0.16 [–0.25 to –0.07]), but no intervention characteristics predicted benefit on both outcomes. [236] (Source guideline: 2)

2. The older adult with DM who presents with new onset or a recurrence of depression should be treated or referred within 2 weeks of presentation, or sooner if the patient is a danger to himself or herself, unless there is documentation that the patient has improved. (IIIB)

There is evidence from carefully conducted meta-analyses of RCTs that pharmacologic and psychologic treatment of older adults (aged 55 and older) is effective in reducing depressive symptoms.[240-242] A recent Cochrane Collaboration (2012) review concluded that pharmacological treatment effectively reduced depression severity and moderately improved glycemic control (mean difference for A1C –0.4%; 95% CI –0.6 to –0.1; *P* = .002; 232 patients; five small trials) in adults with DM.[243] In addition, one RCT found that older (age range 60–94) depressed primary care patients with DM in practices implementing depression care management were less likely to die over the course of a 5-year interval than depressed patients with DM in usual-care practices (adjusted hazard ratio 0.49 [95% CI 0.24–0.98]).[244] There are no RCT data on the optimal timing of referral or implementation of treatment in older adults. The quality and strength of evidence is IA for undertaking clinical intervention but IIIB for the timing of referral or treatment. For patients who show evidence of substance abuse or dependence, initiation of therapy for depression may wait until the patient is in a drug- or alcohol-free state. If therapy is initiated, targeted symptoms should be identified and documented in the record. (Source guideline: 2)

3. The older adult who has received therapy for depression should be evaluated for improvement in target symptoms within 6 weeks of the initiation of therapy. (IIIB)

Evaluation of the effectiveness of therapies for depression is critical to managing the disease. Because there is evidence of inadequate treatment once therapy is initiated for depression among older adults,[228, 229] those who receive therapy for depression should be reassessed to determine if target symptoms have noticeably improved, and efforts made to modify therapy appropriately.[245] There is new evidence that collaborative programs, in which primary care clinicians work closely with mental health specialists, are significantly more effective than typical primary care treatment.[246, 247] No evidence is available on the optimal time to evaluate treatment effectiveness. Six weeks was identified as the interval for evaluating therapy for depression, because antidepressant medications frequently are effective during this time period. (Source guidelines: 2)

Polypharmacy

1. The older adult who has DM should be advised to maintain an updated medication list for review by the clinician. (IIA)

Older adults with DM are at risk of drug side effects, drug interactions, and increased utilization of health services.[99] The availability of an updated medication list that includes over-the-counter drugs allows the health care provider to evaluate the need for current medications, the potential for drug-drug and drug-disease interactions, and ways to enhance medication adherence. It is recommended that upon discharge from the hospital, patients should receive medication reconciliation. Two RCTs found that that reviewing a medication list can significantly decrease potentially inappropriate prescribing[248] and falls.[249] In one epidemiologic study, oral hypoglycemic agents, insulin, warfarin, and oral antiplatelet agents were found to be implicated in 67% of hospitalizations among adults ≥ 65 years of age.[99] One RCT of a polypharmacy intervention for patients with and without DM reported reductions in mortality, emergency visits, and hospitalizations,[250] and another study of patients with DM showed reductions in A1C and blood pressure.[251] Four other studies had mixed outcomes for utilization.[252] Interventions to improve polypharmacy in adults are beneficial in reducing inappropriate prescribing and medication-related problems.[252, 253]

2. The medication list of an older adult with DM who presents with depression, falls, cognitive impairment, or urinary incontinence should be reviewed. (IIA)

Epidemiologic evidence shows that medications may contribute to or exacerbate geriatric syndromes either alone or through drug-drug or drug-disease interactions. Medication use, often specific medications such as those with a sedating effect, is often cited as a risk factor for falls.[254-256] One recent study found that polypharmacy was associated with increased falls among older adults with type 2 DM.[12] Medications are also cited as potential causes of depression, and may complicate its treatment.[257, 258] Many medications (especially sedating medications) have been associated with cognitive impairment (either delirium or dementia) in some older patients.[259-263] Urinary incontinence has been linked to some specific medications as well as drug-drug interaction and polypharmacy, particularly in women.[264-267] In addition, adverse drug reactions have been implicated in failure to thrive among older adults, resulting in functional

decline, depression, and malnutrition.[268] The AGS Beers Criteria provide clinicians with resources on potentially inappropriate medications.[13] (Source guideline: 15)

Cognitive Impairment

1. The clinician should assess the older adult with DM for cognitive impairment using a standardized screening instrument during the initial evaluation period and with any significant decline in clinical status. Increased difficulty with self-care should be considered a change in clinical status. (IIIA)

Diabetes mellitus, particularly type 2, has been associated with accelerated decline in cognitive function in older adults, manifested mainly as decreased memory, learning, or verbal skills.[224, 269-278] Systematic review and meta-analyses of up to 15 studies found that dementia was more likely in persons with DM and suggested that DM was associated with a faster cognitive decline in older adults.[279-281] Cross-sectional and longitudinal studies have also found that hypoglycemia is associated with dementia.[15, 282] However, whether DM increases the risk of developing Alzheimer's disease remains unclear.[283-286]

Two case-control studies[273, 277] found significant differences in cognitive function between older adults with and without DM using the Mini–Mental State Exam (MMSE),[287] demonstrating that a short formal cognitive assessment like the MMSE can detect impairment in older adults with diabetes.[288] One case-control study found that older adults with DM who scored below 24 points on the MMSE were significantly less likely to be solely responsible for self-medication or self-monitoring of blood/urine glucose.[273] In addition, the study found that older adults with diabetes who scored below 24 on the MMSE were more likely to have been hospitalized in the last year. Therefore, it is important both to be aware of a patient's cognitive function when prescribing treatments and to note difficulties with participating in DSME/S that could be an indicator of a change in cognitive status.

2. If there is evidence of cognitive impairment in an older adult with DM and delirium has been excluded as a cause, then an initial evaluation designed to identify reversible conditions that may potentially cause or exacerbate cognitive impairment should be performed within the first 3 months after diagnosis and with any significant change in clinical status. (IIIA)

The American Academy of Neurology guidelines recommend screening older adults with evidence of cognitive impairment for depression, B_{12} deficiency, and hypothyroidism; structural neuroimaging to identify lesions is also recommended for those recently diagnosed.[289] Those

guidelines have not been updated. As noted above, medications can also affect cognitive function, so a review of the medication list should be performed if there is evidence of cognitive impairment (see Polypharmacy recommendation 2).

Epidemiologic evidence has found that cognitive impairment is associated with DM and hyperglycemia may be a treatable cause of cognitive impairment.[274] One prospective study found that older adults with untreated type 2 DM who were treated with an oral hypoglycemic agent for a minimum of 2 weeks (mean fasting glucose before treatment: 13.8 +/- 1.2 mmol/L, mean after treatment: 8.4 +/- 0.4 mmol/L) had significantly (P<.05) improved scores on a variety of tests of cognitive function after treatment.[290] A non-randomized controlled trial found similar results in treated versus untreated older adults with type 2 DM, and found an association between treatment of glycemia and improvement in memory and learning, particularly verbal learning.[291] More recently, an RCT found that intensifying glycemic pharmacologic treatment improved fasting glucose and that the degree of improvement in glucose was significantly correlated (r=0.30) with the magnitude of improved cognitive function.[292] However, in the ACCORD study of adults 55–80 years old, there were no benefits to brain function with either intensive glycemic control or with a blood pressure of < 120 mmHg.[293]

Urinary Incontinence

1. The older adult who has DM should be evaluated for symptoms of urinary incontinence during annual screening. (IIIA)

Epidemiologic studies suggest that women with DM are at higher risk of urinary incontinence than the general population.[18, 294-296] One longitudinal study found that DM independently increased the risk of urinary incontinence in women and that the risk was associated with longer duration of DM.[17] This study estimated that 17% of incontinence and up to 50% of severe incontinence was attributable to DM. The risk factors for urinary incontinence that are more common in older adults with DM include polyuria, overflow secondary to neurogenic bladder and autonomic insufficiency, urinary tract infection, *Candida* vaginitis, and fecal impaction due to autonomic insufficiency. Urinary incontinence is commonly unreported by patients and undetected by healthcare providers, but its effect may be profound, and it may be associated with social isolation, depression, falls, and fractures.[297, 298] No RCT evidence indicates that routine inquiry about urinary incontinence will result in enhanced detection and treatment or

improved outcomes, but one trial on screening and treatment uptake in urinary incontinence in older women is in progress.[299] Evidence from one RCT indicates that using urinary incontinence as a target condition for comprehensive geriatric assessment is associated with reduced functional decline.[300] There is also no evidence in the literature that supports a specific screening interval for evaluation of urinary incontinence. Although the evidence supporting this recommendation is level III (expert opinion), because of the profound negative effect of underdiagnosis and undertreatment of this condition on quality of life, it is given an importance rating of level A.

2. If there is evidence of urinary incontinence in the evaluation of an older adult with diabetes, then an evaluation designed to identify treatable causes of urinary incontinence should be pursued. (IIIB)

Improvements in urinary incontinence for persons with and without DM may be another health benefit of weight loss.[301-303] In addition, urinary incontinence itself can be successfully treated in many patients using pharmacologic interventions.[304, 305]

Among the reversible or treatable causes of urinary incontinence are urinary tract infection, fecal obstruction, restricted mobility, and use of certain medications.[306] Other conditions that may contribute to urinary incontinence and are associated with older age and/or DM include polyuria (glycosuria), neurogenic bladder, prolapse, cystoceles, atrophic vaginitis, and vaginal candidiasis. Lifestyle and behavioral interventions can be used to treat urinary incontinence. One RCT of an intensive lifestyle intervention weight loss program versus a diabetes support and education control condition found that moderate weight loss was associated with reduced prevalence and incidence of urinary incontinence but did not improve resolution rates of urinary incontinence among overweight/obese women 45–75 years old with type 2 DM.[307]. (Source guideline: 5)

Injurious Falls

1. The older adult who has DM should be asked about falls every 12 months or more frequently if needed. (IIIB)

2. If an older adult presents with evidence of falls, the clinician should document a basic falls evaluation, including an assessment of injuries and examination of potentially reversible causes of the falls (eg, medications, environmental factors). (IIIB)

Studies suggest that middle-aged and older adults with DM are at greater risk of falls than persons without DM.[19-21] No RCTs have assessed the efficacy of screening for falls, but evidence from one RCT indicates that using falls as a target condition for comprehensive geriatric assessment is associated with reduced functional decline.[300] Falls frequently go unreported and undetected and may be associated with reversible factors. Multiple studies and systematic reviews[308] show that group and individual exercise programs reduce falls.[309-311] Similarly, several RCTs of fall prevention programs have included home visits to assess safety and modify environmental hazards. Overall evidence, including a systematic review of 13 RCTs,[309] supports home assessment and modification interventions as part of a mutifactorial prevention program to reduce falls.[312-316] The evidence for home visits alone to prevent falls remains unclear.[317-321] As noted above, psychotropic medications have been associated with falls in epidemiologic analyses,[322] and one RCT found that their withdrawal can also lead to a significant reduction in the rate of falling but not the risk of falling.[255] The success of polypharmacy interventions in reducing falls is mixed.[309] Three RCTs of interventions to mitigate polypharmacy did not reduce rates or risks of falls, [253, 323, 324] but another RCT of a prescribing modification program for primary care physicians significantly reduced the risk of falling (RR 0.61, 95% CI 0.41 to 0.91).[249] Additionally, medication management as part of multifactorial interventions have been shown to reduce falls.[310, 325, 326]

Common risk factors for falls include balance disorders, functional impairment, visual deficits, and cognitive impairment.[327, 328] Systematic reviews and meta-analysis of RCTs have found that interventions with multifactorial fall risks assessment and management programs are effective in reducing risks and rates of falling.[308, 329-332] Current guidelines recommend that older adults reporting a fall and found to have unsteadiness during an evaluation require a multifactorial fall risk assessment and customized intervention.[333] Components common in multifactorial interventions include medication review and management, exercise, assessments of and instrumental activities of daily living, orthostatic blood pressure measurement, vision assessment, gait and balance evaluation, cognitive evaluation, and assessment of environmental hazards. Quality indicators for falls and mobility problems in vulnerable older adults are available,[328] and the AGS Guideline for the Prevention of Falls in Older Persons (2010) also provides detailed recommendations on effective interventions to reduce falls.[333] (Source guideline: 13)

Pain

1. The older adult who has DM should be assessed during the initial evaluation period for evidence of persistent pain. (IIIA)

Older adults with DM are at risk of neuropathic pain which may occur in as many as 50% of patients with DM.[22] Older adults with DM and pain are often under-treated (35%) and are often reluctant to report pain unprompted.[334] In many instances, pain can be successfully treated when it is reported.[335] Pharmacologic and non-pharmacologic treatments are available and should be individualized based on cost, patient preferences, goals of treatment, potential drug-drug interactions, comorbidities, and common side effects.[336] A recent systematic review of RCTs of antidepressants, anticonvulsants, opioids, and others medications for the treatment of painful diabetic neuropathic found several drugs to be variably effective in improving quality of life and reducing the pain associated with the neuropathy.[337] Evidence on the efficacy of the chronic use of pharmacologic therapies is lacking in addition to comparative effectiveness studies of different medications and combinations of medications. The *Evidence-based guideline: Treatment of painful diabetic neuropathy* (2011) provides further guidance on the treatment of painful diabetic neuropathy.

Older adults with diabetes should be screened for persistent pain using a targeted history and physical examination. If there is evidence of persistent pain in an older adult with DM, further evaluation should be performed, appropriate therapy offered, [337, 338] and patients monitored as recommended by the American Geriatrics Society guidelines on The Management of Persistent Pain (2009). (Source guideline: 1, 4, 14).

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The following organizations with special interest and expertise in the treatment of diabetes in older adults provided peer review of a preliminary draft of this guideline: TBA

Conflicts of Interest

Ms. Vaisberg, Ms. Kimbro, and Drs. Blaum, Durso, Mangione, Moreno, and Saliba indicated no conflicts of interest. Dr. Chun is on an advisory board related to Patient Centered Medical Home and Alzheimer's care for Janssen Alzheimer Immunotherapy Research & Development, LLC. Dr. Funnell has served as a member of an Advisory Board for Eli Lilly; Halozyne Therapeutics; Briston-Meyers Squibb; Hygeia Inc; Boehringer-Ingelheim; Johnson & Johnson, Animas/Lifescan; Intuity Medical; Omada Health; NovoNordisk; Hygia, Inc.; Bayer Diabetes; Amalyn Pharmaceuticals. She is supported in part by the National Institute of Health (NIH) with an R34 grant for peer-based diabetes self-management education. Dr. Lee holds shares in Mylan Inc. Dr. Linnebur serves as a consultant for the American Geriatrics Society Beers Criteria Expert Panel. She has received a grant from Eli Lilly and Company for a phase 2 study investigating falls and muscle weakness.

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Table 1. Evidence Evaluated for Each Component of Diabetes Care (2002 -2012)

Components of Care	RCTs	Systematic Reviews or Meta-Analysis
Diabetes recommendations		
Aspirin use	3	4
Smoking cessation	2	0
Hypertension management	6	5
Glycemic control	5	5
Lipid management	9	5
Eye care	2	0
Foot care	0	0
Diabetes education and support	37	0
Geriatric syndromes		
Depression	8	4
Polypharmacy	4	1
Cognitive impairment	4	2
Urinary incontinence	2	0
Injurious falls	14	3
Persistent pain	5	1

RCT = randomized controlled trial

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Table 2. Key to Designations of Quality and Strength of Evidence

Quality of Evidence	
Level I	• Evidence from at least one properly randomized, controlled trial
Level II	• Evidence from at least one well-designed clinical trial without randomization, from cohort or case-controlled analytic studies, from multiple time-series studies, or from dramatic results in uncontrolled experiments
Level III	• Evidence from respected authorities, based on clinical experience, descriptive studies, or reports of expert committees
Strength of Evidence	
A	• Good evidence to support the use of a recommendation; clinicians "should do this all the time"
B	• Moderate evidence to support the use of a recommendation; clinicians "should do this most of the time"
C	• Poor evidence to support or to reject the use of a recommendation; clinicians "may or may not follow the recommendation"
D	• Moderate evidence against the use of a recommendation; clinicians "should not do this"
E	• Good evidence against the use of a recommendation; clinicians "should not do this"