Optimizing Outcomes for Older Adults With Type 2 Diabetes is supported by an educational grant from Novo Nordisk Inc. It has been accredited by the American Association of Diabetes Educators (AADE) for nurses, dietitians, and pharmacists.
The following program is a narrated by Barbara Kocurek.

Dr. Kocurek graduated from the University of Pittsburgh in 1987 with a Bachelor of Science in Pharmacy and she received her PharmD degree from the Medical College of Virginia in 1989. Since that time she has been involved in diabetes education in various health care settings. Currently she is the Diabetes Program Manager, Chronic Disease and Care Redesign for the Baylor Health Care System located in north Texas. She oversees the American Diabetes Association (ADA) recognition and data management for 11 outpatient diabetes education centers.

Dr. Kocurek served on the National Certification Board for Diabetes Educators (NCBDE) from 1998–2002 and was Chair for the 2000–2001 year. In 2002–2003 she served as a member of the AADE’s Nominating Committee and in 2004 served on the Professional Development, Education, and Resources Committee. She currently serves on AADE’s Professional Practice Committee and in 2010 became a Fellow of the American Association of Diabetes Educators.
After completing this activity, participants should be better able to:

- Summarize current data on the epidemiology of diabetes in older adults in the United States
- Discuss strategies for individualizing glycemic, blood pressure, and lipid control in older adults with diabetes
- Review issues of special importance in managing type 2 diabetes in older adults
- Describe current nonpharmacologic and pharmacologic approaches to the management of type 2 diabetes in older adults
Today, about 11 million US residents 65 years of age and older have diagnosed or undiagnosed diabetes. The Centers for Disease Control and Prevention (CDC) estimates that between 1980 and 2011, the percentage of older adults with diagnosed diabetes increased by 140%, from 9.1% to 21.8%, among individuals aged 65 to 74 years of age. Over the same period, the percentage increased by 125%, from 8.9% to 20.0%, in individuals 75 years of age or older. The burden of this increase disproportionately affects members of minority groups. The prevalence of diabetes in older adults is expected to keep increasing into the foreseeable future.

Among the causes of the rising prevalence of diabetes among older adults are high obesity rates, an aging US population, an increasing proportion of older adults belonging to ethnic groups with especially high diabetes rates, and increased longevity among people with diabetes.


An economic analysis of the health care expenditures attributed to diabetes in the United States in 2012 showed that approximately 59% of all health care costs were for resources used by the population aged 65 years and older.

Total mean per capita health care expenditures were $4,394 for patients under the age of 45 years, $5,611 for those between 45 and 64 years of age, and $11,825 for those aged 65 years and older.

The sharp increase in total costs in the oldest age group is primarily due to increased use of hospital inpatient and skilled nursing facility resources, physician office visits, and prescription medications.

The analysis also showed that up to 45% of diabetes-attributed medical expenditures were spent treating diabetes complications.
This chart summarizes current CDC data on the prevalence of some of the major clinical and functional consequences of diabetes in adults aged 65 to 74 years and 75 years and older.

The data reflect high rates of chronic macrovascular and microvascular complications in these populations. Note especially that more than 40% of adults between 65 and 74 years of age and more than 55% of those at least 75 years of age have a history of heart disease or stroke.

This brief overview of the personal and societal burden of diabetes emphasizes the compelling need to implement more effective diabetes prevention strategies. It also shows the importance of providing optimal care for older adults who already have diabetes, thereby delaying or minimizing the impact of chronic diabetes complications.


INDIVIDUALIZING GLYCEMIC, BLOOD PRESSURE, AND LIPID CONTROL
The emphasis on individualized goal setting embodied in the 2012 American Diabetes Association (ADA)–European Association for the Study of Diabetes (EASD) position statement on the management of hyperglycemia in type 2 diabetes is important for all people with type 2 diabetes and especially important for older adults. According to the ADA, the care of older adults with diabetes is complicated by their clinical and functional heterogeneity. The CDC has determined that diabetes is currently diagnosed at a median age of 54 years, and that the median diabetes duration for individuals between the ages of 65 and 79 years is 9.6 years. However, there are dramatic differences in older adults’ diabetes histories. Some individuals have had diagnosed diabetes for many years, with significant complications. Others have had undiagnosed diabetes for years, with resultant complications. A small percentage have recent-onset disease, with few or no complications.

There are also marked differences in the clinical and functional status of older adults with diabetes. Some are frail, with other serious chronic conditions and limited physical and/or cognitive functioning. Others are active, with little or no comorbidity and high-level physical and cognitive functioning.


“Diabetes in Older Adults” is a consensus report initiated by the ADA and published in December 2012. The authors stratified older patients with diabetes into 3 groups: healthy, complex/intermediate, and very complex/poor health. These groups correspond with increasing levels of mortality risk.

Patients in the healthy group have few coexisting chronic illnesses and intact cognitive and functional status. These patients should receive aggressive diabetes management because of their relatively long remaining life expectancy.

Patients in the complex/intermediate group have at least 3 coexisting chronic illnesses or at least 2 instrumental activities of daily living (IADL) impairments or mild-to-moderate cognitive impairment. The authors define coexisting chronic illnesses as conditions serious enough to require medications or lifestyle management. Examples include arthritis, cancer, congestive heart failure, depression, emphysema, falls, hypertension, incontinence, stage III or worse chronic kidney disease, myocardial infarction, and stroke. Moderate-intensity diabetes management is appropriate for this group, whose members have an intermediate remaining life expectancy, high treatment burden, hypoglycemia vulnerability, and fall risk.

Patients in the very complex/poor health group are receiving long-term care, or have at least 1 end-stage chronic illness or moderate-to-severe cognitive impairment or at least 2 activities of daily living (ADL) dependencies. End-stage chronic illnesses include stage III/IV congestive heart failure, oxygen-dependent lung disease, chronic kidney disease requiring dialysis, or uncontrolled metastatic cancer. Nonintensive diabetes management is appropriate for this group because their limited remaining life expectancy makes the benefit of treatment uncertain.

This table shows A1C goals for the 3 groups of patients described in the "Diabetes in Older Adults" document. For each group, the authors recommend a reasonable A1C goal, a fasting or preprandial blood glucose (BG) range, and a bedtime BG range. A lower A1C goal may be set for an individual if it is achievable without recurrent or severe hypoglycemia or an undue treatment burden.

For the healthy patient group, the A1C goal is <7.5%, the fasting or preprandial BG range is 90–130 mg/dL, and the bedtime BG range is 90–150 mg/dL.

For complex/intermediate patients, the A1C goal is <8.0%, the fasting or preprandial BG range is 90–150 mg/dL, and the bedtime BG range is 100–180 mg/dL.

For patients in the very complex/poor health group, the A1C goal is <8.5%, the fasting or preprandial BG range is 100–180 mg/dL, and the bedtime BG range is 110–200 mg/dL. The authors note that an A1C of 8.5% equates to an estimated average glucose of approximately 200 mg/dL. Looser glycemic targets than this may expose patients to acute risks from: glycosuria; dehydration; hyperosmolar; hyperglycemic state; and poor wound healing.

Data from randomized, controlled clinical trials provide strong evidence for the benefits of treating hypertension in older adults with and without diabetes.

The ADA consensus report on diabetes in older adults recommends a blood pressure (BP) goal of <140/80 mmHg for patients in the healthy and complex/intermediate groups. This is also the ADA’s current BP goal for the overall population of people with diabetes. The consensus report recommends a looser BP goal of <150/90 mmHg for individuals in the very complex/poor health group.

The “2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults” was developed by the Eighth Joint National Committee and published in December 2013. The JNC 8 report does not stratify older adults with diabetes according to their mortality risk. Instead, a BP goal of <140/90 mmHg is recommended for all people aged at least 18 years with diabetes, including those with chronic kidney disease (CKD). The JNC 8 BP goal for the general population aged ≥60 years is <150/90 mmHg.

According to the American Geriatrics Society (AGS) “Guidelines for Improving the Care of Older Adults with Diabetes Mellitus: 2013 Update,” there is potential harm in lowering systolic BP to <120 mmHg in older adults with type 2 diabetes.

Although the ADA report on diabetes in older adults contains recommendations for using statins, these have been superseded by recommendations in the "2013 American College of Cardiology (ACC)/American Heart Association (AHA) Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults," which was published in November 2013. This guideline differs from many earlier lipid guidelines because the treatment goal is the intensity of statin treatment, not low-density lipoprotein cholesterol (LDL-C) or non-high-density lipoprotein cholesterol (HDL-C) targets.

The ACC/AHA guideline defines 4 groups in whom the potential for an atherosclerotic cardiovascular disease (ASCVD) risk reduction benefit clearly exceeds the potential for adverse effects (AEs) from statin therapy. For convenience, we have assigned a number to each group. Group 1 consists of individuals with clinical ASCVD, including some people with diabetes. Group 2 consists of individuals with primary LDL-C elevations ≥190 mg/dL. Some members of this group have diabetes. Group 3 consists of individuals 40 to 75 years of age with diabetes but without clinical ASCVD and with LDL-C levels from 70 to 189 mg/dL. Note that everyone in this group has diabetes. Group 4 consists of individuals without clinical ASCVD or diabetes who are 40 to 75 years of age with LDL-C from 70 to 189 mg/dL and an estimated 10-year ASCVD risk of ≥7.5% or higher. Ten-year ASCVD risk can be determined using the AHA/ACC 2013 Prevention Guidelines Tools CV Risk Calculator, which is available online.

A 2014 issue of the “Pharmacist’s Letter” provides an excellent summary of the content of the new guidelines.


This table summarizes ACC/AHA guideline recommendations for determining the appropriate intensity of statin therapy for individual patients. With regard to secondary prevention, Group 1 patients 75 years of age or younger should receive high-intensity therapy unless a high statin dose is contraindicated or likely to result in serious adverse effects (AEs). For individuals over age 75, decisions about whether statin therapy is warranted and its treatment intensity should be made on a case-by-case basis.

With regard to primary prevention, Group 2 patients should receive high-intensity therapy unless it is inappropriate. Group 3 patients should receive high-intensity therapy if their estimated 10-year ASCVD risk is at least 7.5% and moderate-intensity therapy if their risk is less than 7.5% or high-intensity therapy is inappropriate. Group 4 patients should receive either high- or moderate-intensity therapy, based on clinical judgment.

Patients with diabetes who are less than 40 or more than 70 years old do not belong to one of the 4 major statin benefit groups. However, the guidelines suggest that prescribers consider the potential for ASCVD benefits, the risks of AEs, and patient preferences when deciding whether to initiate, continue, or intensify statin doses in these patients.


This table shows options for moderate- or high-intensity statin therapy as defined in the 2013 ACC/AHA guideline.

Daily dosing with high-intensity statin therapy achieves an approximate average LDL–C reduction of at least 50%. High-intensity statin therapy consists of atorvastatin, 40 to 80 mg/day, and rosuvastatin, 20 to 40 mg/day.

Daily dosing with moderate-intensity statin therapy achieves an average LDL–C reduction of approximately 30% to less than 50%. Moderate-intensity statin therapy consists of atorvastatin, 10 to 20 mg/day; rosuvastatin, 5 to 10 mg/day; simvastatin, 20 to 40 mg/day; pravastatin, 40 to 80 mg/day; lovastatin, 40 mg/day; fluvastatin XL, 80 mg/day; fluvastatin, 40 mg/day; and pitavastatin, 2 to 4 mg/day.

Health care providers should also refer to the ACC/AHA guideline for detailed recommendations on monitoring patients for the robustness of their therapeutic response to statin therapy and their adherence to statin therapy.

The accurate statement is:

a. Nearly 5 million US residents aged ≥65 years have diabetes.

b. According to the “Diabetes in Older Adults” report, a reasonable A1C goal for older adults in the “healthy” group is <7%.

c. According to the 2013 AGS guideline, lowering systolic blood pressure to less than 120 mmHg can be harmful in older adults.

d. According to the 2013 ACC/AHA guideline, statin therapy should not be used for primary prevention in adults with diabetes who are over the age of 75 years.
The accurate statement is **c**.

According to the 2013 AGS guideline, lowering systolic blood pressure to less than 120 mmHg can be harmful in older adults.
KEY MANAGEMENT ISSUES IN OLDER ADULTS WITH DIABETES
Among the issues that are especially important in the management of diabetes in older adults are hypoglycemia and 6 interrelated geriatric syndromes: injurious falls, cognitive impairment, depression, urinary incontinence, persistent pain, and polypharmacy.

We begin by discussing hypoglycemia, since recent research into hypoglycemia’s pervasively harmful effects has led to a greater appreciation of the importance of avoiding these episodes in all patients with diabetes, but especially in older adults.

We then focus on 6 geriatric syndromes that are more prevalent in older adults with diabetes than in the general population of older adults. In addition to their prevalence, these syndromes have been shown to reduce patients’ ability to manage their diabetes and lead to decrements in quality of life. Therefore, recognition and effective treatment of these syndromes are imperative. In this activity, we will emphasize the management of injurious falls, cognitive impairment, and depression since these syndromes have been studied with special intensity in recent years.


Older adults are especially vulnerable to hypoglycemia for several reasons. Age-related declines in renal function and hepatic enzyme activity may interfere with the metabolism of sulfonylureas, insulin, and other medications that lower BG levels, thereby potentiating their hypoglycemic effects. Many older adults have erratic food intake, a problem whose effects are compounded by age-related slowing of intestinal absorption. Medication errors may occur due to cognitive or visual impairment.

Many older adults do not experience hypoglycemia symptoms until their BG level is very low. Furthermore, hypoglycemia unawareness is widespread in this population. The presenting symptoms of hypoglycemia in older adults are usually neuroglycopenic, consisting of dizziness, confusion, and/or weakness. Since these symptoms can occur in older people with a wide range of disorders, hypoglycemia may remain undetected. In those circumstances, necessary lifestyle modifications or changes to the diabetes treatment regimen may not be made, resulting in recurrent hypoglycemia.


Recent studies have identified many harmful consequences of hypoglycemia in older adults. These include increased mortality, including cardiovascular mortality, increased risk/exacerbation of dementia, cardiovascular events; falls, fall-related fractures, other traumatic injury, and diminished health-related quality of life.


Treatment of hypoglycemia depends on the patient’s BG level and symptoms. Glycemic thresholds for symptom onset differ among older adults, but symptoms often occur when the BG level drops below 70 mg/dL.

To treat hypoglycemia in a patient who can swallow, the 15:15:15 rule should be followed. The patient should consume 15 grams of carbohydrate, such as 3 or 4 glucose tablets or 4 ounces of juice or sweetened soda. The BG should be checked in 15 minutes. By that time, the BG level should have increased by 15 points. If the BG level is still below 70 mg/dL, treatment should be repeated even if the patient’s symptoms have disappeared.

Patients should be advised that hypoglycemia may recur, so they should eat a snack containing carbohydrate and protein if their next meal is more than 1 hour away. Patients should also be cautioned against using high-fat foods to treat hypoglycemia, since they delay gastric emptying and it may take longer to raise BG levels.

Treatment for severe hypoglycemia, defined as low BG requiring the intervention of another person, depends on whether the individual is able to swallow. If the patient can swallow, glucose gel, honey, or syrup can be placed inside the cheek. Otherwise, a glucagon injection can be given to stimulate hepatic glucose production. A family member or friend should be taught how and when to inject glucagon. After the glucagon injection, it is important to turn the patient on his or her side, as glucagon can cause emesis. As soon as possible, the patient should drink a liquid source of carbohydrate since the effects of glucagon are short-lived. Severe hypoglycemia may require professional medical assistance and administration of intravenous glucose.

Given the potentially severe consequences of hypoglycemia in older adults, adopting effective prevention strategies is essential. Patients and/or their caregivers must learn about the causes and prevention of hypoglycemia as part of their diabetes self-management education/training (DSME/T).

Health care providers should assess the patient’s hypoglycemia risk at every visit, being particularly vigilant with high-risk patients. Characteristics of individuals who are especially vulnerable to hypoglycemia are extreme old age, diabetes of long duration, renal insufficiency, recent hospitalization, erratic meal patterns, treatment with insulin or an insulin secretagogue, taking at least 5 concomitant medications, and a known history of hypoglycemia.

Prescribers should avoid using complex glucose-lowering regimens that require multiple decision points and avoid the use of short-acting insulin sliding scales, glyburide, and chlorpropamide. In managing an older patient with frequent and/or severe hypoglycemia, it is important for the provider to increase the patient’s contact with the health care team, reevaluate the overall treatment plan, and initiate appropriate referrals, such as to a diabetes educator for focused DSME/T or to an endocrinologist for further evaluation.


There is a higher incidence of falls in older adults with diabetes than in older adults without diabetes. Among the reasons for this heightened risk are hypoglycemia; polypharmacy, which may result in orthostatic hypotension, dizziness, and weakness; visual impairment; peripheral or autonomic neuropathy; gait and balance disturbances associated with diabetes-related foot conditions; skeletal muscle weakness due to chronic inflammation and other factors; and an increased prevalence of cognitive impairment.

Compared to older adults without diabetes, older individuals with diabetes are also more likely to experience injurious falls requiring hospitalization. Risk factors for these falls include female sex, falling during the past year, balance disturbances, insulin use, and an A1C of 8% or greater.


As part of a fall prevention strategy for older adults with diabetes, it is important for the health care provider to ask the patient about falls at least once a year.

The provider should conduct a periodic falls evaluation for patients who are at risk for or have a history of falls. This would include an assessment of the patient’s history of falls; current medications; gait, balance, and mobility; visual acuity; neurological status; muscle strength; heart rate and rhythm; blood pressure; feet and footwear; and environmental hazards. A visit to assess the safety of the patient’s home should be conducted when possible.

Based on the results of the evaluation, the provider should initiate a customized, comprehensive intervention to reduce identified risks. The intervention would typically include providing or referring the patient for focused education, optimizing the medication regimen, avoiding severe hyperglycemia and hypoglycemia by making lifestyle and medication changes, eliminating environmental hazards, managing foot and footwear problems, and prescribing a supervised, individualized exercise program that includes gait and balance training.


Cognitive impairment is widespread and often undiagnosed in older adults with diabetes. This condition often appears in individuals with a high A1C, because chronic hyperglycemia may compromise blood flow to the brain and damage cerebral blood vessels. Hyperglycemia may also promote free radical-mediated oxidative stress, formation of advanced glycation end-products, and alterations in neuronal insulin signaling pathways. However, cognitive impairment—often severe—is also associated with severe episodes of hypoglycemia. Severe hypoglycemia may lead to cognitive impairment by promoting neuronal cell death, increasing platelet aggregation and fibrinogen formation, and damaging neuronal receptors in the brain.

Many older adults with diabetes experience subtle executive dysfunction, but more severe forms of cognitive impairment are also common. According to one study, Alzheimer’s disease and multi-infarct dementia are twice as likely to occur in older adults with diabetes as in other older adults.


Older adults with diabetes should be assessed for cognitive impairment using a standardized instrument. The health care provider should perform this assessment during the initial evaluation period and whenever there is a significant change in the patient’s clinical status, including increased difficulty with self-care.

The Society of Hospital Medicine’s Clinical Toolbox® for Geriatric Care is an example of a free, online source for a wide variety of assessment instruments. If screening identifies the presence of cognitive impairment, the patient should be assessed further to identify reversible conditions that might be causing or exacerbating the impairment. Adverse drug reactions, depression, hypothyroidism, and vitamin B12 deficiency are frequent, treatable causes of or contributors to cognitive impairment in this population.


When managing diabetes in a patient with cognitive impairment, the health care provider should involve both the patient and the caregiver in developing the treatment plan.

It is important to design a plan that is most likely to keep BG levels at the patient's individualized targets while avoiding a complex medication regimen and food plan as well as episodes of hypoglycemia.

Additionally, the provider should refer the patient for medical management of cognitive impairment and to the appropriate social services.

It is important for the provider to continue to monitor all of the patient's medications since drugs that could potentially affect BG levels might be added by another provider.


The prevalence of clinical depression is at least 2-fold higher in adults with diabetes than in those without diabetes. Patients with diabetes experience the full spectrum of depression, from subclinical depressive symptoms to major depressive disorder.

Today, the link between depression and diabetes is being actively studied. Several mechanisms appear to be involved in the pathogenesis of type 2 diabetes that is preceded by depression. Depression induces neurohormonal changes—activation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system. These changes result in increased levels of cortisol and catecholamines, leading to abdominal adiposity, hypertriglyceridemia, and hyperinsulinemia, all of which are risk factors for diabetes. In addition, lifestyle factors such as suboptimal nutrition, weight gain, physical inactivity, and smoking further increase the diabetes risk. Weight gain associated with some of the psychotropic drugs prescribed for depression may further compound the risk of developing diabetes.

When diabetes precedes depression, stressors such as the intellectual and emotional challenges of managing a chronic disease and its complications, financial difficulties, and social isolation appear to play major roles in the development of depression.


Depression has many negative consequences for older adults with diabetes. It impedes diabetes self-management and reduces adherence to the treatment regimen, compromising glycemic control.

In addition, the presence of depression increases the risks of substance abuse, morbidity, and severe hypoglycemic episodes. It also raises non-mental health care costs.

As previously noted, older adults with diabetes have an increased risk of developing dementia, and the presence of depression heightens this risk even further.

Older adults with diabetes and depression also have an increased incidence of all-cause mortality.


Depression is often undiagnosed in older adults, and depression is especially likely to be overlooked in an older adult who has a complex, management-intensive chronic disease such as diabetes.

Older adults with diabetes should be screened for depression during the initial evaluation period and if there is any unexplained decline in clinical status, including cognitive decline.

A standard short depression screening instrument, such as the Geriatric Depression Scale or the Patient Health Questionnaire (PHQ-9), should be used.


According to the AGS, older adults with diabetes who present with new-onset or recurrent depression should be treated or referred within 2 weeks. They should be treated or referred sooner if they pose a danger to themselves.

A systematic review has shown that pharmacologic treatment of depression is effective in reducing depression severity and moderately improves glycemic control in adults with diabetes.

Recent studies have demonstrated that adoption of a collaborative care model, in which integrated care managers work closely with a patient’s primary care physician to provide guideline-based management of both diabetes and depression, results in greater improvements in BG control and depressive symptoms than standard care provided by a primary care physician alone.


Diabetes independently increases the risk of urinary incontinence (UI) in women, and this risk is associated with longer duration of diabetes. Risk factors for UI that are more common in older adults with diabetes than in the general population include polyuria, overflow secondary to neurogenic bladder and autonomic insufficiency, urinary tract infection, *Candida* vaginitis, and fecal impaction due to autonomic insufficiency. UI is commonly underreported by patients and undetected by health care providers. Nevertheless, the impact of UI may be profound, leading to social isolation, depression, falls, and fractures.

The AGS recommends that older adults with diabetes be evaluated for UI during their annual screening. If the screen is positive, an evaluation to identify treatable causes should be performed. Both tighter glycemic control and weight loss often improve UI symptoms. Although pharmacologic treatment for UI is often successful, some of these medications are highly cholinergic and could cause confusion, constipation, and exacerbation of comorbid medical conditions. Therefore, these agents should be used with caution in older adults and avoided in frail elderly patients.


Persistent pain is widespread in older adults with diabetes. In addition to neuropathic pain, which affects about 50% of people with diabetes, many older adults with diabetes experience pain that is associated with musculoskeletal disorders, nighttime leg pain, or pain from claudication. Despite the prevalence of pain in this population, many older adults with diabetes do not report it unless prompted, and about 35% have undertreated pain. Therefore, the AGS recommends that all older adults with diabetes be screened for persistent pain using a targeted history and physical examination. When there is evidence of persistent pain, further evaluation should be performed and appropriate therapy offered. It is important to prescribe individualized pharmacologic and/or nonpharmacologic treatments based on patient preferences, treatment goals, comorbidities, potential side effects, and drug-drug interactions.

Two recent, detailed guidelines on the management of persistent pain are especially useful to clinicians who treat older adults with diabetes. An AGS expert panel has developed a guideline on the pharmacological management of persistent pain in older persons, and a working group from the American Academy of Neurology and two other organizations has developed a guideline on the treatment of painful diabetic neuropathy.


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<tr>
<td>• Following evaluation of persistent pain, individualized treatments should be prescribed</td>
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<tr>
<td>• Detailed guidelines on management of persistent pain and painful diabetic neuropathy are available</td>
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### Polypharmacy in Older Adults with Diabetes

- 28% of adults in recent study met criterion (≥6 prescription medications)
- Increases risk of drug side effects, drug-drug interactions, and falls
- Patients’ economic costs may be substantial
- Patients should maintain up-to-date medication list
- Comprehensive medication review
  - Annually for outpatients
  - At hospital discharge
  - Immediately for patient with falls, cognitive impairment, depression, or UI
- AGS Updated Beers Criteria provide guidance on potentially inappropriate medications

Polypharmacy is the taking of multiple medications by a patient. Criteria for polypharmacy vary, but the 2012 ADA consensus report on diabetes in older adults defines it as the concurrent use of 6 or more prescription medications. In a recent study of nearly 50,000 adults with type 2 diabetes, 28% of participants had polypharmacy. Although polypharmacy may be necessary to control comorbidities and reduce the risk of diabetes complications in older adults, it also increases the risk of drug side effects, drug-drug interactions, and falls. Furthermore, personal drug expenditures can be substantial, especially when patients fall into the “doughnut hole” of Medicare Part D coverage.

To minimize the risks associated with polypharmacy, health care providers should instruct their patients to maintain an up-to-date list that includes all of their prescription medications, over-the-counter drugs, vitamins, and herbal supplements. The AGS recommends that a comprehensive medication review be performed annually in the outpatient setting and whenever a patient is discharged from the hospital. The medication list of a patient presenting with falls, cognitive impairment, depression, or urinary incontinence should be reviewed immediately.

The AGS Updated Beers Criteria provide guidance about potentially inappropriate medication use in older adults.

The accurate statement about diabetes in older adults is:

a. Falling is the most serious potential consequence of hypoglycemia.
b. Diabetes is associated with many types of cognitive impairment.
c. Antidepressant therapy usually worsens glycemic control.
d. Polypharmacy must be avoided because it can have many harmful effects.
The correct answer is b.

Diabetes is associated with many types of cognitive impairment.
NONPHARMACOLOGIC APPROACHES TO DIABETES MANAGEMENT IN OLDER ADULTS
As with all persons with diabetes, DSME/T for older adults should be tailored to the individual’s unique medical, cultural, social, and financial situation.

DSME/T must also account for possible impairments in vision, hearing, cognition, and functional or physical status.

Even when there is no evidence of cognitive impairment, DSME/T must reflect the reality that many older adults have low health literacy and numeracy skills and that they may be overwhelmed by the need to deal with multiple comorbidities.

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<th>Importance of Individualized DSME/T for Older Adults</th>
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<td>• Have low health literacy and numeracy skills</td>
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<td>• Are overwhelmed by multiple comorbidities</td>
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To increase the likelihood that older adults with diabetes will engage in successful self-care behaviors, the diabetes educator should involve care partners, such as family, friends, or other caregivers, in DSME/T.

When communicating with an older adult who has cognitive impairment, the educator should address the patient by name, even when a caregiver will provide most of the care.

It is also helpful for the educator to:

• Speak in simple terms
• Use memory aids, such as verbal analogies, hands-on experience, demonstrations, and models
• Schedule sequenced visits to build on previously presented information
• Summarize important points frequently
• Focus on one skill at a time
• Teach tasks from simple to complex, and
• Provide easy-to-read handouts.

“Nutrition Therapy Recommendations for the Management of Adults with Diabetes” is a position statement commissioned by the ADA and published in 2013. The statement differs from many earlier statements in that it focuses on “eating patterns” rather than on “diet.”

The underlying principle of the document is that, in order to be effective, nutrition therapy should be individualized for each patient based on specific health goals; personal and cultural preferences; health literacy and numeracy; access to healthful food choices; and readiness, willingness, and ability to change.

Other basic concepts are that nutrition interventions should emphasize a variety of minimally processed, nutrient-dense foods in appropriate portion sizes. Additionally, it is important for interventions to provide the patient with practical tools for day-to-day food planning and behavior change that can be maintained over the long term.

Registered dietitians (RDs) and other members of the health care team should maintain the patient’s pleasure in eating by providing positive messages about food choices while limiting food choices only when indicated by scientific evidence.

The “Nutrition Therapy Recommendations” document endorses the guidelines of the Academy of Nutrition and Dietetics for the implementation of medical nutrition therapy (MNT). All individuals with diabetes, including all older adults, should have an initial series of 3 to 4 encounters with an RD, each lasting from 45 to 90 minutes. These encounters should begin upon diagnosis of diabetes or at first referral to an RD for MNT and be completed within 3 to 6 months. Some patients may benefit from additional encounters during this period. Additionally, it is important for all patients to have at least one follow-up encounter with an RD each year to reinforce lifestyle changes and to evaluate and monitor outcomes indicating the need for changes in MNT or the medication regimen. In 2014, Medicare covers 3 hours of MNT in the first year after referral and 2 hours in subsequent years.

The ADA position statement advises that for many older adults, adopting a simple meal planning approach such as portion control or healthful food choices may be more appropriate than carbohydrate counting. This is especially true for older adults with low health literacy/numeracy.

The ADA statement contains valuable recommendations about coordinating the meal plan with the type of glucose-lowering medication taken. We will present some of these recommendations later in this activity.


According to the ADA, adults over the age of 65 years should follow general adult physical activity guidelines if possible.

Therefore, in the absence of contraindications or disability, older adults with diabetes should be advised to perform at least 150 minutes per week of moderate-intensity aerobic physical activity, defined as 50% to 70% of the maximum heart rate, spread over ≥3 days/wk with no more than 2 consecutive days without exercise. Older adults should also be encouraged to perform resistance training at least twice/wk.

Providers should assess patients for conditions that might contraindicate certain types of exercise or predispose to injury, such as uncontrolled hypertension, severe autonomic neuropathy, severe peripheral neuropathy or history of foot lesions, and unstable proliferative retinopathy. These patients should be referred to an exercise physiologist for an individualized exercise prescription if possible.

When interacting with older adults who cannot meet general physical activity guidelines, health care providers should encourage them to be as physically active as their abilities and conditions allow.

It is important for providers to urge their patients to engage in some physical activity each day and to include aerobic, resistance, flexibility, and balance training in their weekly regimens unless contraindicated.

Patients should be reminded to count all types of aerobic activity when calculating their total activity expenditure. Examples include vacuuming the house, gardening, or walking the dog.

Providers can encourage their patients to perform aquatic or chair exercises if they cannot tolerate weight-bearing activities because of joint disease.

*Exercise and Diabetes*, a book authored by Sheri Colberg and published by the ADA in 2013, contains many additional suggestions for physical activity in older adults with diabetes and other physical limitations.
### Check Point 3

The accurate statement is:

- a. DSME/T is inappropriate for older adults with cognitive impairment.
- b. It is imperative for older adults to master carbohydrate counting.
- c. Older adults should follow general physical activity guidelines if possible.
- d. It is almost always unsafe for older adults to engage in resistance training.

The accurate statement is:

a. DSME/T is inappropriate for older adults with cognitive impairment.

b. It is imperative for older adults to master carbohydrate counting.

c. Older adults should follow general physical activity guidelines if possible.

d. It is almost always unsafe for older adults to engage in resistance training.
The correct answer is c.

Older adults should follow general physical activity guidelines if possible.
PHARMACOLOGIC APPROACHES TO DIABETES MANAGEMENT IN OLDER ADULTS
The CDC estimates that about 90% of older adults with diabetes take at least one glucose-lowering drug. Today, many classes of oral and injectable agents are available, enabling prescribers to select the drug or drug combination that is most appropriate for the individual patient. Several important questions that should be asked during the drug-selection process are shown on the slide.

Lack of adherence to the drug regimen is a particular concern in older adults, who often do not inform their health care provider that they are not taking a drug as prescribed or have stopped taking it altogether. Reasons for nonadherence include complex regimens, unacceptable side effects, depression, cognitive impairment, and financial difficulties. Although nonadherence usually involves failure to take a drug, some older patients do not stop taking a previously prescribed drug because of the perceived waste of an expensive medication. Factors that enhance adherence are good-quality patient education, increased availability of the provider, effective communication between the provider and the patient or caregiver, and selection of an appropriate medication.


Maximizing the Safety of Glucose-Lowering Drugs

- Provide education about drug at start of treatment and periodically thereafter
- Start drug at lowest possible dose and slowly titrate upwards
- Adjust doses of concomitant medications
- Ask patient about side effects
- Periodically reevaluate liver and kidney function
- Emphasize importance of informing provider about medication changes

This slide shows some general precautions for maximizing the safety of glucose-lowering drugs in older adults. The clinician should provide education about the drug at the time it is prescribed and periodically thereafter. Using “teach-back” helps to ensure that the patient has an adequate understanding of the drug. It is often beneficial to start the drug at the lowest possible dose and slowly titrate it upwards. During this process, doses of concomitant medications may need to be adjusted.

Shortly after treatment initiation and continuing at regular intervals, the provider should ask the patient about whether he or she is experiencing side effects. It is important to describe strategies for avoiding or reducing these effects. If the patient is experiencing dangerous or distressing side effects and dose adjustment is not an option, it will be necessary to prescribe a different agent. When a patient is taking a drug that is metabolized by the liver and/or excreted by the kidneys, organ function needs to be reevaluated at regular intervals.

To prevent potentially severe drug-drug interactions, the patient or caregiver must appreciate the importance of informing the provider about any changes in prescription drugs, over-the-counter medications, vitamins, and herbal supplements. It is helpful to ask the patient whether all drugs are obtained from the same pharmacy. When drugs come from different sources, automatic prescription screening for potential interactions is unreliable and the health care provider must be especially vigilant.


We will now review currently available glucose-lowering drugs with substantial data in older adults. These data are available for many classes of oral glucose-lowering drugs. Metformin, the only biguanide available in most parts of the world, improves the effectiveness of insulin in suppressing excess hepatic glucose production. The SUs, such as glimepiride, glipizide, and glyburide, are insulin secretagogues that enhance the second phase of insulin secretion after food ingestion; little effect on first-phase secretion. The glinides, including repaglinide and nateglinide, are short-acting insulin secretagogues that stimulate primarily the first phase of insulin secretion after food ingestion. The thiazolidinediones (TZDs), including pioglitazone and rosiglitazone, increase the sensitivity of muscle, fat, and liver to endogenous and exogenous insulin.

The dipeptidyl peptidase-4 (DPP-4) inhibitors, which include sitagliptin, saxagliptin, and linagliptin, block the activity of DPP-4. DPP-4 is a ubiquitous enzyme that degrades glucagon-like peptide 1 (GLP-1). GLP-1 is an incretin hormone released from the GI tract during food ingestion that increases insulin secretion from pancreatic beta cells and decreases glucagon secretion in a glucose-dependent manner. The α-glucosidase inhibitors (AGIs) acarbose and miglitol reduce the rate of polysaccharide digestion in the proximal small intestine.

The biguanide metformin is considered first-line therapy for most patients with type 2 diabetes. The maximum allowable dose is 2500 mg/day, although little additional benefit is seen with doses greater than 2000 mg/day. The adverse event profile of metformin includes gastrointestinal (GI) side effects, including nausea, diarrhea, and abdominal pain as well as modest weight loss. Tolerability is increased by starting treatment at 500 mg/day and gradually increasing the dose. Metformin should be taken with meals if GI side effects are a problem. Although the GI effects experienced with metformin are usually transient and treatment-related weight loss is often beneficial, these effects may be problematic for frail patients.

Lactic acidosis (LA) is a rare but life-threatening adverse event with an incidence of about 0.03 cases per 1000 patient-years. Because it usually occurs in older adults with marked renal insufficiency, treatment should only be initiated in patients aged 80 or older if measurement of creatinine clearance (CrCl) shows acceptable renal function. Metformin is contraindicated in patients with renal disease or renal dysfunction. Treatment should not be initiated or should be promptly discontinued in patients with other LA risk factors, including congestive heart failure, liver disease, and alcohol abuse.

The SUs are usually very effective at the start of treatment, but secondary treatment failure is common. An attractive feature of these agents is that they are usually inexpensive.

The major AE of the SUs is hypoglycemia, which is especially problematic for older adults. According to the Updated Beers Criteria, glyburide and chlorpropamide, a first-generation SU, should not be prescribed for older adults because of the increased risk of hypoglycemia with these agents. To reduce the likelihood of developing hypoglycemia, the ADA’s Nutrition Therapy Recommendations suggest that patients taking an SU eat a moderate amount of carbohydrate with each meal and snack and not skip meals. The ADA statement does not suggest the amount of carbohydrate to be consumed, but an expert recommendation is 30 to 45 grams.

Weight gain is another common AE of the SUs. These agents should be used with caution in patients with renal or hepatic impairment.


The thiazolidinediones (TZDs) appear to have more durable effectiveness than metformin and SUs. Another important benefit is that the TZDs are not associated with hypoglycemia unless taken with insulin or an insulin secretagogue.

Unfortunately, weight gain is common in TZD-treated patients. Furthermore, the TZDs have other serious AEs that may negate their benefits in older adults. These include fluid retention, precipitation or exacerbation of congestive heart failure, and bone fractures. There is also a possible increased risk of bladder cancer with pioglitazone.

Between 2010 and 2013, access to rosiglitazone was severely limited due to concerns about an increased risk of myocardial infarction (MI) with this product. Following exhaustive data review, however, the U.S. Food and Drug Administration determined that rosiglitazone is not associated with an increased MI risk. Therefore, restrictions on its prescribing and dispensing were removed in November 2013.


## DPP-4 Inhibitors in Older Adults

- Intermediate efficacy
- Taken once daily, with or without food; no initial titration
- Very well tolerated
- Low hypoglycemia risk unless taken with insulin or insulin secretagogue
- Neutral effect on weight
- Dose adjustments for patients with moderate or severe renal impairment (except linagliptin)
- No dose adjustment for patients with hepatic impairment, but use with caution
- Expensive
- Possible increased pancreatitis risk

Although the DPP-4 inhibitors are less effective than metformin, sulfonylureas, TZDs, and GLP-1 agonists, they have several characteristics that make them well suited for use in older adults. They are taken once daily, with or without food, and no titration is needed at the start of therapy. They are very well tolerated and associated with a low risk of hypoglycemia unless taken with insulin or an insulin secretagogue. DPP-4 inhibitors have a neutral effect on weight.

Except for linagliptin, which does not undergo appreciable renal excretion, the dose of a DPP-4 inhibitor must be reduced for patients with moderate to severe renal impairment. No dose adjustments are required for individuals with hepatic impairment, although DPP-4 inhibitors should be used with caution in this population.

Drugs in this therapeutic class are expensive, reducing their utility for many older patients. There have been postmarketing reports of acute pancreatitis, and the relationship between incretin-based therapy and pancreatitis is now being studied intensively.


Despite different mechanisms of action, both α-glycosidase inhibitors and glinides target postprandial hyperglycemia. Therefore, these agents have potential utility in the many older adults whose type 2 diabetes is characterized mainly by post-meal glycemic excursions.

Both classes of agents are taken 3 times per day before major meals. This dosing schedule can sometimes be beneficial since an older adult who decides to skip a meal can withhold the corresponding medication dose. However, other patients may find this dosing frequency burdensome. Another common characteristic of the α-glucosidase inhibitors and glinides is that they are expensive, making them inaccessible to many older adults.

The α-glucosidase inhibitors have a low hypoglycemia risk, but many older adults are unable to tolerate their most common AEs—flatulence and bloating. As short-acting insulin secretagogues, hypoglycemia is the most common AE of the glinides. The risk of hypoglycemia can be reduced by eating a moderate amount of carbohydrate with each meal.

Injected agents with substantial data in older adults include insulin, insulin analogs, and GLP-1 agonists. Manufactured human insulin is a polypeptide hormone that is structurally identical to natural human insulin and produced by recombinant DNA (rDNA) technology. These products provide major improvements in purity over insulin obtained from animal sources. Human insulin products include regular, intermediate-acting (NPH), and premixed insulins.

Insulin analogs are structurally modified insulin products manufactured by rDNA technology. (Recall that an analog is an agent whose function is generally similar to that of another agent—in this case, insulin—but whose origin and structure are different.) Insulin analogs differ from human insulins by the substitution or transposition of one or more amino acids. Available products include rapid-acting, long-acting, and premixed insulin analogs.

The GLP-1 agonists, including exenatide twice daily, liraglutide, and exenatide once weekly, are structurally similar to native GLP-1. However, the GLP-1 agonists have a much longer duration of action than native GLP-1.


Randomized clinical trials that enrolled older adults who had type 2 diabetes with good functional status and no major comorbidities have investigated the safety and efficacy of basal insulin, multiple daily injections of insulin, or insulin pump therapy in this population. The studies showed that carefully selected older adults achieved their glycemic goals at rates similar to those reported in younger adults and that the incidence of hypoglycemia was also similar to that reported in younger patients.

Currently, however, there are few data on the effectiveness and safety of insulin in older adults who are above the age of 75 years, have multiple comorbidities, and/or have limited functional status. Therefore, decisions about whether to initiate insulin in these patients must be made on an individual basis.


Providers can do several things to facilitate insulin therapy in older patients. Because many older adults have misconceptions about insulin—such as that it accelerates the development of vascular complications—it is important to initiate a thorough discussion about the advantages and disadvantages of insulin when the topic of transitioning to insulin first comes up. To promote adherence and reduce the risk of hypoglycemia, the simplest regimen that will achieve the individualized glycemic goal should be used. The advantages versus the disadvantages of premixed insulins need to be weighed carefully. Although fixed combinations can be considered for patients who need more coverage than that provided by basal insulin but are unable to manage complex regimens, these products may also be associated with an increased risk of hypoglycemia.

Providers should consider prescribing an insulin pen, since these devices are especially useful for patients with limited vision or problems with manual dexterity and may be more acceptable to older patients than using a vial and syringe. In addition, providers can identify assistive devices that will facilitate insulin delivery, such as a single-unit pen needle plus pen-needle remover. Once insulin therapy begins, the provider must monitor patients for changes in cognitive and functional status that would compromise their ability to manage the insulin regimen.

The GLP-1 agonists are very effective and often cause modest weight loss. Nausea and other GI disturbances, usually mild and transient, are their most common AEs. Both weight loss and GI disturbances make the GLP-1 agents unsuitable for use in most frail patients.

An important advantage of the GLP-1 agonists is that they are associated with a low risk of hypoglycemia unless they are taken with insulin or an insulin secretagogue. No routine dose reductions are needed for patients with renal or hepatic impairment, but exenatide is not recommended for patients with severe renal impairment or ESRD.

A major disadvantage of the GLP-1 agonists is that they must be given by injection. Although short-acting exenatide and liraglutide are injected with pen devices, long-acting exenatide must be reconstituted before being administered with a product-specific syringe. Another disadvantage is that these agents are very expensive, making them unavailable to many older patients. As with the DPP-4 inhibitors, there is a possible increased risk of pancreatitis during treatment with a GLP-1 agonist.


We have previously discussed evidence-based BP goals for people with diabetes. To reach these goals, the ADA recommends that the pharmacological therapy for all adults with diabetes and hypertension comprise a regimen that includes either an ACE inhibitor or an angiotensin receptor blocker (ARB). If one class is not tolerated, the other should be substituted. The JNC 8 report cautions against coadministration of an ACE inhibitor and an ARB.

Multiple-drug therapy, consisting of maximal doses or two or more agents, is generally required to achieve BP targets.

One or more antihypertensive agents other than a diuretic should be administered at bedtime.

If ACE inhibitors, ARBs, or diuretics are used, either the serum creatinine level or the estimated glomerular filtration rate (eGFR) and the serum potassium level should be monitored.

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As we discussed earlier, the 2013 ACC/AHA guideline on the treatment of blood cholesterol provides detailed recommendations for initiating and continuing statin treatment in older adults with diabetes. Statins are generally well tolerated, and their overall safety profile is similar in older and younger adults. However, since being 65 years of age or older is a risk factor for myopathy, including rhabdomyolysis, statins should be prescribed with caution in older patients.

Safe statin therapy requires conscientious monitoring of all patients. Before initiating treatment, all patients should have creatinine phosphokinase (CPK), liver function, and renal function tests, and follow-up monitoring should be performed. Statins are contraindicated in patients with active liver disease or unexplained, persistent serum transaminase elevations. Since they are at increased risk of myopathy, individuals with renal impairment need especially careful monitoring and may also require a reduced statin dose. The statins engage in clinically significant drug-drug interactions, and the various statins have different drug-interaction profiles. Therefore, an important consideration in deciding which statin to prescribe for an individual patient is the patient’s overall medication regimen. Even if they do not have a contraindication to treatment, some older adults must discontinue statin therapy because they cannot tolerate the gastrointestinal AEs that can occur with these agents.


Lipitor (atorvastatin calcium) tablets for oral administration. Prescribing information. New York: Pfizer; October 2012.
The accurate statement is:

a. Both metformin and sulfonylureas are generally considered first-line therapy for adults with type 2 diabetes.

b. Hypoglycemia is a major adverse effect of the thiazolidinediones and the glinides.

c. Angiotensin receptor blockers should usually be avoided in adults with diabetes.

d. Statin therapy is contraindicated in patients with active liver disease.
The correct answer is d.

Statin therapy is contraindicated in patients with active liver disease.
Today, more than 20% of older adults have diabetes.

It is important to manage the glycemic, BP, and cholesterol levels of older adults in a way that reflects individual characteristics and current evidence-based guidelines.

Issues of special importance in older adults with diabetes include hypoglycemia, injurious falls, cognitive impairment, depression, urinary incontinence, persistent pain, and polypharmacy.

Both nonpharmacologic and pharmacologic approaches are important in managing diabetes in older adults.