• This purpose of this talk is to overview the 2016 American Diabetes Association Standards of Medical Care in Diabetes. These Standards comprise all of the current and key clinical practice recommendations of the American Diabetes Association.

Reference
Over the last ten years we’ve seen steady improvement in the proportion of patients with diabetes who are treated with statins and achieving recommended levels for A1C, blood pressure, and LDL, but nevertheless, 33-49% of patients still do not meet targets for glycemic, blood pressure, or cholesterol control, and [CLICK] only 14% meet targets for all three measures plus nonsmoking status. [CLICK]

Evidence also suggests that our progress in control of cardiovascular disease is slowing. [CLICK]

Even after adjusting for patient factors, the persistent variation in quality of diabetes care across providers and practice settings indicates that there is potential for substantial system-level improvements. [CLICK]

A major barrier to optimal care is a delivery system that is often fragmented, lacks clinical information capabilities, duplicates services, and is poorly designed for the coordinated delivery of chronic care.

[SLIDE]
Moving on to section two, Classification and Diagnosis of Diabetes....

[SLIDE]
The classification of diabetes includes four clinical categories:

1. Type 1 diabetes, due to β-cell destruction, usually leading to absolute insulin deficiency; [CLICK]
2. Type 2 diabetes, due to a progressive insulin secretory defect on the background of insulin resistance; [CLICK]
3. Gestational diabetes mellitus, which is diabetes diagnosed during pregnancy that is not clearly overt diabetes [CLICK]
4. Other specific types of diabetes due to other causes; e.g., genetic defects in β-cell function, genetic defects in insulin action, diseases of the exocrine pancreas (such as cystic fibrosis), and drug- or chemical-induced diabetes (such as in the treatment of HIV/AIDS or after organ transplantation)

[SLIDE]
The same tests are used to screen for and diagnose diabetes and to detect people with prediabetes. These include:

Fasting plasma glucose (FPG) ≥126 mg/dL (7.0 mmol/L)

\[ OR \]

2-h plasma glucose ≥200 mg/dL (11.1 mmol/L) during an OGTT

\[ OR \]

A1C ≥6.5%

\[ OR \]

Random plasma glucose ≥200 mg/dL (11.1 mmol/L)

Or in a patient with classic symptoms of hyperglycemia a random plasma glucose ≥ 200 can also be used.

The subsequent slides examine each of the criteria in greater detail.

[SLIDE]

Reference
Either the Fasting Plasma Glucose (FPG) or the 2 hour Oral Glucose Tolerance Test may be used to screen for or diagnose diabetes. Diagnostic cutpoints are listed on this slide.

It’s worth noting that the concordance between these two tests is imperfect, as is the concordance between A1C and either glucose-based test. Numerous studies have confirmed that, compared with FPG cut points and A1C, the 2-h PG value diagnoses more people with diabetes.

For the fasting plasma glucose, fasting is defined as no caloric intake for at least 8 hours prior. This sometimes can be hard to achieve; patients don’t count the cup of coffee they had on the way to the lab, and forget about the two tablespoons of sugar that are in it.

The 2-hour oral glucose tolerance test is conducted after a 75g load. This is slightly more achievable, but many patients object to sitting around the office, waiting.

[SLIDE]

References
One way to combat both of those issues is with the A1C.

• This test should be performed using a method certified by the National Glycohemoglobin Standardization Program (NGSP) and standardized or traceable to the Diabetes Control and Complications Trial (DCCT) reference assay [CLICK]

• Although point-of-care (POC) assays may be NGSP-certified, proficiency testing is not mandated for performing the test, so use of these assays for diagnostic purposes may be problematic [CLICK]

• The A1C has several advantages to the FPG and OGTT, including greater convenience (fasting not required), possibly greater preanalytical stability, and less day-to-day perturbations during periods of stress and illness [CLICK]

• But, these advantages must be balanced by greater cost, the limited availability of A1C testing in certain regions of the developing world, and the incomplete correlation between A1C and average glucose in certain individuals

References
And in patients with clear symptoms of hyperglycemia you can also diagnose with a random plasma glucose.

Reference
Here are the diagnostic cutpoints for prediabetes across the three tests. Note that risk is continuous, extending below the lower limit of a range and becoming disproportionately greater at higher ends of the range.

[SLIDE]

**Prediabetes***

FPG 100–125 mg/dL
(5.6–6.9 mmol/L): IFG

OR

2-h plasma glucose 140–199 mg/dL
(7.8–11.0 mmol/L): IGT

OR

A1C 5.7–6.4%

* For all three tests, risk is continuous, extending below the lower limit of a range and becoming disproportionately greater at higher ends of the range.

References


The foundations of care include eight key components: Self-management education, nutrition, counseling, physical activity, smoking cessation, immunizations, psychosocial care, and medications, which are covered in other chapters.
Optimal diabetes management starts with laying down the foundations of care. Health care providers must take a holistic approach in providing care, taking into account all aspects of the patient’s life circumstances.

A team approach to diabetes management facilities a comprehensive assessment and development of a plan that addresses the patient’s values and circumstances. The investment of time and collaboration can facilitate, and potentially expedite, care delivery and achieve and maintain outcomes.

[SLIDE]
Recommendations for physical activity for people with diabetes\(^1\) are summarized on this slide

- As with all children, children with diabetes or prediabetes should be encouraged to engage in at least 60 minutes of physical activity each day.  

- Adults with diabetes should be advised to perform at least 150 min/week of moderate-intensity aerobic physical activity (with “moderate” defined as 50–70% of maximum heart rate), spread over at least 3 days/week with no more than 2 consecutive days without exercise.

- All individuals, including those with diabetes, should reduce sedentary time, particularly by breaking up extended amounts of time (>90 min) spent sitting.

- Adults with type 2 diabetes should perform resistance training at least twice weekly.

References

The Association offers two key recommendations in the areas of tobacco and e-cigarettes. First, do advise all patients not to use cigarettes, other tobacco products, or e-cigarettes. This last one – e-cigarettes – is hard, but there just are no rigorous studies demonstrating that e-cigarettes are a healthier alternative to smoking or that e-cigarettes can facilitate smoking cessation. More extensive research of their short- and long-term effects is needed to determine their safety and their cardiopulmonary effects in comparison with smoking and standard approaches to smoking cessation so the Association recommends against their use.

[CLICK]

And secondly, do include smoking cessation counseling and other forms of treatment as a routine component of diabetes care.

[SLIDE]
As far as immunizations, the Association recommends that, as for the general population, all children and adults with diabetes should receive routine vaccinations according to age-specific CDC recommendations, which you can download at CDC/vaccines. These recommendations include both flu and pneumococcal pneumonia vaccines. [CLICK]

And finally, people with diabetes have higher rates of hepatitis B than the general population, perhaps due to contact with infected blood or through improper equipment use. Thus, due to the higher likelihood of transmission, hepatitis B vaccine is recommended for adults with diabetes.

[SLIDE]
Emotional well-being is an important part of diabetes care and self-management. Psychological and social problems can impair the individual’s or family’s ability to carry out diabetes care tasks and therefore compromise health status. The Association offers several recommendations for addressing psychosocial issues, comprised on the next two slides.

• First, the patient’s psychological and social situation should be addressed within the context of the medical management of diabetes.

• Psychosocial screening and follow-up may include, but are not limited to, attitudes about the illness, expectations for medical management and outcomes, affect/mood, general and diabetes-related quality-of-life, resources (financial, social, and emotional), and psychiatric history.

[SLIDE]
• Routinely screen for psychosocial problems such as depression, diabetes-related distress, anxiety, eating disorders, and cognitive impairment. [CLICK]

• Older adults (aged ≥65 years) with diabetes should be considered for evaluation of cognitive function, depression screening and treatment. [CLICK]

And finally,

• Patients with comorbid diabetes and depression should receive a stepwise collaborative care approach for the management of depression.

[SLIDE]
Section 5. Glycemic Targets
We’ll discuss glycemic goals in children and adolescents and in pregnant women in the sections specific to care of those populations. These slides are specific to nonpregnant adults.

Hyperglycemia defines diabetes, and glycemic control is fundamental to diabetes management; recommendations for glycemic goals in adults are reviewed on three slides. The concerning mortality findings in the ACCORD trial, discussed which we’ll get to shortly, and the relatively intense efforts required to achieve near-euglycemia should also be considered when setting glycemic targets.

• Glycemic control achieved using A1C targets of <7% has been shown to reduce microvascular complications of diabetes and, in type 1 diabetes, mortality. If implemented soon after the diagnosis of diabetes this target is associated with long-term reduction in macrovascular disease.

• Providers might suggest more stringent A1C goals (such as <6.5%) for selected individual patients if this can be achieved without significant hypoglycemia or other adverse effects of treatment. Appropriate patients might include those with short duration of diabetes, type 2 diabetes treated with lifestyle or metformin only, long life expectancy, or no significant cardiovascular disease.

• Less stringent A1C goals (such as <8%) may be appropriate for patients with a history of severe hyperglycemia, limited life expectancy, or other conditions that make <7% difficult to attain.

References
hypoglycemia, limited life expectancy, advanced microvascular or macrovascular complications, extensive comorbid conditions, or long-standing diabetes in whom the general goal is difficult to attain despite diabetes self-management education, appropriate glucose monitoring, and effective doses of multiple glucose-lowering agents including insulin.

[SLIDE]
There is evidence for a cardiovascular benefit of intensive glycemic control after long-term follow-up of study cohorts treated early in the course of both type 1 and type 2 diabetes. For example in the Diabetes Control & Complications Trial (DCCT) there was a trend toward lower risk of CVD events with intensive control. In the 9-year post-DCCT follow-up of the Epidemiology of Diabetes Interventions and Complications (EDIC) cohort, participants previously randomized to the intensive arm had a significant 57% reduction in the risk of nonfatal myocardial infarction (MI), stroke, or CVD death compared with those previously in the standard arm.

The benefit of intensive glycemic control in this type 1 diabetic cohort has been shown to persist for several decades and to be associated with a modest reduction in all-cause mortality.

The ACCORD, ADVANCE, and VADT suggested no significant reduction in CVD outcomes with intensive glycemic control in participants followed for 3.5–5.6 years who had more advanced type 2 diabetes than UKPDS participants.

Details of these studies are reviewed extensively in the Association’s position statement on intensive glycemic control and the prevention of cardiovascular events, which you can download for free from care.diabetesjournals.org.

[SLIDE]
Shown here are the Association's recommended glycemic goals for many nonpregnant adults. These recommendations are based on those for A1C values, with listed blood glucose levels that appear to correlate with achievement of an A1C of <7%.

**References**

- American Diabetes Association. Postprandial blood glucose. Diabetes Care 2001;24:775–778
Either gastric banding or procedures that involve resecting, bypassing, or transposing sections of the stomach and small intestine, can be effective weight-loss treatments for severe obesity when performed as part of a comprehensive weight-management program with lifelong lifestyle support and medical monitoring. Bariatric surgery has been shown to achieve near- or complete normalization of glycemia 2 years following surgery in 72% of patients.

If you’re trying to choose between banding, gastrectomy and bypass, in one meta-analysis, gastric banding resulted in less weight loss than sleeve gastrectomy and Roux-en-Y, with one-year excess weight loss ~33% vs ~70%.

[SLIDE]
National guidelines support consideration for bariatric surgery for people with type 2 diabetes with BMI >35, particularly if diabetes or associated comorbidities are difficult to control with lifestyle and pharmacological therapy. [CLICK]

Second, patients with type 2 diabetes who have undergone bariatric surgery need lifelong lifestyle support and annual medical monitoring, at a minimum. [SLIDE]
And finally, although small trials have shown glycemic benefit of bariatric surgery in patients with type 2 diabetes and BMI between 30-35, there is currently insufficient evidence to generally recommend surgery in patients with BMIs of 35 or under.
There are several disadvantages to keep in mind when considering bariatric surgery for your patients with type 2 diabetes. First, it’s costly. And there still are associated risks, though morbidity and mortality rates have decreased considerably in recent years, with 30-day mortality rates now 0.2% for laparoscopic procedures and 2.1% for open procedures.

Finally, some recent studies suggest that patients who undergo bariatric surgery may be at higher risk for substance use including drug and alcohol use and cigarette smoking.

Understanding the long-term benefits and risks of bariatric surgery in patients with type 2 diabetes, especially those who are not severely obese, will require well-designed clinical trials, with optimal medical therapy as the comparator. Unfortunately, such studies may not be feasible.
8. Cardiovascular Disease and Risk Management

Moving on to cardiovascular disease and risk management....
Cardiovascular Disease

- CVD is the leading cause of morbidity and mortality for those with diabetes.
- Largest contributor to direct/indirect costs
- Common conditions coexisting with type 2 diabetes (e.g., hypertension, dyslipidemia) are clear risk factors for ASCVD.
- Diabetes itself confers independent risk
- Control individual cardiovascular risk factors to prevent/slow CVD in people with diabetes.
- Systematically assess all patients with diabetes for cardiovascular risk factors.

References
Hypertension is a common diabetes comorbidity that affects many patients, with the prevalence depending on type of diabetes, age, BMI, and ethnicity. Hypertension is a major risk factor for both ASCVD and microvascular complications. In type 1 diabetes, hypertension is often the result of underlying diabetic kidney disease, while in type 2 diabetes, it usually coexists with other cardiometabolic risk factors.
Given the epidemiological relationship between lower blood pressure and better long-term clinical outcomes, two landmark trials, Action to Control Cardiovascular Risk in Diabetes, or ACCORD trial, and Action in Diabetes and Vascular Disease: Preterax and Diamicron MR Controlled Evaluation–Blood Pressure (ADVANCE-BP), examined the benefit of tighter blood pressure control in patients with type 2 diabetes. [CLICK]

The ACCORD trial examined whether a lower SBP of <120 mm Hg, in type 2 diabetes patients at high risk for ASCVD, provided greater cardiovascular protection than an SBP level of 130–140 mm Hg and the study did not find a benefit in primary endpoints of nonfatal MI, nonfatal stroke and cardiovascular death.

The ADVANCE-BP intervention arm consisted of a single pill, fixed dose administration of perindopril and indapamide and [CLICK] showed a significant reduction in the risk of the primary composite end point (major macrovascular or microvascular event) and significant reductions in the risk of death from any cause and of death from cardiovascular causes.

Recently published 6-year follow-up of the ADVANCE-ON study reported that the reductions in the risk of death from any cause and of death from cardiovascular causes in the intervention group were attenuated, but remained significant.
• People with diabetes and hypertension should be treated to a systolic blood pressure goal of <140 mmHg. There is strong evidence that systolic BP greater than 140 is harmful, and suggests clinicians should promptly initiate and titrate therapy in an ongoing fashion to achieve and maintain SBP <140 mmHg in most patients; We’ll talk about your older adult patients shortly;

• Lower systolic targets, such as <130 mmHg, may be appropriate for certain individuals, such as younger patients, if it can be achieved without undue treatment burden.

Reference
Similarly, strong evidence from randomized clinical trials supports diastolic blood pressure targets less than 90.

• Lower diastolic targets, such as <80 mmHg, may be appropriate for certain individuals, such as younger patients, if it can be achieved without undue treatment burden.

These targets are in harmonization with a recent publication by the Eighth Joint National Committee that recommended, for individuals over 18 years of age with diabetes, a DBP threshold of <90 mmHg and SBP <140 mmHg.

Reference
Aspirin has been shown to be effective in reducing cardiovascular morbidity and mortality in high-risk patients with previous MI or stroke (secondary prevention). Its net benefit in primary prevention among patients with no previous cardiovascular events is more controversial, both for patients with and without diabetes.

Multiple recent well-conducted studies and meta-analyses reported a risk of heart disease and stroke that is equivalent if not higher in women compared to men with diabetes, including among non-elderly adults. Thus, the recommendations for using aspirin as primary prevention are now revised to include both men and women aged 50 years or older with diabetes and one or more major risk factors, to reflect these more recent findings.

Recommendations for the use of antiplatelet agents are summarized in three slides.

- Consider aspirin therapy as a primary prevention strategy in those with type 1 and type 2 diabetes who are at increased cardiovascular risk. This includes most men or women with diabetes aged 50 years and up who have at least one additional major risk factor (such as family history of premature ASCVD, hypertension, smoking, dyslipidemia, or albuminuria) and are not at increased risk of bleeding.

References
Recommendations for screening for coronary heart disease are summarized on this slide:

- The screening of asymptomatic patients with high ASCVD risk is not recommended, in part because these high-risk patients should already be receiving intensive medical therapy, an approach that provides similar benefit as invasive revascularization. There is also some evidence that silent MI may reverse over time, adding to the controversy concerning aggressive screening strategies.

- But do consider investigations for coronary artery disease in the presence of any of the following:
  - Atypical cardiac symptoms (e.g. unexplained dyspnea, chest discomfort)
  - Signs or symptoms of associated vascular disease including carotid bruits, transient ischemic attack, stroke, claudication or PAD
  - EKG abnormalities (e.g. Q waves)

[SLIDE]

Reference
Moving onto section 9, Microvascular Complications and Foot Care.
Recommendations for screening patients with diabetic kidney disease are highlighted on this slide. Diabetic kidney disease, or kidney disease attributed to diabetes, occurs in 20–40% of patients with diabetes and is the leading cause of end-stage renal disease (ESRD). Kidney disease not attributable to diabetes, and due to other etiologies, is referred to as chronic kidney disease (CKD).

- At least once a year, assess urinary albumin (e.g., spot urine albumin-to-creatinine ratio [UACR]) and estimated glomerular filtration rate (eGFR) in patients with type 1 diabetes with duration of ≥5 years B
- In all patients with type 2 diabetes B
- In all patients with comorbid hypertension B

Reference
Diabetic retinopathy is a highly specific vascular complication of both type 1 and type 2 diabetes, with prevalence strongly related to duration of diabetes. It’s the most frequent cause of new cases of blindness among adults aged 20–74 years.

Glaucoma, cataracts, and other disorders of the eye occur earlier and more frequently in people with diabetes.

In addition to duration of diabetes, other factors that increase the risk of, or are associated with, retinopathy include chronic hyperglycemia\textsuperscript{2}, the presence of nephropathy\textsuperscript{3}, and hypertension\textsuperscript{4}.

The first line of defense against diabetic retinopathy, to reduce the risk or slow its progression, is to optimize glycemic control and blood pressure.

References
As far as screening for diabetic retinopathy, your patients with diabetes should have a dilated and comprehensive eye exam by an ophthalmologist or optometrist.

Because retinopathy is estimated to take at least 5 years to develop after the onset of hyperglycemia, patients with type 1 diabetes should have an initial dilated and comprehensive eye examination within 5 years after the diagnosis of diabetes.

Patients with type 2 diabetes who may have had years of undiagnosed diabetes and have a significant risk of prevalent diabetic retinopathy at the time of diagnosis should have an initial dilated and comprehensive eye examination at the time of diagnosis.

• Results of eye examinations should be documented and transmitted to the referring health care professional.

Reference
The early recognition and appropriate management of neuropathy in the patient with diabetes is important because:

1. Diabetic neuropathy is a diagnosis of exclusion. Nondiabetic neuropathies may be present in patients with diabetes and may be treatable. [CLICK]

2. Numerous treatment options exist for symptomatic diabetic neuropathy. [CLICK]

3. Up to 50% of DPN may be asymptomatic. If not recognized and if preventive foot care is not implemented (see below), patients are at risk for injuries to their insensate feet. [CLICK]

4. Recognition and treatment may improve symptoms, reduce seqeullae, and improve quality-of-life.

[SLIDE]

Reference