American Diabetes Association

3. Initial Evaluation and Diabetes Management Planning

MEDICAL EVALUATION

Recommendation

- Consider screening those with type 1 diabetes for autoimmune diseases (e.g., thyroid dysfunction, celiac disease) as appropriate. **E**

A complete medical evaluation should be performed at the initial visit to

1. Classify diabetes
2. Detect diabetes complications
3. Review previous treatment and risk factor control in patients with established diabetes
4. Assist in formulating a management plan
5. Provide a basis for continuing care

Laboratory tests appropriate to the evaluation of each patient's medical condition should be completed. A focus on the components of comprehensive care (**Table 3.1**) will enable the health care team to optimally manage the patient with diabetes. Adults who develop type 1 diabetes can develop additional autoimmune disorders, although their risk is lower than that in children and adolescents with type 1 diabetes. For additional details on autoimmune conditions, see Section 11. Children and Adolescents.

MANAGEMENT PLAN

People with diabetes should receive medical care from a collaborative, integrated team with expertise in diabetes. This team may include physicians, nurse practitioners, physician's assistants, nurses, dietitians, pharmacists, and mental health professionals. Individuals with diabetes must also assume an active role in their care.

The management plan should be written with input from the patient and family, the physician, and other members of the health care team. Diabetes self-management education (DSME) and ongoing diabetes support should be integral components of the management plan. Various strategies and techniques should be used to enable patients to self-manage diabetes, including providing education on problem-solving skills for all aspects of diabetes management. Treatment goals and plans should be individualized and take patient preferences into account. In developing the plan, consideration should be given to the patient's age, school/work schedule and conditions, physical activity, eating patterns, social situation, cultural factors, presence of diabetes complications, health priorities, and other medical conditions.

COMMON COMORBID CONDITIONS

Recommendation

- Consider assessing for and addressing common comorbid conditions (e.g., depression, obstructive sleep apnea) that may complicate diabetes management. **B**

Improved disease prevention and treatment efficacy means that patients with diabetes are living longer, often with multiple comorbidities requiring complicated medical regimens (1). Obesity, hypertension, and dyslipidemia are the most commonly appreciated comorbidities. However, concurrent conditions, such as heart

POSITION STATEMENT

Table 3.1—Components of the comprehensive diabetes evaluation

Medical history
- Age and characteristics of onset of diabetes (e.g., DKA, asymptomatic laboratory finding)
- Eating patterns, physical activity habits, nutritional status, and weight history; growth and development in children and adolescents
- Presence of common comorbidities, psychosocial problems, and dental disease
- Diabetes education history
- Review of previous treatment regimens and response to therapy (A1C records)
- Current treatment of diabetes, including medications, medication adherence and barriers thereto, meal plan, physical activity patterns, and readiness for behavior change
- Results of glucose monitoring and patient's use of data
- DKA frequency, severity, and cause
- Hypoglycemic episodes
  - Hypoglycemia awareness
  - Any severe hypoglycemia: frequency and cause
- History of diabetes-related complications
  - Microvascular: retinopathy, nephropathy, neuropathy (sensory, including history of foot lesions; autonomic, including sexual dysfunction and gastroparesis)
  - Macrovascular: coronary heart disease, cerebrovascular disease, and peripheral arterial disease

Physical examination
- Height, weight, BMI
- Blood pressure determination, including orthostatic measurements when indicated
- Fundoscopic examination
- Thyroid palpation
- Skin examination (for acanthosis nigricans and insulin injection sites)
- Comprehensive foot examination
  - Inspection
  - Palpation of dorsalis pedis and posterior tibial pulses
  - Presence/absence of patellar and Achilles reflexes
  - Determination of proprioception, vibration, and monofilament sensation

Laboratory evaluation
- A1C, if results not available within past 3 months
- If not performed/available within past year
  - Fasting lipid profile, including total, LDL, and HDL cholesterol and triglycerides, as needed
  - Liver function tests
  - Test for urine albumin excretion with spot urine albumin-to-creatinine ratio
  - Serum creatinine and calculated glomerular filtration rate
  - TSH in type 1 diabetes, dyslipidemia, or women over age 50 years

Referrals
- Eye care professional for annual dilated eye exam
- Family planning for women of reproductive age
- Registered dietitian for medical nutrition therapy
- DSME/DSMS
- Dentist for comprehensive periodontal examination
- Mental health professional, if needed

DKA, diabetic ketoacidosis; DSMS, diabetes self-management support; TSH, thyroid-stimulating hormone.

failure, depression, anxiety, and arthritis, are found at higher rates in people with diabetes than in age-matched people without diabetes and often complicate diabetes management. These concurrent conditions present clinical challenges related to polypharmacy, prevalent symptoms, and complexity of care (2–5).

Depression

As discussed in Section 4. Foundations of Care, depression, anxiety, and other mental health symptoms are highly prevalent in people with diabetes and are associated with worse outcomes.

Obstructive Sleep Apnea

Age-adjusted rates of obstructive sleep apnea, a risk factor for cardiovascular disease, are significantly higher (4- to 10-fold) with obesity, especially with central obesity, in men and women (6). The prevalence in general populations with type 2 diabetes may be up to 23% (7) and in obese participants enrolled in the Look AHEAD trial exceeded 80% (8). Treatment of sleep apnea significantly improves quality of life and blood pressure control. The evidence for a treatment effect on glycemic control is mixed (9).

Fatty Liver Disease

Unexplained elevations of hepatic transaminase concentrations are significantly associated with higher BMI, waist circumference, triglycerides, and fasting insulin and with lower HDL cholesterol. In a prospective analysis, diabetes was significantly associated with incident nonalcoholic chronic liver disease and with hepatocellular carcinoma (10). Interventions that improve metabolic abnormalities in patients with diabetes (weight loss, glycemic control, and treatment with specific drugs for hyperglycemia or dyslipidemia) are also beneficial for fatty liver disease (11).

Cancer

Diabetes (possibly only type 2 diabetes) is associated with increased risk of cancers of the liver, pancreas, endometrium, colon/rectum, breast, and bladder (12). The association may result from shared risk factors between type 2 diabetes and cancer (obesity, older age, and physical inactivity), but may also be due to hyperinsulinemia or hyperglycemia (13). Patients with diabetes should be encouraged to undergo recommended age- and sex-appropriate cancer screenings and to reduce their modifiable cancer risk factors (obesity, smoking, and physical inactivity).

Fractures

Age-matched hip fracture risk is significantly increased in both type 1 (summary relative risk [RR] 6.3) and type 2 diabetes (summary RR 1.7) in both sexes (14). Type 1 diabetes is associated with osteoporosis, but in type 2 diabetes an increased risk of hip fracture is seen despite higher bone mineral density (BMD) (15). In three large observational studies of older adults, femoral neck BMD T score and the WHO Fracture Risk Algorithm (FRAX) score were associated with hip and nonspine fracture, although fracture risk was higher in participants with diabetes compared with those without diabetes for a given T score and age or for a given FRAX score (16). It is appropriate to assess fracture history and risk factors in older patients with diabetes and recommend BMD testing if appropriate for the patient's age and sex. Prevention strategies are the same as for the general population. For type 2 diabetic patients with fracture risk factors, avoiding thiazolidinediones is warranted.

Cognitive Impairment

Diabetes is associated with a significantly increased risk, and rate, of cognitive decline and with increased risk of dementia (17,18). In a 15-year prospective study of community-dwelling people over the age of 60 years, the presence of diabetes at baseline significantly increased the age- and sex-adjusted incidence of all-cause dementia, Alzheimer disease, and vascular dementia compared with rates in those with normal glucose tolerance (19). In a substudy of the Action to Control Cardiovascular Risk in Diabetes (ACCORD) clinical trial, there were no differences in cognitive outcomes between intensive and standard glycemic control, although there was significantly less of a decrement in total brain volume, as measured by MRI, in participants in the intensive arm (20). The effects of hyperglycemia and insulin on the brain are areas of intense research interest.

Low Testosterone in Men

Mean levels of testosterone are lower in men with diabetes compared with age-matched men without diabetes, but obesity is a major confounder (21). Treatment in asymptomatic men is controversial. The evidence that testosterone replacement affects outcomes is mixed, and recent guidelines suggest that testing and treating men without symptoms are not recommended (22).

Periodontal Disease

Periodontal disease is more severe, but not necessarily more prevalent, in patients with diabetes than in those without (23). Current evidence suggests that periodontal disease adversely affects diabetes outcomes, although evidence for treatment benefits remains controversial (5).

Hearing Impairment

Hearing impairment, both in high frequency and low/mid frequency ranges, is more common in people with diabetes than in those without, perhaps due to neuropathy and/or vascular disease. In a National Health and Nutrition Examination Survey (NHANES) analysis, hearing impairment was about twice as prevalent in people with diabetes compared with those without, after adjusting for age and other risk factors for hearing impairment (24).

References

1. Selvin E, Coresh J, Brancati FL. The burden and treatment of diabetes in elderly individuals in the U.S. Diabetes Care 2006;29:2415–2419
2. Grant RW, Ashburner JM, Hong CS, Chang Y, Barry MJ, Atlas SJ. Defining patient complexity from the primary care physician's perspective: a cohort study. Ann Intern Med 2011;155: 797–804
3. Tinetti ME, Fried TR, Boyd CM. Designing health care for the most common chronic condition—multimorbidity. JAMA 2012;307: 2493–2494
4. Sudore RL, Karter AJ, Huang ES, et al. Symptom burden of adults with type 2 diabetes across the disease course: Diabetes & Aging Study. J Gen Intern Med 2012;27:1674–1681
5. Borgnakke WS, Ylöstalo PV, Taylor GW, Genco RJ. Effect of periodontal disease on diabetes: systematic review of epidemiologic observational evidence. J Periodontol 2013; 84(Suppl.):S135–S152
6. Li C, Ford ES, Zhao G, Croft JB, Balluz LS, Mokdad AH. Prevalence of self-reported clinically diagnosed sleep apnea according to obesity status in men and women: National Health and Nutrition Examination Survey, 2005-2006. Prev Med 2010;51:18–23
7. West SD, Nicoll DJ, Stradling JR. Prevalence of obstructive sleep apnoea in men with type 2 diabetes. Thorax 2006;61:945–950
8. Foster GD, Sanders MH, Millman R, et al.; Sleep AHEAD Research Group. Obstructive sleep apnea among obese patients with type 2 diabetes. Diabetes Care 2009;32:1017–1019
9. Shaw JE, Punjabi NM, Wilding JP, Alberti KGMM, Zimmet PZ; International Diabetes Federation Taskforce on Epidemiology and Prevention. Sleep-disordered breathing and type 2 diabetes: a report from the International Diabetes Federation Taskforce on Epidemiology and Prevention. Diabetes Res Clin Pract 2008;81:2–12
10. El-Serag HB, Tran T, Everhart JE. Diabetes increases the risk of chronic liver disease and hepatocellular carcinoma. Gastroenterology 2004;126:460–468
11. American Gastroenterological Association. American Gastroenterological Association medical position statement: nonalcoholic fatty liver disease. Gastroenterology 2002;123:1702–1704

12. Suh S, Kim KW. Diabetes and cancer: is diabetes causally related to cancer? Diabetes Metab J 2011;35:193–198
13. Giovannucci E, Harlan DM, Archer MC, et al. Diabetes and cancer: a consensus report. Diabetes Care 2010;33:1674–1685
14. Janghorbani M, Van Dam RM, Willett WC, Hu FB. Systematic review of type 1 and type 2 diabetes mellitus and risk of fracture. Am J Epidemiol 2007;166:495–505
15. Vestergaard P. Discrepancies in bone mineral density and fracture risk in patients with type 1 and type 2 diabetes—a meta-analysis. Osteoporos Int 2007;18:427–444
16. Schwartz AV, Vittinghoff E, Bauer DC, et al.; Study of Osteoporotic Fractures (SOF) Research Group; Osteoporotic Fractures in Men (MrOS) Research Group; Health, Aging, and Body Composition (Health ABC) Research Group. Association of BMD and FRAX score with risk of fracture in older adults with type 2 diabetes. JAMA 2011;305:2184–2192
17. Cukierman T, Gerstein HC, Williamson JD. Cognitive decline and dementia in diabetes—systematic overview of prospective observational studies. Diabetologia 2005;48:2460–2469
18. Biessels GJ, Staekenborg S, Brunner E, Brayne C, Scheltens P. Risk of dementia in diabetes mellitus: a systematic review. Lancet Neurol 2006;5:64–74
19. Ohara T, Doi Y, Ninomiya T, et al. Glucose tolerance status and risk of dementia in the community: the Hisayama study. Neurology 2011;77:1126–1134
20. Launer LJ, Miller ME, Williamson JD, et al.; ACCORD MIND investigators. Effects of intensive glucose lowering on brain structure and function in people with type 2 diabetes (ACCORD MIND): a randomised open-label substudy. Lancet Neurol 2011;10:969–977
21. Dhindsa S, Miller MG, McWhirter CL, et al. Testosterone concentrations in diabetic and nondiabetic obese men. Diabetes Care 2010; 33:1186–1192
22. Bhasin S, Cunningham GR, Hayes FJ, et al. Testosterone therapy in men with androgen deficiency syndromes: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab 2010;95:2536–2559
23. Khader YS, Dauod AS, El-Qaderi SS, Alkafajei A, Batayha WQ. Periodontal status of diabetics compared with nondiabetics: a meta-analysis. J Diabetes Complications 2006;20: 59–68
24. Bainbridge KE, Hoffman HJ, Cowie CC. Diabetes and hearing impairment in the United States: audiometric evidence from the National Health and Nutrition Examination Survey, 1999 to 2004. Ann Intern Med 2008;149:1–10