Diabetes (DM) Type I

Diagnosis/Condition:	Insulin Dependent Diabetes mellitus Type I Diabetes mellitus
Discipline:	ND
ICD-10 Codes:	E08.9; E09.9; E13.9; E11.9
Origination Date:	2012
Review/Revised Date:	10/2025
Next Review Date:	10/2027

Type I Diabetes mellitus (T1D) is a chronic autoimmune disease in which blood sugar (glucose) levels are abnormally high caused by insulin deficiency following the destruction of immune-mediated insulin-producing pancreatic β cells, which is attributed to genetic and environmental factors.[1] It was formerly referred to as insulin dependent diabetes mellitus (IDDM) or juvenile diabetes, as it is often diagnosed in childhood. 14% of new cases are in adults and usually develop before age 30. In the United States, the overall incidence of T1D seems to be rising in most age and ethnic groups.[2,3] According to the data from the International Diabetes Federation Atlas 2021, approximately 1.2 million children and adolescents are diagnosed with T1DM in 2021.[4] Approximately twenty six percent (26%) of U.S. adults with diabetes reported using some form of CAM in2017.[5,6]

In T1D, more than 90% of the insulin-producing (Beta) cells of the pancreas are permanently destroyed producing little or no insulin. About 10% of all people with diabetes have Type I disease. The new diagnosis of T1D can be very challenging for both children and adults. Ongoing education and management is critical.

OTHER TYPES OF DIABETES
Metabolic syndrome (syndrome X or insulin-resistance syndrome): thought to be due to developing insulin resistance and can occur in patients with overtly normal glucose tolerance, prediabetes, or diabetes. Diagnosed when a patient has at least 3 of the following 5 conditions: 1. Abdominal obesity. 2. Elevated triglyceride level. 3. Low level of high-density lipoprotein (HDL) cholesterol. 4. Elevated blood pressure (BP). 5. Fasting glucose value of 100 mg/dL or higher.
Pre-diabetes: glucose levels are too high to be considered normal but not high enough to be labeled diabetes. Fasting glucose levels - between 101 mg/dL and 126 mg/dL or glucose level 2 hours after a glucose tolerance test between 140 mg/dL and 200 mg/dL. Decreasing body weight by 5 to 10% through diet and exercise can significantly reduce the risk of developing future diabetes.

Gestational Diabetes Mellitus (GDM): diabetes diagnosed during pregnancy.
Type II (T2D): (formerly called non-insulin-dependent diabetes mellitus or adult-onset diabetes) - the pancreas continues to produce insulin, sometimes even at higher-than-normal levels. However, the body develops resistance to the effects of insulin so there is not enough insulin to meet the body's needs. Usually begins in people older than 30 and becomes progressively more common with age. About 15% of people older than 70 have T2D. Can be a genetic predisposition. Obesity is a chief risk factor for developing T2D. Eighty to ninety percent of people with T2D are overweight or obese.

Successful management includes*:*

- Balancing strict glycemic control.
- Setting realistic goals for each patient and family, while considering the patient's age and developmental status. The level of family involvement is key in establishing a practical management plan that can be implemented.
- Maintaining normal growth, development, and emotional maturation in childhood.
- Increasing independence and self-care as the diabetic child grows is an ongoing goal.
- Educating the patient and family in daily diabetes care (including insulin administration and blood glucose testing) in order to attain glucose control within the range of predetermined goals, and to recognize and treat hypoglycemia.

Potential Risk Factors

- Can be an environmental, viral, nutritional, genetic predisposition.
- T1D risk factors may include the following:[7,6]
    - Genetic causes: HLA genes on chromosome 6 (1in 10 with this gene develop T1D).
    - Family members with T1D.[8]
    - Viral infections: particularly enterovirus infections, rubella, coxsackievirus, mump.
    - Higher risk race/ethnicity: Caucasians have slightly higher incidence of T1D.
    - Diet, especially exposure to cow's milk at an early age.[9]
    - Higher socioeconomic status.
    - High birth weight.
    - Family increased incidence of autoimmune disease, including Graves, MS, pernicious anemia.
    - Living in northern climates.
    - Abdominal injury resulting in pancreatic damage.

Subjective Findings and History

- Can be asymptomatic.
- Classic presentation: new onset of chronic polydipsia, polyuria, and weight loss with hyperglycemia and ketonemia (or ketonuria).
- Increased appetite without weight gain.
- Polycystic ovarian syndrome (PCOS).
- Diabetic ketoacidosis (fruity breath).
- Family history of diabetes.

- Blurry vision or other visual disturbances.
- Hunger, weight loss
- Fatigue, irritability.
- Neuropathies/paresthesias.
- Yeast infections/balanitis.
- Abdominal pain.
- Erectile dysfunction.
- Menstrual disorders, spontaneous abortion.
- Headache.
- Dehydration.

Complications

Diabetes is a life-long disease. Sequelae of end-organ damage can develop over months to years. Morbidity from diabetes is a consequence of both macrovascular disease (atherosclerosis) and microvascular disease (retinopathy, nephropathy, and neuropathy). If blood glucose levels are not well-controlled, complications can include: arteriosclerosis, atherosclerosis, other cardio-vascular disease (CVD), strokes, claudication, vision problems (diabetic retinopathy), (poly) neuropathies, limb weakness, skin ulcers and infections (fungal and bacterial), renal failure, injuries and falls, and diabetic ketoacidosis. Acute hypoglycemia can occur and is a medical emergency.

Diagnosis and Differential Diagnosis

- Metabolic Syndrome.
- Pre-diabetes.
- T2D.
- Celiac disease.
- Gestational diabetes.
- Other causes of hyperglycemia.
- Secondary hyperglycemia can be caused by physiological stresses (such as acute infection and trauma) or by various endocrine conditions.

The American Diabetes Association (ADA) criteria for the diagnosis of T1D are any of the following signs of abnormal glucose metabolism:[10]

• An HbA1c level of 6.5% or higher*; **or**
• A fasting plasma glucose (FPG) level of 126 mg/dL (7.0 mmol/L) or higher; fasting is defined as no caloric intake for at least 8 hours, **or**
• A 2-hour plasma glucose level of 200 mg/dL (11.1 mmol/L) or higher during a 75-g oral glucose tolerance test (OGTT), **or**
• A random plasma glucose (RPG) of 200 mg/dL (11.1 mmol/L) or higher in a patient with classic symptoms of hyperglycemia (i.e., polyuria, polydipsia, polyphagia, weight loss) or hyperglycemic crisis
*The American Association of Clinical Endocrinologists recommends that HbA1c be considered an additional optional diagnostic criterion for long term trends, rather than a primary criterion for diagnosis of diabetes.[11]

Objective Findings and Assessment

A workup should be done when a patient presents with symptoms or in asymptomatic patients who present with random serum glucose levels (>140 mg/dL).

Physical Exam (should be performed two to three times yearly), Testing, and Vaccinations[12] (these are very similar for T1D and T2D patients):

Management and Physical Exam	Frequency	Comments
Smoking cessation counseling	Every visit	For smokers only
Blood pressure	Every visit	Goal <130/80, or <140/90 [13,14,15,16,17](guidelines vary)
Dilated eye examination (fundoscopic)	Annually	Begin at onset of T2DM, three to five years after onset of T1DM. Examine more than annually if significant retinopathy
Foot examination	Annually	Every visit if peripheral vascular disease or neuropathy is present (include inspection, assessment of foot pulses, reflexes, and testing for loss of protective sensations and vibration)
Skin examination	Every visit	For acanthosis nigricans and insulin injection sites
Thyroid evaluation/palpation	Annually	
Cardiovascular exam and studies		Stress test if indicated or if beginning exercise program
Dental screening	Annually	
Cancer screening	Variable	Some studies have suggested an increased risk of cancer in patients with diabetes, possibly related to the coincident obesity
Psychosocial-Mental Health screening	Variable	Referral as indicated – screen for depression, anxiety, eating disorders, cognitive impairment
Laboratory Studies	**Frequency**	**Comments**
Fasting serum lipid profile	Annually	May obtain every two years if profile is low risk.
Antibodies	Once	There is no specific test to distinguish between the two types of diabetes, T1DM is suggested by the presence of

		circulating, pancreatic autoantibodies. The absence of pancreatic autoantibodies does not rule out the possibility of T1D. Up to 30 percent of individuals with the classical appearance and presentation of T2D have positive autoantibodies and may have a slowly progressive type of autoimmune diabetes.
Blood glucose	Every visit	The patient should check multiple times per day
Insulin and C-peptide levels	Initial and consider annual	High fasting insulin and C-peptide levels suggest T2D. Levels are inappropriately low or in the normal range relative to the concomitant plasma glucose concentration in T1DM. At presentation, insulin and C-peptide levels may be suppressed by severe hyperglycemia and illness.
HA1C	Every three to six months	Goal 6-7 percent (may be lower or higher in selected patients)
Microalbuminuria – persistent values between 30 and 300 mg/day (20 to 200 mcg/min)	Annually	Begin three to five years after onset of type 1 diabetes; protein excretion and serum creatinine should also be monitored if persistent albuminuria is present
Liver function tests (LFTs) and thyroid panel	Annually	
Potassium, serum creatinine and glomerular filtration rate (GFR)	Annually	GFR should be followed closely and nephrology referral based upon National Kidney Foundation guidelines[18]
Vaccinations	**Frequency**	**Comments**
Pneumococcus	One time	Patients over age 65 need a second dose if vaccine was received ≥5 years previously and age was <65 at time of vaccination
Influenza	Annually	
Hepatitis B	Three dose series	Administer to unvaccinated adults who are ages 19 to 59 years; For older patients, administer based upon risk of acquiring HBV and likelihood of adequate immune response to vaccination

Other	Frequency	Comments
Education, self-management review	Annually	
Carry or wear medical identification (bracelet or tag)	At all times	Alert of diagnosis in an emergency

Plan

A main goal of diabetes treatment is to keep blood sugar levels within the normal range to prevent hypoglycemia and resultant comorbidities. Treatment involves diet, exercise, education, and supplemental insulin. If people with diabetes strictly control blood sugar levels, complications are less likely to develop. People with T1D who are able to maintain a healthy weight may be able to reduce their doses of insulin. Many families with children with T1D use complementary and alternative medicine (CAM) as adjunctive treatment for controlling symptoms.[6,7]

Diet:

- Dietary modification (i.e. Low glycemic index diet, DASH diet, Bernstein diet).[19]
- Gluten-free diet (GFD) may offer significant benefits for children and adolescents with both T1DM over a standard diet.[20]
- Fish consumption, long chain fatty acids.[21]
- Meals should be eaten on a regular schedule and long periods between eating should be avoided.
- Tight glycemic control (target A1C <6.5 percent with intensive therapy).
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Supplements and Nutrients: (Note: this is for adult treatment; treatment in children may differ and be contraindicated)

- Vitamin C, vitamin D, folate.[22]
- Biotin.[23]
- Magnesium.
- Probiotics and synbiotics may be effective as complementary therapies for managing diabetes.[24,25]
- Alpha lipoic acid (diabetic neuropathy).[26,27,28]
- Trigonella foenum-graecum (Fenugreek).[29]

Movement and Exercise:

- Exercise to help people control their weight and maintain blood sugar levels within the normal range. Because blood sugar levels go down during exercise, patients must be alert for symptoms of low blood sugar. [30]
- Multicomponent exercise[31]

Lifestyle Counseling:

- Consume no more than moderate amounts of alcohol.

- Weight reduction/maintenance.[32]
- Tight blood pressure control (target <140/85 mmHg for most of the study and <130/80 mmHg for the last two years.
- Smoking cessation. A meta-analysis of many of the cardiovascular risk reduction trials showed that cessation of smoking had a much greater benefit on survival than most other interventions.[33]

Pharmaceuticals (Prescription): Insulin is necessary in T1D.

- Angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) therapy should be considered in adults.
- In all patients ≤ 40 years old with diabetes, moderate intensity statin treatment should be considered; higher doses should be considered in those with increased CVD risk.[10]
- Aspirin. The merits of daily aspirin therapy in patients with macrovascular disease are widely accepted.[34] (adults)

Surgical intervention*:*

- Bariatric surgery should be considered in patients who are unsuccessful in other weight loss measures.

Referral Criteria

Diabetes educator: most children and families should be referred to a diabetes educator for initial and ongoing management.
Endocrinologist: Patients using insulin should have a consultation with an endocrinologist in regards to their care. Primary care providers can certainly provide overlap management of T1D.

- **Diabetic ketoacidosis** - a medical emergency, can cause coma and death. Hospitalization, usually in an intensive care unit, is necessary.
- **Nonketotic hyperglycemic-hyperosmolar coma** is treated much like diabetic ketoacidosis. The levels of sugar in the blood must be restored to normal levels gradually to avoid sudden shifts of fluid into the brain.
- **Women of childbearing age** – pre-pregnancy counseling and planning is important. Prior to pregnancy, glycemic control should be optimized, and both ACE inhibitor and statin medications should be discontinued.

Resources for Clinicians

American Diabetes Association. Standards of Medical Care in Diabetes. Summary of Revisions: Diabetes Care. 2019;42(Suppl 1):S4-S6.

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Resources for Patients

Juvenile Diabetes Research Foundation. http://jdrf.org/t1d-resources/

National Center for Complementary and Alternative Medicine (part of the National Institute of Health) - http://nccam.nih.gov/ - Search for Type 1 Diabetes

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