Diabetes (DM)
Type I

Diagnosis/Condition: Insulin Dependent Diabetes mellitus
Type I Diabetes mellitus

Discipline: ND
ICD-9 Codes: 250.01
ICD-10 Codes: E08.9; E09.9; E13.9; E11.9
Origination Date: 10/2012
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Type I Diabetes mellitus (T1DM) is a disorder in which blood sugar (glucose) levels are abnormally high caused by insulin deficiency following destruction of the insulin-producing pancreatic beta cells. It is sometimes referred to as insulin dependent diabetes (IDDM), or juvenile diabetes as it is often diagnosed in childhood, although 14% of new cases are in adults. In the United States, the overall incidence of T1DM seems to be rising in most age and ethnic groups.1

<table>
<thead>
<tr>
<th>Types of Diabetes</th>
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</thead>
<tbody>
<tr>
<td>Metabolic syndrome (syndrome X or the insulin-resistance syndrome): thought to be due to 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:</td>
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<tr>
<td>Abdominal obesity</td>
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<td>Elevated triglyceride level</td>
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<tr>
<td>Low level of high-density lipoprotein (HDL) cholesterol</td>
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<tr>
<td>Elevated blood pressure (BP)</td>
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<td>Fasting glucose value of 100 mg/dL or higher</td>
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**Prediabetes:** 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.

**Type I:** (formerly called insulin-dependent diabetes or juvenile-onset diabetes) - more than 90% of the insulin-producing cells of the pancreas are permanently destroyed and therefore, produces little or no insulin. About 10% of all people with diabetes have Type I disease. Usually developed before age 30. Can be an environmental, viral, nutritional, genetic predisposition.

**Type II:** (formerly called non-insulin-dependent diabetes 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 T2DM. Can be a genetic predisposition. Obesity is the chief risk factor for developing T2DM. Eighty to 90% of people with type 2 are overweight or obese.
More than 90% of the insulin-producing cells of the pancreas are permanently destroyed and therefore, produces little or no insulin. About 10% of all people with diabetes have Type I disease. Usually developed before age 30. The new diagnosis of T1DM can be very challenging for both children and adults. Education and ongoing management is critical.

**Successful management includes:**
- Balancing strict glycemic control,
- Setting realistic goals for each child and family, 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.
- Increasing independence and self-care as the 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.

**Risk Factors**
Can be an environmental, viral, nutritional, genetic predisposition.
T1DM risk factors include the following:
- Viral infections, particularly, enterovirus infections
- Immunizations
- Diet, especially exposure to cow’s milk at an early age
- Higher socioeconomic status
- Obesity
- Vitamin D deficiency
- Perinatal factors such as maternal age, history of preeclampsia, and neonatal jaundice.
- Low birth weight decreases the risk of developing T1DM

**Subjective Findings and History**
- Classic new onset of chronic polydipsia, polyuria, and weight loss with hyperglycemia and ketonemia (or ketonuria)
- Diabetic ketoacidosis
- Family history of diabetes
- Can be asymptomatic
- Blurry vision
- Hunger, weight loss or weight gain
- Fatigue
- Neuropathies/paresthesias
- Yeast infections/balanitis
- Abdominal pain

**Complications**
Diabetes is a life-long disease. Sequelae 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, strokes, claudication, vision problems (diabetic retinopathy), (poly) neuropathies, limb weakness, skin ulcers and infections (fungal and bacterial), renal failure, injuries and falls, diabetic ketoacidosis. Acute hypoglycemia can occur and is a medical emergency.

**Diagnosis and Differential Diagnosis**
- Metabolic Syndrome
- Pre-diabetes
- T1DM
- T2DM
- Celiac disease
- 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 T1DM are any of the following signs of abnormal glucose metabolism:

| • 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 of 200 mg/dL (11.1 mmol/L) or higher in a patient with classic symptoms of hyperglycemia (ie, 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.

**Objective Findings and Assessment**
A workup should be done when someone presents with symptoms or in asymptomatic patients who present with random serum glucose levels (>140 mg/dL).

**Physical Exam, Testing, and Vaccinations** (these are very similar for T1DM and T2DM patients)

- Antibodies – 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 T1DM. Up to 30 percent of individuals with the classical appearance and presentation of T2DM have positive autoantibodies and may have a slowly progressive type of autoimmune diabetes.
The goal of diabetes treatment is to keep blood sugar levels within the normal range to prevent hypoglycemia. Treatment involves diet, exercise, education, and, insulin. If people with diabetes strictly control blood sugar levels, complications are less likely to develop. People with T1DM who are able to maintain a healthy weight may be able to reduce their
doses of insulin. Many families with children with T1DM use complementary and alternative medicine (CAM) as treatment.5,7

**Lifestyle and dietary Modifications:**
- Dietary modification (ie. Low glycemic index diet)6
- Meals should be eaten on a regular schedule. Long periods between eating should be avoided.
- Exercise to help people control their weight and maintain blood sugar levels within the normal range. Because blood sugar levels go down during exercise, people must be alert for symptoms of low blood sugar.
- Chiropractic manipulation of musculoskeletal sequelae7,8
- Weight reduction/maintenance9
- Light to moderate exercise10,11,12
- 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 interventions13
- Only consume only moderate amounts of alcohol (up to one drink per day for women and two for men).
- Tight glyemic control (target A1C <6.5 percent with intensive therapy)14
- Tight blood pressure control (target <140/85 mmHg for most of the study and <130/80 mmHg for the last two years

**Supplementation or Nutraceuticals:** (Note: this is for adult treatment; treatment in children may differ and be contraindicated)
- Vitamin C, vitamin D, folate, and chrome picolinate15
- American Ginseng (Panax quinquefolius)16,17,18
- Ocimum sanctum (Holy basil)19,20,
- Trigonella foenum-graecum (Fenugreek)21
- Cinnamomum cassia (Cinnamon)22
- Gymnema sylvestre (Gurmar)23-25
- Chromium (Polynicotinate)26
- Biotin27
- Vanadium Sulfate

**Prescription Medication:**
- Insulin is necessary in T1DM
- Angiotensin converting enzyme (ACE) inhibitor therapy regardless of blood pressure (adults)
- Lipid-lowering therapy (target total cholesterol <190 mg/dL [4.9 mmol/L] for most of the study and <175 mg/dL [4.5 mmol/L] for the last two years; target fasting serum triglyceride <150 mg/dL [1.7 mmol/L]) (adults)
- Aspirin. The merits of daily aspirin therapy in patients with macrovascular disease are widely accepted.28 (adults)

**Referral Criteria**
Diabetes educator: most children and families should be referred to a diabetes educator for initial and ongoing management.
• **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**


**Resources for Patients**
Juvenile Diabetes Research Foundation. [http://jdrf.org/life-with-t1d/other-resources/](http://jdrf.org/life-with-t1d/other-resources/)

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

**Clinical Pathway Feedback**
CHP desires to keep our clinical pathways customarily updated. If you wish to provide additional input, please use the e-mail address listed below and identify which clinical pathway you are referencing. Thank you for taking the time to give us your comments.

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6 Thomas D, Elliott EJ. Low glycaemic index, or low glycaemic load, diets for diabetes mellitus. Cochrane Database of Systematic Reviews 2009, Issue 1.