Evaluating for Insulin Resistance

Pediatric overweight is increasingly common. In response to inquiries, the Texas Department of Health offers this resource information for primary care clinicians.

In children and teens (ages 2 to 20 years), body mass index (BMI)-for-age can be plotted on gender-specific growth charts and used for assessment. Overweight (BMI $\geq$ 95th percentile-for-age) or "at risk of overweight" (85th to <95th percentile) status in the absence of any related co-morbidity is a finding, not a disease.

Acanthosis nigricans (AN) is a skin marker. It is considered a finding or risk factor, not a disease. Youth referred for AN should be evaluated for several possible conditions, including insulin resistance. Insulin resistance indicates that cells have a reduced sensitivity to available insulin. It is typically associated with excess body weight, abdominal adiposity, elevated insulin levels, hypertension, and dyslipidemia.

Risk factors for insulin resistance include:
- Height/weight measurement > 85th percentile for gender and age and/or BMI (Growth charts at http://www.cdc.gov/nccdphp/dnpa/bmi/bmi-for-age.htm)
- Family history (assess 3 generations for type 2 diabetes or cardiovascular disease)
- Ethnic/racial group (higher in African American, Hispanic/Latino, American Indian, and Asian/Pacific Islander populations)
- Puberty (due to increased GH production)

Recommended clinical evaluation and laboratory tests include:
- Assess for symptoms of diabetes, e.g., polydypsia, nocturia, polyuria, etc.
- Evaluate for hypertension (blood pressure cuff appropriate for body size)
- Document any acanthosis nigricans
- Assess for sleep apnea
- Measure fasting plasma glucose [Note: normal adult FPG <100 mg/dl; Impaired Fasting Glucose (IFG) = FPG 100mg/dl (5.6 mmo/l) to 125 mg/dl (6.9 mmo/l)]
- Obtain fasting lipid profile (total cholesterol, HDL-C, LDL-C, triglycerides)
- Review gestational age and birth weight
- Determine sexual maturity (Tanner) stage
- Assess females for irregular menses and/or hirsutism

Consider other laboratory tests:
- Oral glucose tolerance (1.75 gm/kg to maximum of 75 gram)
- Thyroid (thyroxin, TSH) if symptomatic, goiter detected, or short stature for age
- Liver transaminases (ALT and AST) to detect fatty liver in patients $\geq$ 95th percentile weight for height
- DHEAS, androstenedione and testosterone if hirsute or menstrual irregularity

Management and follow-up may include:

- Patient and family education on the condition and risks for type 2 diabetes and/or cardiovascular disease
- Preventive measures for weight management through healthy lifestyle
    - Increased physical activity and exercise; limited daily sedentary activity
    - Nutrition counseling
- Medical follow-up every 2 years or depending on findings

For clinical algorithm for Prevention and Delay of Type 2 Diabetes in Patients with Impaired Fasting Glucose and Impaired Glucose Tolerance (Publication #45-11825, April, 2004): www.texasdiabetescouncil.org (Click on "Health Care Professionals" link.)
For education information on risk reduction: www.ndep.nih.gov

For additional information on acanthosis nigricans:
http://www.tdh.state.tx.us/diabetes/healthcare/research.htm

References: American Diabetes Association (*Diab Care* 2004;23:S11-S14);
Texas Department of Health *Disease Prevention News* 2002;62(2)

APPLICABLE BILLING CODES

251.1   Hyperinsulinemia
256.4   Polycystic Ovary Syndrome
272.1   Hypertriglyceridemia
272.2   Mixed hyperlipidemia
272.4   Hyperlipidemia (unspecified)
277.7   Dysmetabolic Syndrome/ Syndrome X
278.00 Overweight/Obesity (unspecified)
278.01 Morbid Obesity
401.1   Hypertension, essential, benign
401.9   Hypertension, essential, unspecified
626.0   Amenorrhea (primary or secondary)
701.2   Acanthosis nigricans
780.57   Apnea, sleep
790.2   Abnormal glucose tolerance test
790.6   Hyperglycemia
791.0   Microalbuminuria/proteinuria
V18.0   Diabetes, family history
V18.1   Hyperlipidemia, family history
V77.1   Diabetes, screening
V77.91 Cholesterol/HDL screen
V81.1   Hypertension screening

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