

Insulin Resistance and Prediabetes

Why NOW is the Time to Intervene



This job aid provides screening guidelines and talking points for counseling clients about insulin resistance and prediabetes in a family planning setting.

Why offer prediabetes screening and prevention services?

By the time individuals are diagnosed with prediabetes, they likely have had insulin resistance for some time and are at risk for health complications.

- One in 5 adolescents and 1 in 4 young adults have prediabetes and the prevalence is rising.
- Only about 15% of the 88 million adults with prediabetes in the U.S. are diagnosed.¹
- Young people tend to progress faster to full-blown type 2 diabetes than older adults because young people have accelerated loss of functionality of their pancreatic β -cells (the cells that produce, store, and release insulin). This makes today the client's best opportunity to change course.
- High blood glucose and/or obesity during pregnancy are linked to macrosomia, C-section, birth defects, spontaneous abortion, and future risk of cardiovascular disease and diabetes in offspring.²
- Insulin resistance and resultant hyperinsulinemia can impact fertility. It can compromise oocyte development and ovulation, eventually causing anovulation and, potentially, infertility.³

Screening for prediabetes and diabetes

Screen asymptomatic adults, with⁴

Overweight or obesity + one of these:

- First degree relative with diabetes
- Inadequate physical activity
- Race/ethnicity: Native American, African American, Latino, Asian American, Pacific Islander
- Hypertension or cardiovascular disease
- Dyslipidemia: low HDL and/or high TG
- Polycystic ovary syndrome, acanthosis nigricans
- Prediabetes: screen for type 2 diabetes annually
- Gestational diabetes history: screen every 3 years
- HIV+
- > 45 years; or
- Planning pregnancy

Diabetes may be diagnosed based on plasma glucose criteria, either the fasting plasma glucose (FPG) value or the 2-h plasma glucose (2-h PG) value during a 75-g oral glucose tolerance test (OGTT), or A1C criteria.

- In the absence of unequivocal hyperglycemia, diagnosis requires two abnormal test results.
- If results are normal, repeat in 3 years or less, depending on initial results and risk status.⁵

Insulin resistance: what to know

Insulin is a hormone that transports glucose from the blood into cells, providing them with the energy to function. Insulin resistance is the reduced ability to respond to insulin. Early in the disease process, blood glucose levels remain normal because the pancreas produces extra insulin (resulting in hyperinsulinemia) in order to get glucose into the cells. As time goes on, the pancreas becomes unable to produce enough insulin, resulting in **decreased transport of glucose into the cells and increased glucose in the blood. Blood glucose levels increase first to the prediabetes range and progress to the diabetes range.** Insulin resistance occurs due to genetic susceptibility, excess body fat, and insufficient physical activity; and has harmful effects throughout the body.

The Effects of Insulin Resistance Throughout the Body⁶

BRAIN

The incretin hormone glucagon-like peptide-1 (GLP-1) acts as a neurotransmitter in the hypothalamus to decrease hunger and increase satiety. Because GLP-1 is deficient in people with impaired glucose tolerance, the result is increased hunger, food intake, and weight gain.

MUSCLE

Muscle cells fail to adequately take up glucose from the blood after the ingestion of carbohydrates, resulting in postprandial hyperglycemia.

LIVER

Failing to recognize the presence of high levels of insulin in the blood, the liver overproduces glucose in an attempt to meet cells' needs for energy.

PANCREAS

Blood glucose levels rise only after β -cells have failed and caused insulin production to decrease.

The α -cells of the pancreas secrete elevated levels of glucagon, which correlate to higher fasting glucose levels.

GASTROINTESTINAL TRACT

Eating elicits the release of GLP-1, which enhances insulin release, reduces glucagon secretion, and promotes satiety. In people with impaired glucose tolerance, GLP-1 is deficient.

FAT

Over time, fat cells release higher levels of free fatty acids into the circulation. These are taken up by other organs, such as the liver and the skeletal muscles, that are unable to safely store large amounts of fat. This can lead to insulin resistance in these organs.

How to Explain Insulin Resistance to Your Client

BRAIN

"Problems with hormones and chemical messengers in the brain can make you feel more hungry, which can cause you to eat more and gain weight."

MUSCLE

"Muscle cells become slow to allow blood sugar to enter, which causes the amount of sugar in your blood to become too high. The good news is that exercise allows your muscles to accept sugar more readily."

LIVER

"The liver's job is to release blood sugar when you're sleeping and other times you're not eating, so that your body has energy between meals. Insulin resistance causes your liver to release too much sugar."

PANCREAS

"Initially, your pancreas makes extra insulin to compensate and try to get sugar into the cells. Over time, the pancreas loses its ability to make enough insulin to move sugar into the cells, so too much sugar stays in the bloodstream."

GASTROINTESTINAL TRACT

"You have hormones in your gut that don't function properly, which causes you to have too much sugar in your blood and to feel hungrier."

FAT

"Because of insulin resistance in your fat tissue, your blood carries an excess of fats, which impairs the ability of your pancreas to produce enough insulin and makes it harder for your muscle and liver cells to take up sugar."

1 Centers for Disease Control and Prevention. *National Diabetes Statistics Report, 2020*. Atlanta, GA.

2 American Diabetes Association *Medical Management of Pregnancy Complicated by Diabetes*, 5th ed.

3 Sakumoto, T. et al. (2010). Insulin resistance/hyperinsulinemia and reproductive disorders in infertile women. *Reproductive medicine and biology*, 9(4), 185-190.

4 American Diabetes Association *Standards of Medical Care in Diabetes-2021*. *Diabetes Care* 2021; 44, S:1.

5 American Diabetes Association *Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes-2021*.

6 DeFronzo RA. From the Triumvirate to the Ominous Octet: A new paradigm in the treatment of type 2 diabetes mellitus. *Diabetes*. 2009;58(4)773-795.

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