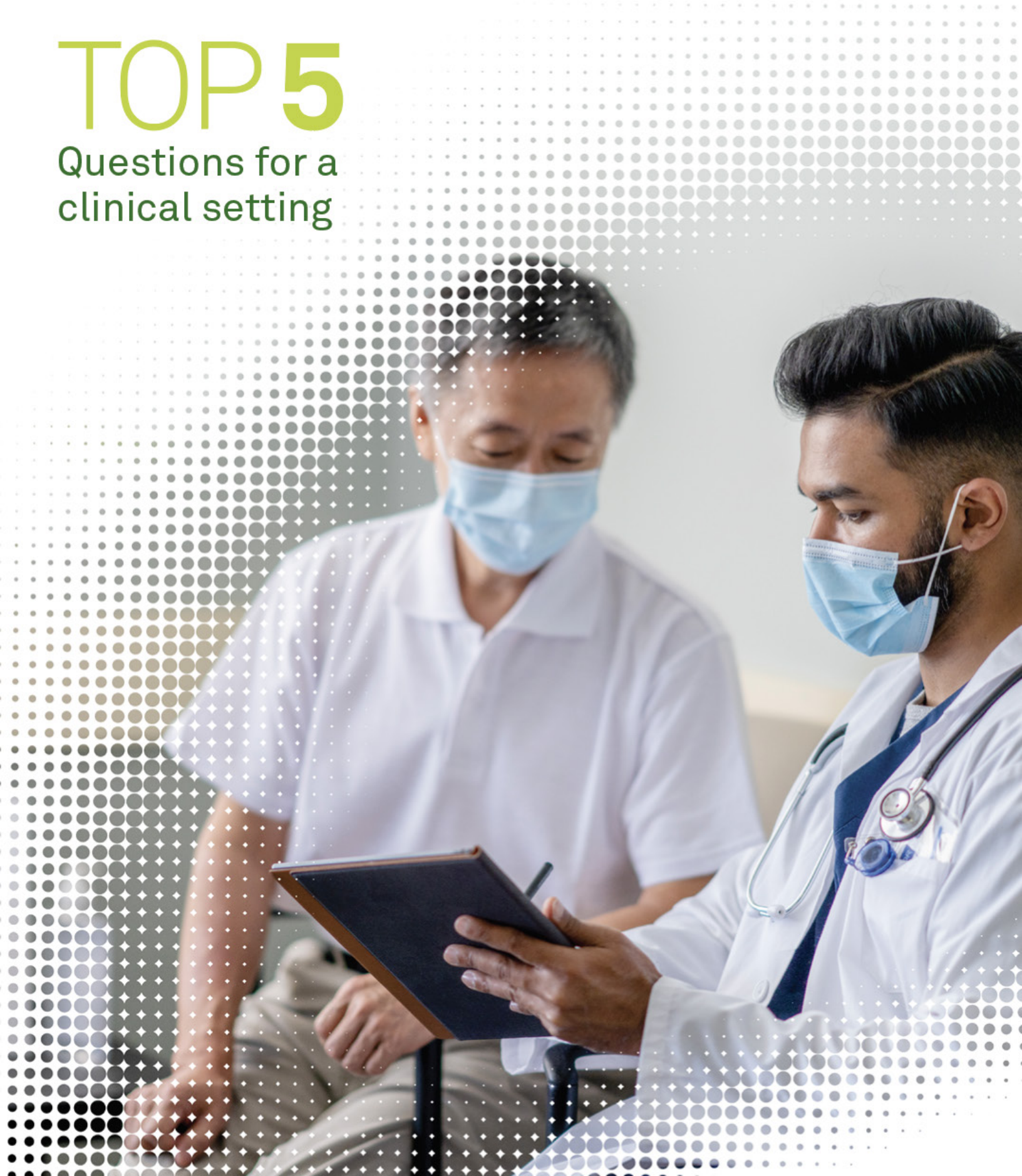
Quest Diagnostics®

TOP 5

Questions for a clinical setting



Introduction

Insulin resistance, which occurs when cells become less sensitive to insulin stimulation, can occur as early as 10 years before progressing to prediabetes. As such, insulin resistance is the earliest laboratory indicator of type 2 diabetes (T2D), cardiovascular disease and other adverse health conditions.[1].

This document answers the top 5 questions about insulin resistance, covering what the condition is and how to test for it, which patients should be tested, and the best ways to interpret results.

Over 40 percent of young American adults have insulin resistance[2]

8.7 percent of the US population has been diagnosed with diabetes[3]

Of the approximately 96 million US adults who have prediabetes, over 80 percent of them don't even know it[4]

The American Diabetes Association's 2022 Standard of Care recommends screenning for prediabetes and diabetes begin at age 35[5]

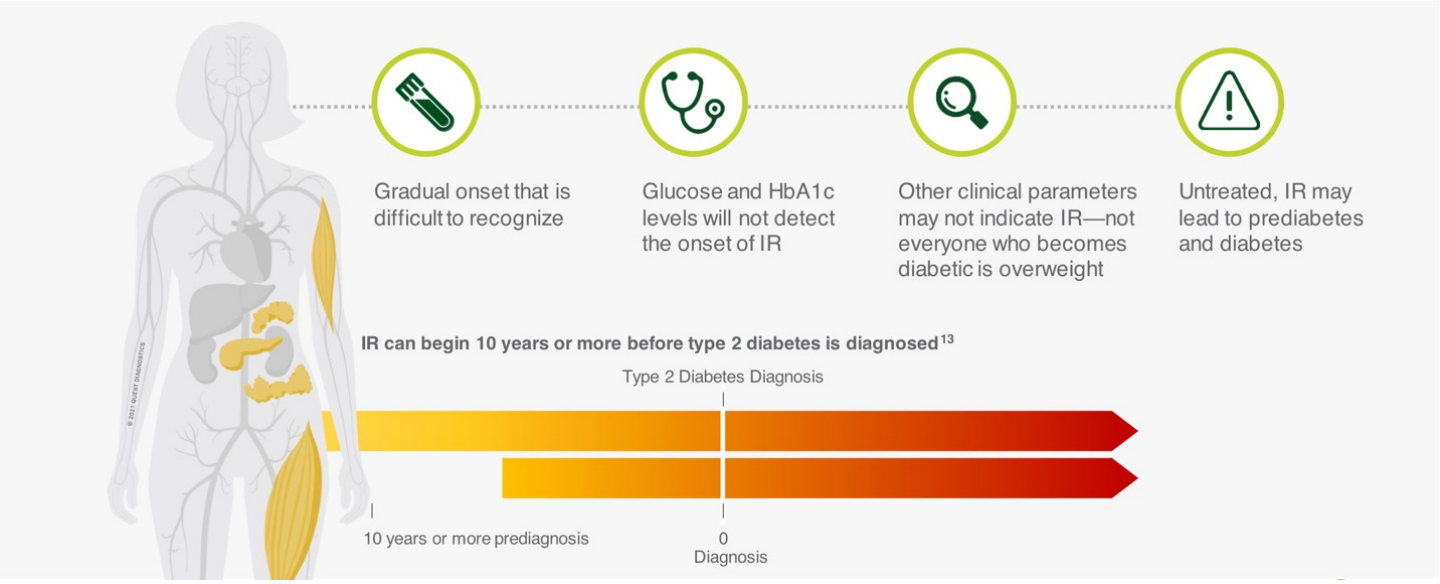
1

What is **Insulin Resistance (IR)** and why is it a key measure of cardiometabolic health?

Insulin resistance (IR) is a metabolic condition that occurs when cells become less sensitive to insulin's stimulation to absorb glucose from the bloodstream. When cells become insulin resistant, pancreatic β-cells increase the production of insulin to maintain normoglycemia.[1,6]

Over time, IR may continue to increase and/or pancreatic function may decline,[6] which can gradually elevate blood glucose and HbA1c levels.

If IR is left untreated, it can lead to development of prediabetes and type 2 diabetes mellitus (T2DM) and is also associated with other clinical conditions including hypertension, cardiovascular disease, stroke, nonalcoholic fatty liver disease, polycystic ovary syndrome, and certain forms of cancer.[1]

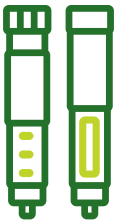


2

Why should IR be measured **in addition to glucose and HbA1c?**

Until recently, determining IR was inconvenient and poorly suited to primary care. Traditionally, many clinicians relied on glucose and HbA1c, but it has been shown that patients with normal levels may still have IR that puts them at risk of developing prediabetes and diabetes.

Identifying individuals with insulin resistance early, before fasting glucose and HbA1c become abnormal, can help prevent disease progression.



Insulin Resistance → **Prediabetes** → **Diabetes**

Measured by — Measured by

IR panel with score + **Fasting blood glucose** + **HbA1c** = 

3

Which patients **should be monitored for IR?**

IR testing is appropriate for patients 35+, who present with risk factors such as:

- Family history of type 2 diabetes
- Past diagnosis of gestational diabetes
- Metabolic syndrome
- Hypertension
- Central obesity
- Acanthosis nigricans (dark patches of thick, velvety skin on the back of the neck, armpits, and groin)

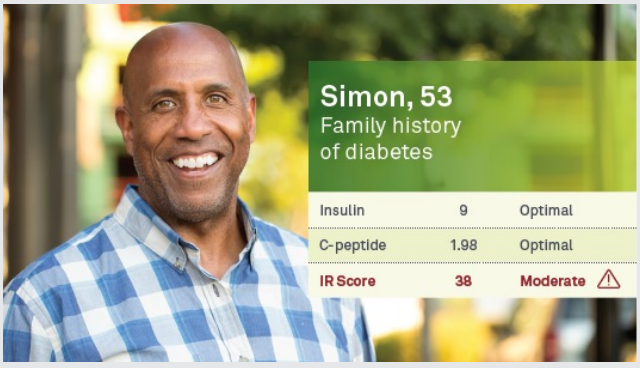
It is known that IR can be present 10 years or more before diabetes is diagnosed,[7] and that **by the time diabetes is evident, 80% of beta-cell function has already been lost**.[8] By screening patients who otherwise appear healthy, but have these risk factors, you may be able to catch IR before it progresses.

4

How are fasting insulin and C-peptide measurements **relevant for IR monitoring** in primary care?

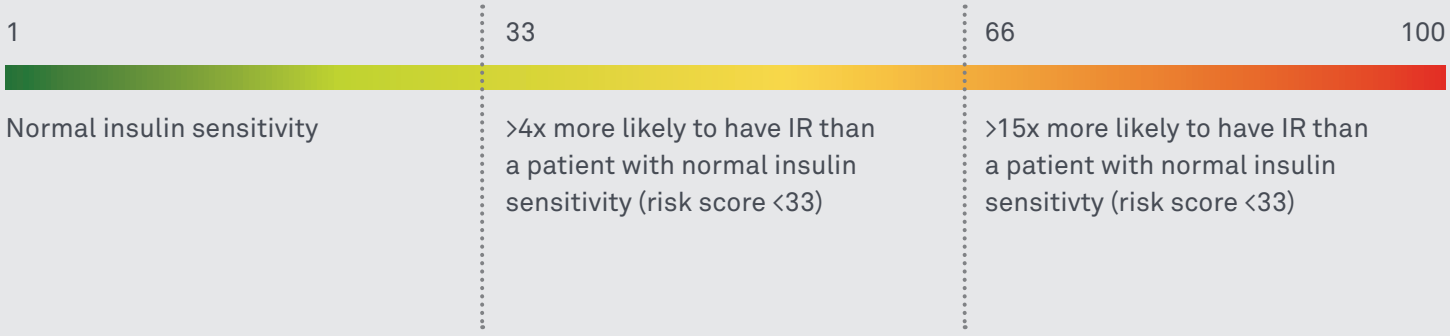
Although insulin and C-peptide are co-secreted from pancreatic β-cells at the same rate, their stability and clearance vary. C-peptide has a much longer half-life in circulation (20-30 minutes for C-peptide compared to 3-5 minutes for insulin), and insulin is primarily cleared by the liver, whereas C-peptide is cleared through the kidneys.[9] Together, insulin and C-peptide measurements provide a better indicator of IR than either alone.[10]

The Insulin Resistance Panel with Score from Quest Diagnostics uses a calculation of insulin and c-peptide measurements to provide a score that indicates the probability of an individual having IR.[10]



Each score is associated with a probability of IR based on population tertiles[10]:

- A score less than 33 is optimal and indicates normal insulin sensitivity
- A score of 33-66 indicates an individual has >4-fold greater probability of having IR relative to someone with a score less than 33
- A score of greater than 66 indicates an individual has >15-fold greater probability of having IR relative to someone with a score less than 33



5

How can **measuring IR help patients** and clinicians get ahead of chronic disease?

Early identification and intervention can halt or reverse the progression of clinical conditions related to IR. With enhanced reporting that provides insights about a patient's condition, you can provide effective counseling for patients who need to make lifestyle changes. With lifestyle and diet modifications, changes may be seen in as few as 4-6 weeks.

> The idea of the silent killer applies to so many of these diseases. That is why early detection is so important. You do not want to catch the DM [diabetes mellitus] with the 3Ps [polyuria, polydipsia, and polyphagia], because it's so much harder to control diagnosed diabetes than catching someone even before that A1C starts to move. I didn't know how much of an impact this kind of intervention could have, but it's made such a difference
> —Dr. Jessie Ciriola, DNP

Quest Diagnostics®

Shine a light on patients at increased risk of T2DM through the early identification of insulin resistance

The IR Panel with Score helps empower patients and providers to recognize prediabetes and diabetes risk, prevent disease progression, and get those most at-risk on a path to better health.

Quest Diagnostics is committed to supporting early risk identification of prediabetes and diabetes.

Visit **QuestDiagnostics.com/IRScore** to learn more.

References: 1. Reaven GM. The insulin resistance syndrome. *Curr Atheroscler Rep.* 2003;5:364-371. **2.** Vibhu Parcha, Brittain Heindl, Rajat Kalra, Peng Li, Barbara Gower, Garima Arora, Pankaj Arora, Insulin Resistance and Cardiometabolic Risk Profile Among Nondiabetic American Young Adults: Insights From NHANES, *The Journal of Clinical Endocrinology & Metabolism*, Volume 107, Issue 1, January 2022, Pages e25–e37,https://doi.org/10.1210/clinem/dgab645 **3.** Prevalence of Diagnosed Diabetes. Centers for Disease Control and Prevention. https://www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html#:~:text=28.7%20million%20people%20of%20all%20ages%E2%80%94or%208.7%25%20of,diabetes.%20This%20includes%20244%2C000%20with%20type%201%20diabetes. December 17, 2021. Accessed May 26, 2022. **4.** Diabetes Fast Facts. Centers for Disease Control and Prevention https://www.cdc.gov/diabetes/basics/quick-facts.html. December 17, 2021. Accessed March 3, 2022. **5.** American Diabetes Association; Introduction: Standards of Medical Care in Diabetes—2022. *Diabetes Care* 1 January 2022; 45 (Supplement_1): S1–S2. https://doi.org/10.2337/dc22-Sint-**6.** SaishoY. β-cell dysfunction: Its critical role in prevention and management of type 2 diabetes. *World J Diabetes*. 2015;6:109-124. **7.** Holman RR. Assessing the potential for alpha-glucosidase inhibitors in prediabetic states. *Diabetes Res Clin Pract.* 1998;40 Suppl:S21-S25. **8.** Dall T, ThiseltonD, Varvel S. Targeting insulin resistance: the ongoing paradigm shift in diabetes prevention. AJMC. April 11, 2013. www.ajmc.com/journals/evidence-based-diabetes-management/2013/2013-1-vol19-sp2/targeting-insulin-resistance-the-ongoing-paradigm-shift-in-diabetes-prevention. Accessed September 20, 2018. **9.** Leighton E, Sainsbury CA, Jones GC. A practical review of C-peptide testing in diabetes. *Diabetes Ther.* 2017;8:475-487. 9. Abassi F, Shiffman D, Tong CH, et al. Insulin resistance probability scores forapparently healthy individuals. J Endocr Soc.In press. **10.** Pei D, Jones CN, Bhargava R, et al. Evaluation of octreotide to assess insulin-mediated glucose disposal by the insulin suppression test. *Diabetologica*. 1994;37:843-845. **11.** DeFronzo RA, Tobin JD, Andres R. Glucose clamp technique: a method for quantifying insulin secretion and resistance. *Am J Physiol*. 1979;237:E214-223.

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