Quest
Diagnostics™

Know what's ahead—the earlier, the better

Detecting insulin resistance now can help you and your patients take action to change its course

# Put your patients on the right path—before it's too late

Insulin resistance (IR) testing offers significant—and often untapped—clinical value. Identifying patients who are likely to have insulin resistance can help drive actions to change the course of prediabetes and diabetes.[1]

- Patients can have normal glucose and HbA1c, but their β-cells may be struggling with glucose load, leading to IR, and subsequently prediabetes and diabetes
- IR can be gradual and difficult to recognize[1]—patients must be identified while there is still time to reverse course
- IR is also associated with cardiovascular disease (CVD), nonalcoholic fatty liver disease (NAFLD), and polycystic ovary syndrome (PCOS)[1]

IR affects
>60m
Americans[2]

PROGRESSION OF TYPE 2 DIABETES AND THE ROLE OF IR

IR can begin 10 years or more before type 2 diabetes is diagnosed[3]

TYPE 2 DIAGNOSIS

Insulin resistance

Prediabetes | Diabetes

10 years or more pre-diagnosis | 0
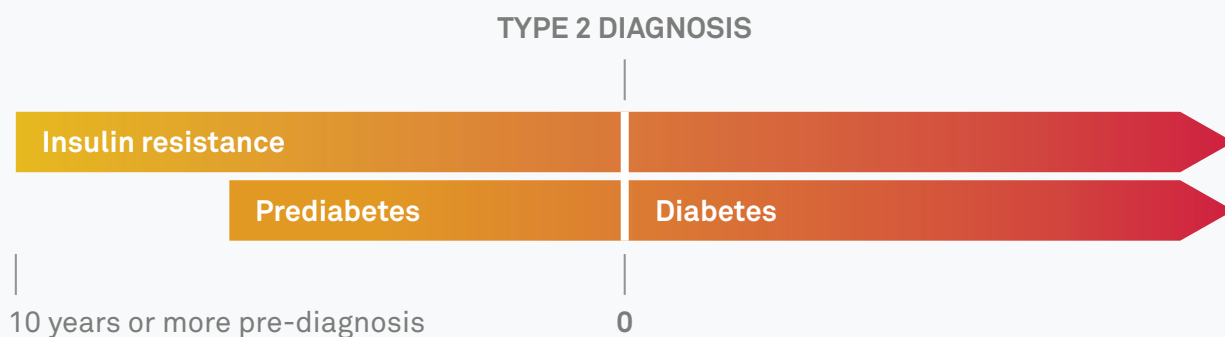
For patients whose risk factors may not be as evident, IR testing can provide actionable insight.

Know more with the IR test available only from Quest

Quest offers the Cardio IQ® Insulin Resistance Panel with Score, a simple, accurate, and actionable way to assess IR and identify prediabetes and diabetes risk.
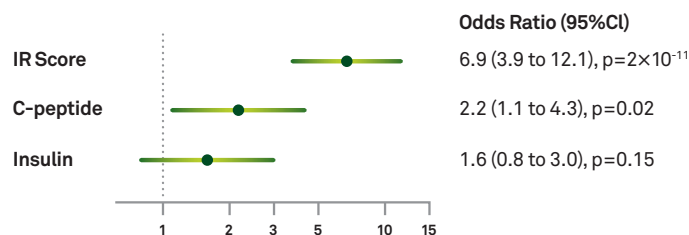
A routine insulin resistance score validated against the gold standard:

- Validated in a Stanford University study[4] against the insulin suppression test, a gold standard method for the direct measurement of IR
- Provides an enhanced assessment of IR through the combined measurement of insulin and C-peptide from a single fasting blood specimen
- Offers greater discrimination of IR compared to either insulin or C-peptide levels alone and a better assessment of IR status than TG/HDL or HOMA-IR[4]
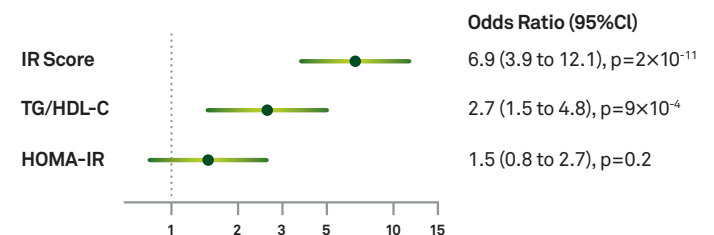- Detects IR and possible risk of prediabetes or diabetes before traditional markers can

Clinical evaluation of the Cardio IQ® Insulin Resistance Panel with Score

In the Stanford IR study, 535 apparently healthy individuals were assessed for risk of IR using fasting insulin and C-peptide, measured by LC/MS/MS assays.[4]

The IR score showed greater discrimination of IR compared to either insulin or C-peptide levels alone.

		Odds Ratio (95%CI)
IR Score		6.9 (3.9 to 12.1), p=2×10^{-11}
C-peptide		2.2 (1.1 to 4.3), p=0.02
Insulin		1.6 (0.8 to 3.0), p=0.15

Adjusted for age, sex, body mass index (BMI), fasting plasma glucose (FPG) systolic blood pressure (SBP), diastolic blood pressure (DBP), TG/HDL-C, LDL-C ratio, creatinine, ALT, ethnicity, and C-peptide or insulin, as appropriate.

The IR score provided a better assessment of IR status compared to TG/HDL-C and HOMA-IR.

		Odds Ratio (95%CI)
IR Score		6.9 (3.9 to 12.1), p=2×10^{-11}
TG/HDL-C		2.7 (1.5 to 4.8), p=9×10^{-4}
HOMA-IR		1.5 (0.8 to 2.7), p=0.2

In model that includes age, sex, ethnicity, BMI, insulin, C-peptide, FPG, SBP, DBP, TG/HDL-C ratio, LDL-C, creatinine, and ALT.

The IR score can assess insulin resistance better than other methods, giving you greater confidence in identifying patients at risk for progression to prediabetes and diabetes.
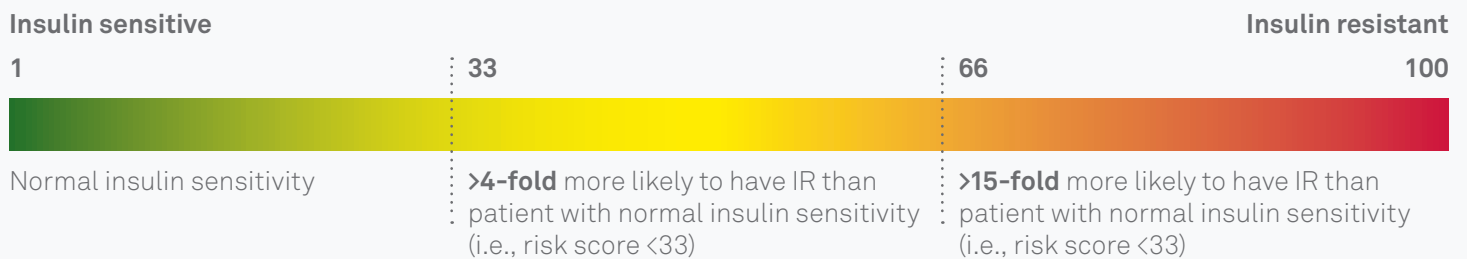
Take action to change the course of IR

Which patients are suitable for testing?

1. **Patients with normal glucose and HbA1c who may be at risk[4]**

2. **Individuals with clinical features associated with IR**

- Overweight/obese
- Central obesity
- Family history of diabetes
- A history of gestational diabetes mellitus

- Hypertension
- Acanthosis nigricans (dark patches of thick, velvety skin on the back of the neck, armpits, and groin)

RELEVANCE OF IR SCORE, EVEN IN LEAN PATIENTS[4]

Insulin sensitive			Insulin resistant
1	33	66	100

Normal insulin sensitivity

>4-fold more likely to have IR than patient with normal insulin sensitivity (i.e., risk score <33)

>15-fold more likely to have IR than patient with normal insulin sensitivity (i.e., risk score <33)

Put patients on the right path

Clinical trials have shown that lifestyle or pharmacological interventions that increase insulin sensitivity or induce weight loss can significantly delay the onset of type 2 diabetes in patients with impaired glucose tolerance.[5-8]

It is possible that even earlier intervention for insulin-resistant patients who have not yet experienced loss of β-cell function and progressed to prediabetes could help prevent—not just delay—the development of diabetes.[9-10]

For patients who already have prediabetes or diabetes, the IR score may help monitor response to therapy and motivate patients to adhere to lifestyle changes.

Counsel patients with an effective tool

The Cardio IQ® Insulin Resistance Panel with Score provides a risk score report, giving you an effective counseling tool for patients who need to make lifestyle changes.

Sample risk score report

Ordering information

Test Name	Patient Preparation	Test Code	CPT Codes*
Cardio IQ® Insulin Resistance Panel with Score	Overnight fasting required	36509(X)	83525, 84681

* The CPT codes provided are based on AMA guidelines and are for informational purposes only. CPT coding is the sole responsibility of the billing party. Please direct any questions regarding coding to the payer being billed.

Know more across the entire diabetes care continuum

Quest Diagnostics offers a comprehensive array of diabetes laboratory testing services to help you manage insulin resistance, prediabetes, and diabetes in all of your patients, no matter where they are on the diabetes care continuum.

NAFLD/Nonalcoholic Steatohepatitis				
Insulin resistance	Prediabetes	Diabetes	Chronic kidney disease	End-stage renal disease

Cardio IQ® Insulin Resistance Panel with Score	**Tests for screening, diagnosis, and monitoring:** • Diabetes Risk Panel with Score • Diabetes and ASCVD Risk Panel with Scores • Antibody testing (GAD-65, Islet Cell, IA-2, ZnT8) • C-Peptide • Diabetes, Newly Diagnosed and Monitoring Panel • Diabetes, Advancing CKD Management Panel • NAFLD Fibrosis Score Panel • Cystatin C

Knowing what's ahead can make all the difference. Contact your Quest Diagnostics sales representative or visit **QuestDiagnostics.com/IRscore** to learn more.

References

1. Reaven GM. The insulin resistance syndrome. *Curr Atheroscler Rep*. 2003;5:364-371. **2.** American Heart Association. About diabetes. Available at www.heart.org/en/health-topics/diabetes/about-diabetes. Accessed August 17, 2018. **3.** Holman, RR. Assessing the potential for alpha-glucosidase inhibitors in prediabetic states. *Diabetes Res Clin Pract*. 1998;40 Suppl:S21-25. **4.** Abbasi F, Shiffman D, Tong CH, et al. Insulin resistance probability scores for apparently healthy individuals. *J Endocr Soc*. 2018;2:1050-1057. **5.** Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346:393-403. **6.** Daniel S, Soleymani T, Garvey WT. A complications based clinical staging of obesity to guide treatment modality and intensity. *Cur Opin Endocrinol Diabetes Obes*. 2013;20:377-388. **7.** Torgerson JS, Hauptman J, Boldrin MN, et al. XENical in the prevention of diabetes in obese subjects (XENDOS) study: A randomized study of orlistat as an adjunct to lifestyle changes for the prevention of type 2 diabetes in obese patients. *Diabetes Care*. 2004;27:155-161. **8.** Garvey WT, Ryan DH, Henry R, et al. Prevention of type 2 diabetes in subjects with prediabetes and metabolic syndrome treated with phentermine and topiramate extended release. *Diabetes Care*. 2014;37:912-921. **9.** American Diabetes Association, National Institute of Diabetes, Digestive and Kidney Disorders. The prevention or delay of type 2 diabetes. *Diabetes Care*. 2002;25:742-749. **10.** Genuth S, Kahn R. A step backward—or is it forward? *Diabetes Care*. 2008;31:1093-1096.

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