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- Confirming Diagnosis of Type 2 Diabetes and Prediabetes
- Interpreting Laboratory Results
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- Comparing Diagnoses

This fact sheet compares the following tests:
- A1C test
- fasting plasma glucose (FPG) test
- oral glucose tolerance test (OGTT)
- random plasma glucose (RPG) test

In addition, the National Diabetes Education Program (NDEP) offers a pocket guide, Diabetes Numbers At-a-Glance, which can be ordered at www.ndep.nih.gov. Both resources utilize current American Diabetes Association (ADA) clinical recommendations for diagnosing and managing diabetes and prediabetes.¹

Confirming Diagnosis of Type 2 Diabetes and Prediabetes

Diagnosis must be confirmed unless symptoms are present. Repeat the test using one of the following methods:

- Repeat the same test on a different day—preferred.
- If two different tests are used—e.g., FPG and A1C—and both indicate diabetes, consider the diagnosis confirmed.
- If the two different tests are discordant, repeat the test that is above the diagnostic cut point.

If diagnosis cannot be confirmed using the results of two tests, but at least one test indicates high risk, health care providers may wish to follow the patient closely and retest in 3 to 6 months.¹
Interpreting Laboratory Results

When interpreting laboratory results health care providers should

- consider that all laboratory test results represent a range, rather than an exact number
- be informed about the A1C assay methods used by their laboratory
- send blood samples for diagnosis to a laboratory that uses an NGSP-certified method for A1C analysis to ensure the results are standardized
- consider the possibility of interference in the A1C test when a result is above 15% or is at odds with other diabetes test results
- consider each patient’s profile, including risk factors and history, and individualize diagnosis and treatment decisions in discussion with the patient

Comparing Diabetes Blood Tests

PDF Version (461 KB)

<table>
<thead>
<tr>
<th>Test</th>
<th>Uses</th>
<th>Technical Features</th>
<th>PROS</th>
<th>CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1C Test</td>
<td>Screening and diagnosis of prediabetes 5.7–6.4%</td>
<td>Diagnosis requires a laboratory test certified by the NGSP, not meter—point-of-care A1C tests are only suitable for monitoring</td>
<td>Reflects long-term blood glucose concentration</td>
<td>Lower sensitivity: identifies fewer cases of diabetes than the glucose tests</td>
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<td></td>
<td>Screening and diagnosis of type 2 diabetes ≥ 6.5%</td>
<td>Sample any time of day, no fasting</td>
<td>Unaffected by acute changes in glucose levels</td>
<td>Interference resulting in falsely increased or lowered results due to</td>
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<td></td>
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<td>Sample: anticoagulated whole blood</td>
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<td>genetic variants including</td>
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<td>Sample stability: superior</td>
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<td></td>
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<td>Sensitivity: less than the FPG test and the OGTT</td>
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<td>Coefficient of variation: assay</td>
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<td><strong>FPG Test</strong></td>
<td><strong>Diabetes variability, see <a href="http://www.ngsp.org">www.ngsp.org</a> Disclaimer</strong></td>
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<tr>
<td><strong>Screening and diagnosis of prediabetes or impaired fasting glucose (IFG)</strong></td>
<td><strong>Due to stress or illness</strong></td>
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<td>100–125 mg/dL</td>
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<td>Screening and diagnosis of diabetes</td>
<td><strong>Highly correlated with risks for complications such as retinopathy and cardiovascular disease (CVD)</strong></td>
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<td>≥126 mg/dL</td>
<td><strong>Convenient for patient and healthcare providers</strong></td>
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<td>Repeat for confirmation of diagnosis</td>
<td><strong>Most stable sample after collection</strong></td>
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<td><strong>Diagnosis requires a laboratory test, not meter</strong></td>
<td><strong>Low within-patient variability</strong></td>
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<td><strong>Sample in morning, after 8-hour fast</strong></td>
<td><strong>Established international standardization of lab tests</strong></td>
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<td><strong>Sample: sodium fluoride plasma preferred</strong></td>
<td><strong>Accuracy of test is monitored</strong></td>
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<tr>
<td><strong>Sample stability: low—requires processing within 30 minutes</strong></td>
<td><strong>HbS, HbC, HbD, and HbE traits and HbF:</strong> <strong>affects people of African, Mediterranean, and Southeast Asian heritages</strong></td>
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<td><strong>Sensitivity: greater than the A1C test, less than the OGTT</strong></td>
<td><strong>o Kidney disease</strong></td>
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<td><strong>Coefficient of variation: assay variability:</strong></td>
<td><strong>o Liver disease</strong></td>
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<td><strong>Low cost</strong></td>
<td><strong>o Iron deficiency anemia</strong></td>
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<td><strong>Assay is widely available</strong></td>
<td><strong>o Heavy bleeding</strong></td>
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<td><strong>Assay is automated</strong></td>
<td><strong>Not recommended for rapidly progressing diabetes, e.g., type 1 diabetes in children</strong></td>
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<td><strong>Indicates single-point blood glucose level</strong></td>
<td><strong>May not be available in some laboratories/areas of the world</strong></td>
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<td><strong>Affected by short-term lifestyle changes: stress or illness</strong></td>
<td><strong>Expensive</strong></td>
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<tr>
<td><strong>Less tightly linked to diabetes complications than A1C</strong></td>
<td><strong>See <a href="http://www.ngsp.org">www.ngsp.org</a> Disclaimer for information on A1C interference and recommended testing methods.</strong></td>
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<td><strong>Not convenient for patient or health care provider: requires fasting and scheduling a morning appointment or</strong></td>
<td><strong>See the NIDDK publication The A1C Test and Diabetes at <a href="http://www.diabetes.niddk.nih.gov">www.diabetes.niddk.nih.gov</a>.</strong></td>
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With a coefficient of variation 5.7% (typical biological variation within the same person), an FPG test result of 126 mg/dL could indicate a true FPG of anywhere from ~110 to 142 mg/dL.

**OGTT**
- Screening and diagnosis of prediabetes or impaired glucose tolerance (IGT)
  - 140–199 mg/dL at 2 hr.
- Screening and diagnosis of diabetes
  - ≥200 mg/dL at 2 hr.
- Screening and diagnosis of gestational diabetes mellitus (GDM)*

**RPG Test**
- Diagnosis of diabetes—used only with classic symptoms of hyperglycemia or hyperglycemic crisis:
  - polyuria, polydypsia, and unexplained weight loss
  - 200 mg/dL

**Sample in morning, after 8-hr. fast and 2 hrs. after glucose load**
- Sample stability: low—requires processing within 30 minutes
- Patients should ingest at least 150 g/day of carbohydrates for 3 days prior
- Sensitivity: greater than the A1C or the FPG tests
- Range of variability: 16.7%

**Sensitive indicator of risk of developing diabetes**
**Early marker of impaired glucose balance**

**Sample any time, no fasting**
- Sample stability: low—requires processing in fewer than 2 hours

**Convenient**
**Part of basic metabolic panel screen**

**Indicates single-point blood glucose level**
**Used only in symptomatic patients, not recommended for screening**

**In insensitive measurement**
**Greater within-patient variability**
**Affected by short-term lifestyle changes and prandial state**

- Diurnal variation
- Sample not stable after collection
- High within-patient variability
- Many laboratories measure serum, which is not recommended
- Inadequate standardization of assays
Comparing Diagnoses

In some people, a blood glucose test may indicate a diagnosis of diabetes even though an A1C test does not.

The reverse can also occur—an A1C test may indicate a diagnosis of diabetes even though a blood glucose test does not.

Because of these variations in test results, health care providers should repeat tests before making a diagnosis. People with differing test results may be in an early stage of the disease, where blood glucose levels have not risen high enough to show on every test.

References

3. See [www.ngsp.org](http://www.ngsp.org) for information on A1C test interference and recommended testing methods.

This information may contain content about medications and, when taken as prescribed, the conditions they treat. When prepared, this content included the most current information available. For updates or for questions about any medications, contact the U.S. Food and Drug Administration toll-free at 1-888-INFO-FDA (1-888-463-6332) or visit [www.fda.gov](http://www.fda.gov). Consult your health care provider for more information.

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