

Glucose Tolerance Notes

Although the glucose tolerance test (GTT) is widely used, it may not be widely appreciated that there are many variables which influence the carbohydrate tolerance of any individual and therefore also influence the interpretation of glucose tolerance test results for that individual. In order to minimize the variability of testing and interpretation of glucose tolerances, WellSpan Laboratory Services makes recommendations which will define the conditions for patient preparation, testing, dosage levels and interpretation of results. These recommendations are consistent with the Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (Diabetes Care 2010;33:S62-S69).

INDICATIONS FOR TESTING

For Diabetes Mellitus:

- If diabetes mellitus is diagnosed with symptoms of hyperglycemia (polyuria, polydipsia, weight loss, polyphagia, or blurred vision) with a casual plasma glucose ≥ 200 mg/dL,
- or if a fasting plasma glucose is ≥ 126 mg/dL on two (2) occasions,
an oral glucose tolerance is NOT necessary.

For Gestational Diabetes:

- If the result of a one hour screening test following a 50 gram oral glucose load is ≥ 140 mg/dL,
a full 100 gram carbohydrate load, 3 hour glucose tolerance test should be performed in the fasting state.

Screening of persons with:

- a high risk of glucose intolerance,
- symptoms suggestive of hyperglycemia or glycosuria,
- metabolic conditions associated with diabetes (elevated cholesterol, triglycerides or uric acid),
- unexplained presence of neuropathy, retinopathy, peripheral vascular disease, or coronary heart disease,
should start with a fasting plasma glucose determination.

CRITERIA FOR TESTING FOR DIABETES IN ASYMPTOMATIC ADULTS

1. Age ≥ 45 without risk factors
2. Any adult with BMI ≥ 25
3. Age < 45 with any two additional risk factors:
 - Sedentary lifestyle
 - First degree relatives with diabetes
 - High risk ethnic population: non-caucasians
 - Delivered baby > 9 pounds
 - Gestational diabetes
 - Hypertension
 - HDL cholesterol < 35 mg/dL
 - Triglyceride > 250 mg/dL
 - Women with polycystic ovarian syndrome
 - A1C $> 5.7\%$ or impaired fasting glucose or impaired post prandial glucose

- Clinical conditions associated with insulin resistance (like severe obesity, acanthosis nigricans)
- History of vascular disease including erectile dysfunction

ORDERING

We recommend that the GTT be ordered in the following way - specific for the carbohydrate metabolic abnormality sought.

- GTT2 (2 hr glucose tolerance) for diabetes mellitus
- GTT3 (3 hr glucose tolerance) for gestational diabetes (Is not recommended for non-pregnant patients or hypoglycemia.)
- 2HPP (2 hr post prandial glucose) for prediabetes or diabetes screen post meal
- PGS (glucose gestational screen) for gestational glucose screen

PATIENT PREPARATION

- Ambulatory, non-hospitalized (if hospitalized, then no recent surgery, trauma or illness).
- No surgery, trauma or illness for two weeks.
- For all tolerance testing an unrestricted carbohydrate diet 3 days prior to testing is recommended.
- For GTT2 and GTT3 the testing recommends fasting for 8 hours following an unrestricted carbohydrate diet for 3 days prior to testing.
- For 2HPP no fasting is required, however a recommended meal plan per the WellSpan Diabetes outpatient guidelines includes 2 pieces of plain, white toast, 1 tablespoon of jelly and 8 ounces of juice to equal 75 grams of carbohydrate. The plasma glucose will be drawn after two hours.

TESTING

- Start the test between 7 a.m. and 9 a.m.
- The glucose load should be 75 grams for adults and 1.75 grams/kg of ideal body weight for children, up to a maximum of 75 grams. For gestational diabetes, the glucose load should be 100 grams. For the gestational glucose screen the glucose load should be 50 grams.
- The entire dose should be ingested in less than 5 minutes.
- The times of collection are specific for the kind of tolerance test requested:
 - GTT2 for diabetes; fasting and 2 hours.
 - GTT3 for gestational diabetes; fasting, 1 hour, 2 hours and 3 hours.
 - PGS for gestational glucose screen; 1 hour. Fasting is not required.
 - 2HPP for prediabetes or diabetes screen, 2 hours.
- A sample should be taken at any time the patient complains of symptoms of hypoglycemia (nervousness, sweating, tachycardia, drowsiness, etc.)
- For the GTT2 and GTT3 a diary should be kept by the patient detailing physical feelings and times of reactions during the test to be discussed later with the referring physician.

The patient should not smoke, drink coffee or exercise during the test other than to walk around. If autonomic nervous system responses develop during the test (pallor, sweating, nausea, fainting, etc.), the test should be discontinued after a blood sample has been drawn and repeated at another time.

INTERPRETATION

- Expert Committee on the Diagnosis and Classification of Diabetes Mellitus: (These values apply to patients of all ages.)

Diabetes Mellitus:	Impaired Glucose Tolerance (IGT):	Impaired Fasting Glucose (IFG):
Fasting: ≥ 126 mg/dL	Fasting: < 126 mg/dL	Fasting: 100-125 mg/dL
2 hr: ≥ 200 mg/dL	2 hr: 140-199 mg/dL	

- For pregnant women the diagnosis of gestational diabetes is made if any two of the results meet or exceed the following recommended values:

Fasting: 95 mg/dL
1 hour: 180 mg/dL
2 hour: 155 mg/dL
3 hour: 140 mg/dL

- Normal glucose values for nonpregnant adults.
Fasting: < 100 mg/dL
GTT2 or 2HPP: < 140 mg/dL

The following terms are no longer used: latent, subclinical and chemical diabetes mellitus, prediabetes, potential diabetes, adult-onset diabetes, maturity-onset, juvenile-onset diabetes, insulin-dependent diabetes and non-insulin diabetes (IDDM and NIDDM). Instead the terms Type 1 and Type 2 diabetes are recommended.

- Normal gestational glucose screen: < 140 mg/dL
- True hypoglycemia is rare. "Hypoglycemic" values of less than 47 mg/dL are seen in 10% of the healthy population at times from 2 to 5 hours after the glucose load. True hypoglycemia must be demonstrated by hypoglycemic plasma glucose values of < 39 mg/dL at the time of occurrence of hypoglycemia symptoms (headache, weakness, tachycardia, hunger, excessive sweating, loss of concentration and anxiety).
- The prevalence of glycosuria in the healthy population following a glucose load has been shown to be about 10%.
- Medications such as diuretics (particularly thiazides), phenytoin, phenylephrine-containing cough syrups, oral contraceptives, sulfonyleureas and other medications are known to alter carbohydrate tolerance.