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| Glucose Tolerance Protocol |
| **Purpose** | This procedure provides instructions for GLUCOSE TOLERANCE PROTOCOL. In the glucose tolerance test, plasma glucose is measured before and after a measured dose of glucose is given orally. OGTT may be useful in excluding diabetes in children presenting with glycosuria or transient hyperglycemia. |
| **Policy Statements** | * This procedure is intended for all laboratory and nursing personnel involved in ordering, stimulating, collecting, receiving, or testing specimens for the determination of glucose in a series for glucose tolerance testing.
* Laboratory Staff will calculate the correct glucose beverage dosage using Children’s Six Rights of Medication Administration policy.
* Point of Care devices are not used to report Glucose Tolerance Results
* Point of Care devices may be used to monitor fasting glucose prior to dosing
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| **Materials** | **Supplies*** Orange 100 gm Oral Glucose Tolerance Drink, 10 fl oz, concentration 10gm/oz
* Lemon-Lime 100 gm Oral Glucose Tolerance Drink, 10 oz. This beverage contains no dye.
* Available through Cardinal Health, manufactured by Thermo Scientific
* Worksheet “CH 4.03.F1 Glucose Tolerance Protocol Worksheet”

**Beverage Storage:** Oral Glucose Test Drink should be stored at room temperature. Chill before administering. Protect from light. Do not freeze. Discard any unused portions.  |
| **Special Safety Precautions** | **Adverse Reactions and Warnings:** Glucose load may cause nausea, vomiting, abdominal bloating, and or headache. Product should be consumed under the direct supervision of a trained medical professional. Healthcare professionals, or the American Diabetes Association should be contacted for further information regarding procedures and test results. Ingredients are listed on individual bottles. |
| **Sample** | **Venous heparinized plasma** preferred. Plasma and serum are acceptable specimens. Refer to the Phlebotomy/Specimen Collection Manual for proper collection procedures. Capillary samples collected during OGTT yield values 20-25% higher than venous samples and are not recommended. Whole blood glucose is ≈ 11% lower than plasma**Plasma:** Draw 2.7 ml of blood in green-top, (lithium heparin) tube or 0.6 ml blood in a MICROTAINER® to yield a minimum of 0.2 mL of lithium-heparinized plasma. Specimens collected in tubes/microtainers containing anticoagulant may be centrifuged immediately.**Serum:** Draw 0.6 mL of blood in either plain, red top tube(s) or plain, red-top MICROTAINER(s) to yield 0.2 mL of serum. Specimens collected in plain red top tubes or microtainers must be allowed to clot prior to centrifugation.**Use care in labeling the samples with the correct collection time.****Specimen rejection:** Unlabeled specimens, non-fasting patient. |
| **Test Code** |

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| Sunquest Test Code | **Test** |
| GLFT | Fasting Glucose Dose |
| GLF | Fasting Glucose |
| GLH | ½ hour Glucose |
| GT1 | 1 hour Glucose |
| GT2 | 2 hour Glucose |
| GT3 | 3 hour Glucose |
| GT4 | 4 hour Glucose |

1. Orders placed in Cerner will generate labels with separate accession numbers for each interval ordered.
2. Order directly in Sunquest by clicking on the Laboratory Orders folder.
	1. Order the test codes that correspond to the written order, forcing a unique accession number for each interval.
	2. For example: if a 2 hour OGTT is requested, order GLFT.
	3. When finished, and an accession number is generated, repeat the process for GLH, GT1, and GT2.
	4. CF Clinic patients will have only the GLFT and the GT2 requested
	5. For GT3 or GT4, order the additional tests in the same manner.
	6. Order by the scheduled collection time.
3. Receive each sample in function CVIS documenting the actual collection time.
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| **Definitions** | FPG: fasting plasma glucoseIFG: impaired fasting glucose.IGT: impaired glucose tolerance |
| **Patient Preparation** | * The patient should be on a high carbohydrate diet (>150 gms/day) for 3 days prior to testing.
* The patient should then fast, where a fast is no caloric intake, from 8-14 hours prior to the test. During this time water is permitted.
* The patient should remain quiet, should not smoke, not ingest caffeine, and not be under stress before and during the test.
* Testing should be done in the morning to reduce diurnal variation in FPG.
* Weigh patient to calculate correct glucose beverage dosage
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| Dosage and Patient Six Rights | The Patient Six Rights is an independent double check that includes the six rights of medication administration: Right patient, drug, dose, route, time (frequency), and documentation |
|  |  | **NOTE:** You may use “CH 4.03.F1 Glucose Tolerance Protocol Worksheet” for assistance with calculating dosage during downtime, and collection times for timed glucose draws.  |
|  |  | Identify the patient and confirm the patient is having a glucose tolerance test, has fasted for the previous 8-14 hours, and has consumed adequate carbohydrates in the past 3 days. |
|  | Place an order in Sunquest for GLFT, a fasting blood glucose, or proceed directly to step 3 |
|  | In Sunquest, function MEM, bypass prompts until WORKSHEET. |
|  | Enter GLUT at worksheet |
|  |  | Bypass through TEST-1: and accept methods |
|  |  | Bypass WORKLOAD DATA FOR: |
|  | Enter patient’s accession number at MANUAL RESULT ENTRY ACC. NO.:  |
|  | At LBS prompt, enter patient’s correct weight: |
| ***If:*** | ***Then:*** |
| You know the patient’s weight in pounds: (LBS) | 1. Enter weight in pounds at LBS
2. Enter 0.0 at KG prompt
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| You know the patient’s weight in Kilograms (KG) | 1. Enter 0 (zero) at LBS prompt
2. Enter weight in Kilograms (KG)
 |
|  | AT the GCONC prompt, locate the concentration of the glucose beverage on the front of the bottle in large orange letters. Enter this value at GCONC: |
| ***If:*** | ***Then:*** |
| The glucose beverage concentration is correct | Sunquest will calculate the number of ounces of the glucose beverage to give the patient. |
| The glucose beverage concentration is NOT correct: | 1. Look at the bottle concentration again to confirm
2. “M” to modify and re-enter the appropriate concentration
 |
| The calculation fails again: | 1. Do not administer the glucose beverage.
2. “R” to reject the accession number
3. Notify a laboratory supervisor before proceeding
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|  |  | At DOS: Sunquest calculates the amount of glucose beverage to give the patient in ounces |
|  | The maximum pediatric dosage is 7.5 ounces of glucose beverage or 75 grams of glucose. |
|  | Obtain a clean beverage container and pour the calculated dose into it. |
|  |  | The attending nurse or laboratory staff administers the glucose beverage following the procedure below. |

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| **Procedure** |  |
|  |  | Action | **Related Document** |
| 1 | Draw a fasting glucose specimen (GLF).  |  |
| **If:** | **Then:** |  |
| The patient is a known CF Clinic patient | 1. Draw a POCT glucose in addition to the GLF
2. Perform a POC glucose using the glucose meter
 | [Nova Statstrip Glucose Meter](http://khan.childrensmn.org/Manuals/Lab/POCT/Test/204252.pdf) |
| The patient is not a CF Clinic patient | Send the GLF to the main lab for analysis |  |
|  | 2 | Evaluate results to determine if test is appropriate for the patient. |  |
| **If:** | **Then:** |
| FPG (GLF) ≤ 126 mg/dL | Give glucose drink |
| FPG (GLF) > 126 mg/dL | OGTT not indicated. Consult the patient’s provider before proceeding. |
| 3 | Give the patient the glucose solution to drink. The drink must be consumed in 5 minutes or less. The timing of the test begins with the first drink of glucose beverage. |  |
| 4 | During the test the patient must remain quiet and consume nothing other than water |  |
| 5 | Draw remaining specimens at precisely the required intervals after the initial drink of glucose beverage. |  |
| 6 | Use care in labeling and preparing multiple specimens to avoid the possibility of mislabeling |  |
| 7 | Send specimens to the main laboratory for analysis. |  |
| 8 | Glucose is analyzed following the procedure *CH 6.39 Glucose* in the Chemistry Manual. |  |
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| **Calculations** | Dosage: body weight in Kg x 1.75 gm glucose/Kg = number of ounces to administer 10 grams / ounceWeight in pounds ÷ 2.2 = wt in Kgweight in Kg x 0.175 = number of ounces to administer |
| **Interpretation/ Results/Critical Values** | **At risk for future diabetes:**IFG = 100 - 125 mg/dLIGT = 140 - 199 mg/dLA1c = 5.7% - 6.4%The diagnosis of diabetes mellitus is made based on any one of the following criteria, confirmed by repeated testing on a second day:* Symptoms of diabetes and a casual plasma glucose ≥ 200 mg/dL
* FPG ≥ 126 mg/dL
* 2-hour plasma glucose ≥ 200 mg/dl during an OGGT
* A1c ≥ 6.5% using an NGSP method
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| **Reference Range** | **Critical Value** | **Reference Range** |
|  | <50 or >300 mg/dL | Fasting < 100 mg/dL |
| 2-hour glucose < 140 mg/dL |
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| **Limitations** | * Plasma or serum should be separated from the cells and analyzed within 1 hour of collection.
* Glucose meter results cannot be reported for the fasting or 2-hour sample.
* Glucose meter results are accepted to determine if glucose beverage can be administered to CF patients, and may be useful at the bedside during the test.
* If the patient vomits during the test, the test is invalid.
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| **Procedure Notes** | * Fasting plasma glucose is preferred as a screening tool for diabetes, while OGTT is a more sensitive diagnostic tool.
* Expected TAT for fasting glucose is < 30 minutes.
* The ADA recommendation for glucose tolerance testing is a fasting collection and a 2-hour collection only, sometimes referred to as 2 + 2 (2 samples; 2 hours).
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| **Result Reporting** | * In **Sunquest**: Refer to the procedure *Result Reporting* CH 7.03
* Critical values must be called according to the Critical Limit Test Value Policy.
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| **References** | 1. Clinical Chemistry, March 2002, Volume 48, Number 3, pg 436-446
2. <http://www.captoday/archive/2002/qa_0802.html> William Winter, MD
3. AmJ Clin Pathol 1999:112:665-674
4. Pre-Analytical, Analytical and Post-Analytical Factors Influencing Specific Tests for Diagnosis and Monitoring of DM, DubravkaJuretic, eJIFCC vol 13 no5
5. Product Insert: Thermo Fisher Scientific, Middletown, VA, 22645, 2010
6. Jacobs & DeMott Laboratory Test Handbook, Lexi-Comp, Inc, Hudson, OH, 5th Edition, 2001
7. ADA 2015 Diabetes Diagnosis, National Diabetes Education Initiative, http://www.ndei.org/ADA-diabetes-management-guidelines-diagnosis-A1C-testing.aspx
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| **Historical Record** | **Version** | **Written/Revised by:** | **Effective Date:** | **Summary of Revisions** |
|  | Linda Lichty | 9/16/03 | Replaces elements of previous versions. |
|  | Linda Lichty | 3/23/04 |  |
|  | L. Lichty | 6/2/07 |  |
|  | L. Lichty | 6/4/08 |  |
|  | Linda Lichty | 5/19/09 | Changed glucose drink product |
|  |  | D. Helfinstine | 04/01/2011 | New format, renumbered from CH 0.065 |
|  | L. Lichty | 08/01/2011 | Fasting POC protocol for CF patients |
|  | L. Lichty | 07/01/2013 | Added Patient Six Rights |
|  | L. Lichty | 01/06/2014 | Revised glucose beverage |
|  | L. Lichty | 12/21/2015 | Updated Interpretation criteria |
|  | Kelsi Brown | 4/23/19 | New format. Procedure reviewed. |
|  | Matt Johnson | 7/26/2022 | Reviewed, added optional worksheet |
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