# Diagnosis and Management of Diabetes in Pregnancy for Ben Taub Patients

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This guideline is updated with the DKA management algorithm at Ben Taub Hospital.

# American Diabetes Association (ADA) Diabetes Classifications

## **Table 1**. Diabetes Definitions

| | | |
|---|---|---|
| **Type 1 DM (T1DM)** | Type 1 DM diagnosed *prior* to the current pregnancy | Presence of insulin antibodies predictive for T1DM, and differentiate between T1 and T2DM: anti-GAD-65 (found in 80% of patients with T1DM at clinical presentation), Insulin autoantibodies (IAA), Islet Cell Antibodies, protein tyrosine phosphate, ZnT8 |
| **Type 2 DM (T2DM)** | T2DM diagnosed *prior* to the current pregnancy | Marked insulin resistance |
| **Suspected Pregestational T2DM** | Patients meet criteria for pre-gestational diabetes using standard ADA screening prior to 24 weeks. See Early Diabetes Screening section for screening criteria and recommendations. | |
| **Gestational DM (GDM)** | Either of following present at 24w0d or later:<br><br>1. Two or more abnormal values on 3-hour 100g OGTT<br>OR<br>2. A 1-hour 50g oral glucose challenge test > 200 mg/dL | A1DM: glycemic control is achieved with nutrition therapy and exercise.<br><br>A2DM: glycemic control is NOT achieved with nutrition therapy and exercise; generally, medication treatment is initiated. |

# Screening for gestational and pregestational DM during pregnancy and postpartum

Due to the lack of consistent evidence to indicate neonatal and maternal benefit of early diagnosis and treatment of GDM, **ACOG does not recommend universal screening for GDM prior to 24 weeks**. However, due to the increasing proportion of pregnant individuals with undiagnosed T2DM in the setting of increasing prevalence of obesity and challenges of access to glucose screening, **ACOG continues to recommend screening for pregestational diabetes in patients with risk factors**.[1]

## Early Diabetes Screening (prior to 24 weeks)

- **For pregnant people with risk factors for pregestational DM (Table 2), screen with a hemoglobin A1C at the first prenatal visit** (Figure 1).
- The 2-step screening process using a 1-hour glucola and 3-hour GTT is NOT recommended for screening for pregestational DM.
- If pregestational DM is diagnosed at <24 0/7 weeks, treatment should be the same as those with a diagnosis established prior to pregnancy (Table 4).
- If pregestational DM is not diagnosed early in pregnancy, screening for GDM should be performed at 24-28 weeks gestation.
- For those with evidence of impaired glucose tolerance without pregestational DM (eg, A1c value 5.7–6.4% or 2-hour glucose value between 140 and 199 mg/dL on the 75-g OGTT), nutrition counseling can be offered where resources are available. Screening for GDM is still recommended at 24–28 weeks of gestation in this population.[1]

***Table 2**. Criteria for Early Screening for Pregestational Diabetes*

| ***Testing should be considered in adults with overweight or obesity (BMI ≥25 kg/m² or ≥23 kg/m² in Asian Americans) who have one or more of the following factors:*** |
|---|
| **• First-degree relative with diabetes** |
| **• Black, Hispanic, Native American, Asian American, and Pacific Islander individuals (i.e., non-White)** |
| **• History of cardiovascular disease** |
| **• Hypertension (≥140/90 mmHg or on therapy for hypertension)** |
| **• Prior history of hyperlipidemia - HDL cholesterol level <35 mg/dL (0.90 mmol/L) and/or a triglyceride level >250 mg/dL (2.82 mmol/L)** |
| **• Polycystic ovary syndrome** |
| **• Physical inactivity** |
| **• Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)** |
| **• Prediabetes (A1C ≥5.7% [39 mmol/mol], impaired glucose tolerance, or impaired fasting glucose)** |
| **• Previous gestational diabetes diagnosis.** |
| **• Age 35 years or greater** |
| **• HIV** |
| **• Or other factors suggestive of an increased risk for pregestational diabetes** |

At this time, there are insufficient data to support the best screening modality for pregestational diabetes in pregnancy, but consideration can be made to use the same diagnostic criteria as for the nonpregnant population, understanding the limitations of these criteria as they have not been validated in pregnancy.[2]

- A1C ≥ 6.5%, or
- Fasting plasma glucose* ≥ 126 mg/dl, or
- Random plasma glucose ≥ 200 in patients with classic hyperglycemia symptoms, or
- 2-hour plasma glucose value ≥ 200 following a 75 g OGTT

**Due to altered relationship between A1C and glycemia with HIV, hemoglobinopathies, and G6PD deficiency, plasma glucose levels are the preferred screening modality for patients with these diagnoses.*[3]

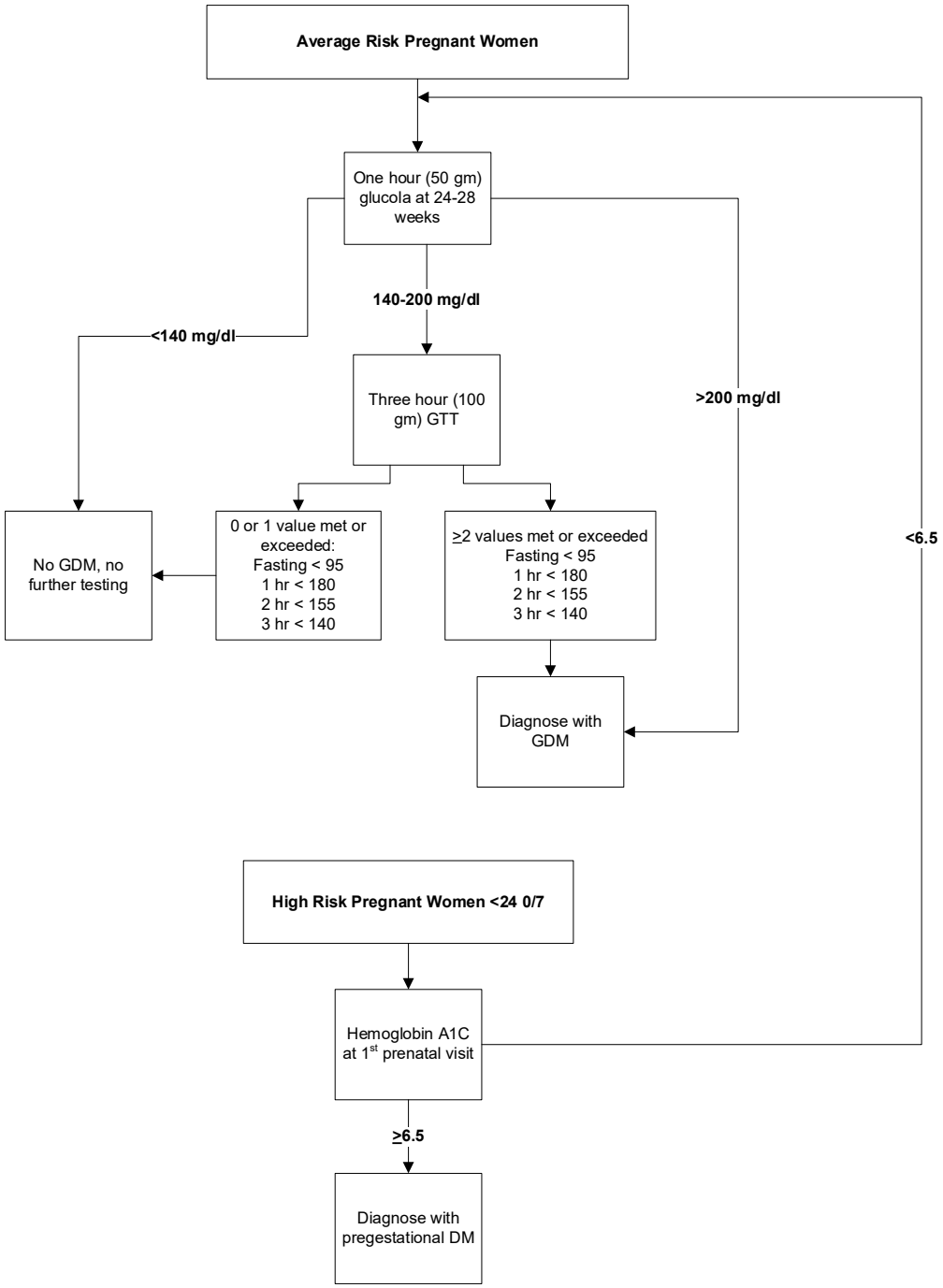
Patients diagnosed with T2DM should be treated following the checklist from Table 4.

## Standard GDM Screening

**Patients who have not been diagnosed with pregestational diabetes should be screened at 24–28 weeks for GDM.**

- For pregnant people with no high-risk factors (Table 2) or for those with high-risk factors that were not diagnosed with pregestational DM prior to 24 weeks, perform 2-step screening with the 1-hour and 3-hour GTT (Figure 1).[1]
- Carpenter and Coustan criteria should be used for diagnosis.
- If GDM is diagnosed, refer to
- Table 5 for pregnancy management.

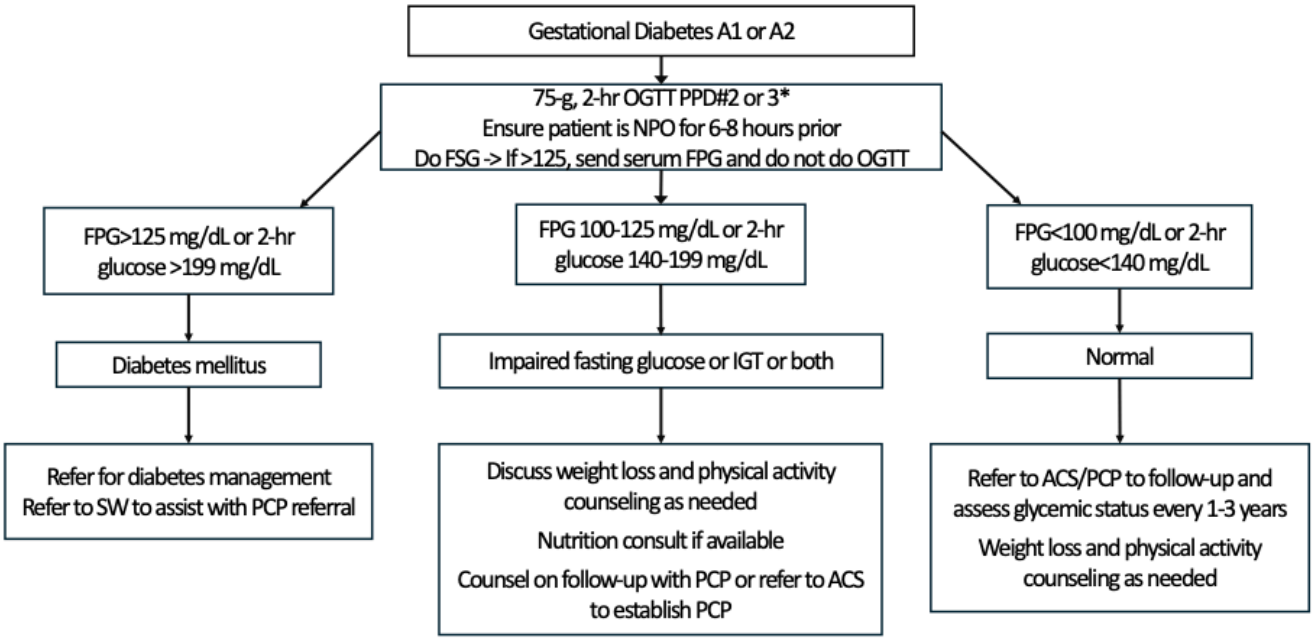
## **Figure 1**. Diagnosis of GDM and Pregestational DM in Pregnancy[1,4-7]



## Postpartum T2DM Screening

- Based on two studies published in 2020 that evaluated women diagnosed with GDM who underwent the 75g OGTT during the delivery hospitalization, **screening with the 75g OGTT for type 2 DM during the delivery hospitalization in the immediate postpartum period is now considered a reasonable alternative in lieu of performing the 75g OGTT at 4-12 weeks postpartum**.[1]
- **For patients with GDM during their pregnancy, screen for T2DM on post-partum day #2 using the 75g GTT (Figure 2).**[*1,6,8]
- If T2DM is diagnosed postpartum, counsel patient on diagnosis and arrange for primary care appointment.
- If the 75g GTT is unable to be performed during the delivery hospitalization, plan to perform 4-12 weeks postpartum.

***Figure 2**. Postpartum T2DM Screening*




Adapted and modified from ACOG Practice Bulletin #190 (6). Management of postpartum screening results. FPG = fasting plasma glucose; OGTT = oral glucose tolerance test; ICT = impaired glucose tolerance; ACS = ambulatory care services (Harris Health). Avoid in patient unable to tolerate glucose load (eg, gastric bypass).

[*]Two studies published in 2020 evaluated women diagnosed with GDM who underwent the 75g OGTT during the delivery hospitalization followed by repeat testing at 4–12 weeks postpartum. Both studies demonstrated high negative predictive values (greater than or equal to 97.5%) for excluding type 2 DM via the postpartum day two OGTT compared to the 4–12-week postpartum OGTT. The study that further evaluated women for type 2 DM one-year postpartum showed similar diagnostic value of the postpartum day two OGTT as the 4–12-week postpartum OGTT in predicting impaired glucose metabolism and diabetes at one year after delivery. This study also noted nearly 100% adherence to the postpartum day two OGTT compared to 68% for the 4–12-week OGTT. Given that fewer than half of women with GDM receive postpartum OGTT screening 4-12 weeks postpartum and based on recent studies, screening with the 75g OGTT for type 2 DM during the delivery hospitalization in the immediate postpartum period is now considered a reasonable alternative in lieu of performing the 75g OGTT at 4-12 weeks postpartum.

# Diabetes Management in Pregnancy[4,5]

## Blood glucose targets during pregnancy:

| Timing | Blood glucose |
|---|---|
| **Fasting** | <95 mg/dL and >60 mg/dL |
| **1 hour postprandial** | <140 mg/dL and >100 mg/dL |
| **2 hours postprandial** | <120 mg/dL and >100 mg/dL |

## Pregnancy Management

Refer to Table 4 and Table 5 for antenatal care checklists
Refer to Table 6 for the pre-conception consultation checklist
Refer to Table S2 for Harris Health diabetic supplies funding information

## Medication Management and Special Considerations

*Type 1 DM*[4,5,9-12]

- **Insulin is the only recommended management option for patients with T1DM**
- **Patients with T1DM need insulin therapy AT ALL times (either basal and/or prandial) to prevent precipitation of diabetic ketoacidosis (DKA)**
- In times of decreased oral intake, illness, anticipated NPO status for a procedure, etc., intermediate-acting or long-acting basal insulin must still be administered, along with dextrose containing IV fluids, if needed to maintain euglycemia. The basal insulin dosing can be temporarily decreased for these situations, and the prandial doses may be held if patient is not eating.
- A **carbohydrate-counting method** can be used to determine prandial insulin. This may be considered in consultation with Endocrinology.
  - The 500 Rule: Insulin-carb ratio (ICR) = 500/TDD = number of carbs covered by 1 unit of insulin
  - The 1500 Rule (short acting insulin): Insulin sensitivity factor (ISF) = 1500/TDD = amount of blood glucose reduced by 1 unit of *short* acting insulin
  - The 1800 Rule (rapid acting insulin): Insulin sensitivity factor (ISF) = 1800/TDD = amount of blood glucose reduced by 1 unit of *rapid* acting insulin
- **Continuous subcutaneous insulin infusions** (CSII, or "insulin pumps"):
  - CSII are becoming common for patients with T1 and T2DM outside of pregnancy, and are often used in conjunction with continuous glucose monitors (CGMs).
  - If a patient is well-controlled with a CSII outside of pregnancy and comes into pregnancy on a CSII, it is reasonable to continue CSII with the assistance of Endocrinology and an MFM provider comfortable with management of CSII.
  - **The BCM OB/Gyn Perinatal Guidelines Committee does not recommend starting a CSII for the first time in pregnancy.**

*T2DM*

**Insulin is the preferred treatment.** In patients who decline insulin therapy or for whom the obstetricians/obstetric care providers believe will be unable to safely administer insulin, **metformin is a reasonable alternative choice** in the context of discussion with the patient the limitations of the safety data and a high rate of treatment failure, which requires insulin supplementation.

- Sample smart phrase for documentation of counseling: *I counseled @NAME@ on the recommendation for medical management due to her persistent hyperglycemia. I counseled her on*

*the risks and benefits of insulin vs metformin. I explained that insulin, which does not cross the placenta, is considered the preferred treatment for diabetes in pregnancy. I explained that metformin crosses the placenta and is lacking long-term data in exposed offspring. While metformin is considered a reasonable alternative choice to insulin, I further counseled that it has a max dose and may require ultimate conversion to insulin if euglycemia is not achieved or sustained. After counseling, @NAME@ elected to start insulin/metformin.*

### *GDM*

Pharmacologic treatment is recommended if glucose targets cannot be achieved with nutrition therapy/dietary modifications and exercise alone.

- **The BCM OB/Gyn Perinatal Guidelines committee recommends pharmacologic therapy when 50% or more of fasting and/or post-prandial values are above goal-range.**
- **Insulin is first-line therapy** and it should be used for all patients initiating medical therapy for GDM in pregnancy, unless a significant barrier prevents insulin from being safely initiated (e.g. patient cannot store insulin safely, patient unable to inject themselves, etc.).
- In patients who decline insulin therapy or for whom the obstetricians/obstetric care providers believe will be unable to safely administer insulin, **metformin is a reasonable alternative choice**. However, metformin does cross the placenta and has been shown to have increased levels in fetuses, and the long-term safety/metabolic influence on exposed offspring of metformin remains unclear.
- **Glyburide should not be recommended as a first-choice** pharmacologic treatment.
- CNM patients with GDM requiring medication and all patients with pre-gestational DM will be transferred to the Ben Taub High Risk Ob clinic (HROB) for management. Per patient preference, they may continue with Centering Pregnancy for educational purposes at their CNM clinic, but all clinical management will be provided by HROB.

***Table 3**. Pregnancy Considerations for Insulin and Metformin Use*[4,5]

| Medication | Class/Mechanism | Dosing | Notes |
|---|---|---|---|
| | First Line Agent | | |
| **Insulin** | Insulin<br><br>Anabolic hormone<br><br>Stimulates: glucose uptake into muscle, fat, & liver<br><br>Inhibits: glucagon release | Recommended starting doses<br><br>0.7-0.8 U/kg/day actual body weight in the 1st trimester<br><br>0.8-1.0 U/kg/day in the 2nd trimester<br><br>0.9-1.2 U/kg/ day in the 3rd trimester | • Only FDA-approved agent for gestational diabetes mellitus<br>• ACOG recommends as first line therapy of diabetes in pregnancy requiring medical therapy<br>• Most evidence regarding efficacy and safety<br>• Easy, rapid titration<br>• Does not cross the placenta<br>• **REQUIRED for T1DM** |
| | Second Line Agent | | |
| **Metformin** | Biguanide<br><br>Inhibits: hepatic gluconeogenesis &, glucose absorption<br><br>Stimulates: glucose uptake in peripheral tissue | Starting dose: *500 mg q HS for 1 week*<br><br>Titrate up to 500 mg BID and then in increments of 500 mg weekly to a maximum dose of 2,500-3,000 mg daily (to minimize GI symptoms) | • 15 – 30% will require insulin eventually<br>• **Crosses placenta**, and is renally excreted (risk for fetal bioaccumulation)<br>• **DO NOT USE in T1DM** |

## Initiation of Insulin Therapy[4,5]

- **The total daily dose (TDD) of insulin should be calculated based on actual body weight and trimester (Table 3).**
- The TDD is divided with a regimen of multiple injections using long-acting (Lantus) or intermediate-acting (NPH) insulin in combination with rapid-acting (Lispro) or short-acting (Regular) insulin.
  - Common insulin combinations:
    - NPH and Regular
    - Lantus and Lispro
  - **Consider decreasing calculated TDD by ~ 20% in insulin naive patients**, especially when initiating insulin as an outpatient
  - Once the TDD is calculated, use the Figure 3 and Figure 4 to break down how the doses should be administered.
  - **A single agent intermediate- or long-acting basal insulin regimen may be considered if only fasting hyperglycemia is present.**
- Insulin formularies for PFW and Ben Taub are found in Table S1
- Lispro/Lantus Regimen (Figure 3) – **PREFERRED**
  - **Four separate injections:**

Breakfast Lispro targets postprandial glucose

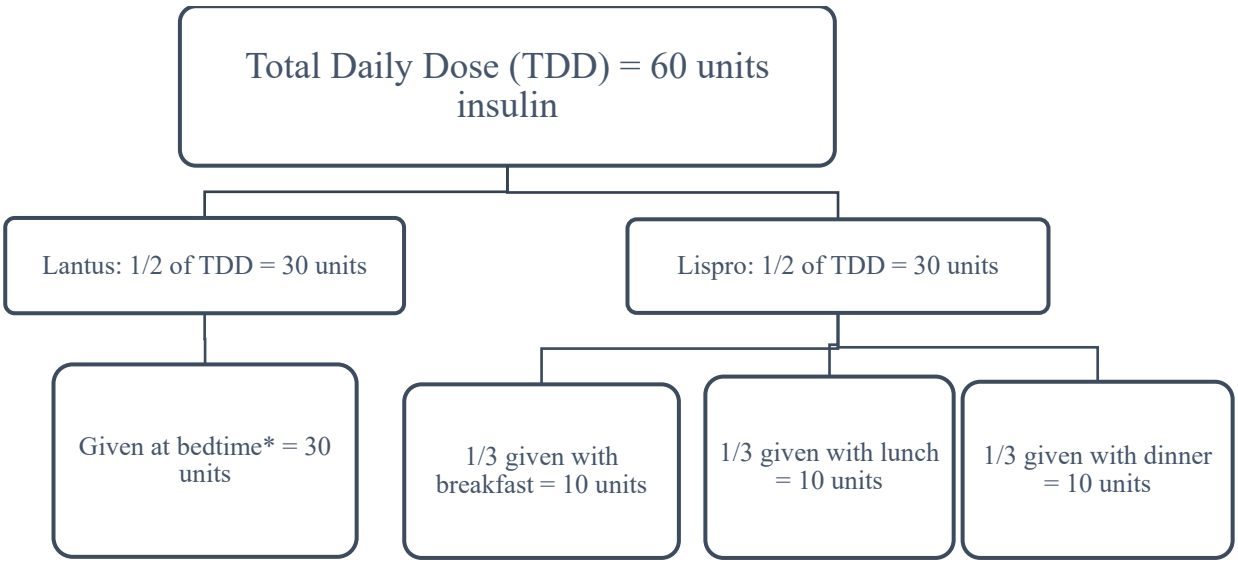
| | |
|---|---|
| Lunch | Lispro targets postprandial glucose |
| Dinner | Lispro targets postprandial glucose |
| Bedtime | Lantus targets fasting glucose |

- NPH/Regular Regimen (Figure 4)
  - **Three separate injections:**

| | |
|---|---|
| Breakfast | Regular targets postprandial *breakfast* glucose; NPH targets postprandial *lunch* glucose |
| Dinner | Regular targets postprandial dinner |
| Bedtime | Targets fasting glucose |

***Figure 3.*** *Glargine (Lantus) and Humalog (Lispro) insulin example regimen (**PREFERRED**)*

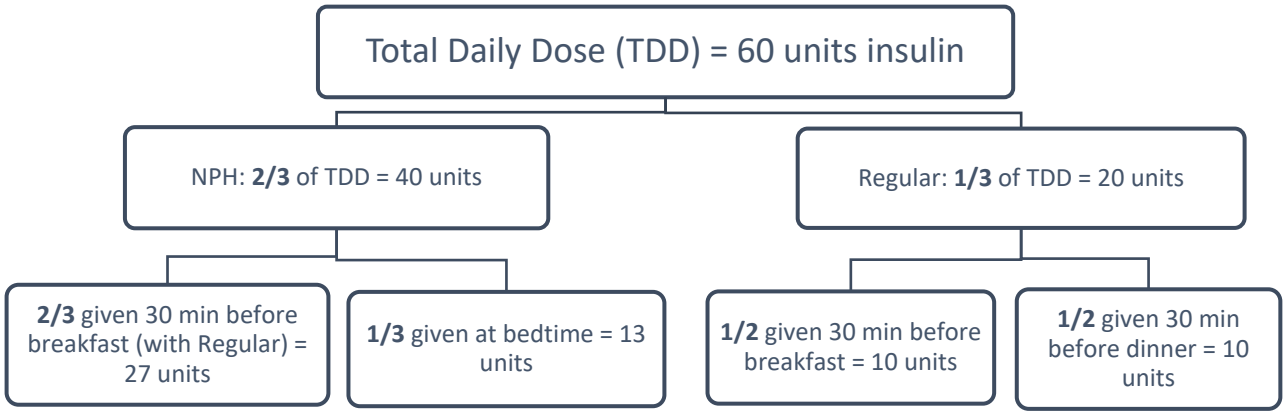
Example: 16 weeks, actual body weight of 75 kg at 0.8 units/kg/day X 75 kg = TDD of 60 units per day




*Consider split dosing AM/PM if Lantus dose is ≥ 60 units.

***Figure 4****. NPH and Regular insulin example regimen*

Example: 16 weeks, actual body weight of 75 kg at 0.8 units/kg/day X 75 kg = TDD of 60 units per day



## Adjustment of Insulin Therapy

- Once initiated, insulin should be increased or decreased by ~20% at a time when ~50% or more of BG values are higher or lower than target values.
- Insulin adjustments should target the insulin that will impact the high or low BG values. For example:
  - If only post-prandial breakfast values are elevated, only increase the morning Regular or Lispro insulin.
  - If only fasting values are elevated, only increase the bedtime NPH or Lantus insulin
  - If all BG values are elevated, all doses should be increased.
- **Consider split dose AM/PM for long-acting doses > 60 units as there is impaired absorption with large injections.**
- Insulin conversion is listed in Table S3.

## Antepartum Checklists

***Table 4.*** *Checklist for antepartum care of Type 1 or 2 DM*

**Initial prenatal visit**

☐ Record age at onset of DM

☐ History of DM complications:

[ ] Ketoacidosis [ ] Retinopathy [ ] Nephropathy
[ ] Hypoglycemia [ ] Hypertension [ ] Coronary artery disease
[ ] Gastroparesis [ ] Neuropathy [ ] Arterial occlusive disease

☐ Physical exam

☐ Refer for retinal examination (if not performed in past year)

☐ Refer to Nutrition and Certified Diabetic Educator (CDE)

☐ Review medications

- T1DM: should be on insulin
- T2DM:
  - If not taking medications, initiate insulin if elevated BG values
  - If taking insulin, adjust as needed
  - If taking metformin, counsel on risks and benefits of continuing metformin vs. switching to insulin
  - If taking a medication other than insulin or metformin, discontinue agent and initiate insulin

☐ Consider Endocrine consultation in patients with type 1 DM or persistent hyperglycemia despite medication adjustments.

☐ Patient education/counseling

[ ] Relationship between glycemic control and adverse pregnancy outcomes (miscarriage, birth defects, fetal growth restriction, macrosomia, stillbirth, preterm birth)
[ ] Maternal adverse effects (hypertension/preeclampsia, worsening retinopathy or nephropathy)
[ ] Impact of pregnancy hormones on glycemic control and likelihood of increasing medication needs throughout pregnancy despite nutrition and exercise adherence
[ ] Home blood glucose (BG) monitoring and BG goals
  - QID BG checks – fasting (upon awakening) and 2 hours after the start of every meal
  - BG Goals: fasting 60-95 mg/dL, 2-hr postprandial (PP) 100-120, 1-hr PP <140

☐ Family education on recognition and management of hypoglycemia

☐ Fetal ultrasound for dating and early anatomy

☐ Baseline labs and assessment of end-organ damage (include date of test):

| Lab | Value |
|---|---|
| Hemoglobin A1C | |
| Comprehensive metabolic panel | |
| TSH (for T1DM) | |
| Urinary protein/creatinine ratio | |
| Electrocardiogram (ECG) | |
| Maternal echo if other co-morbidities and/or abnormal ECG findings | |

**Second Trimester**

- ☐ Aspirin 81 mg daily (start between 12 and 28 weeks of gestation, optimally before 16 weeks)
- ☐ Comprehensive fetal anatomy ultrasound at 20 weeks
- ☐ Pneumococcus vaccine (PCV20)
- ☐ Fetal echocardiogram

**At every prenatal visit**

- ☐ Review:
  - BG log
  - Nutrition and exercise regimen/adherence
  - Medication adherence as prescribed (review medications taken and time of day taken)
  - Adequacy of supplies (lancets, test strips, medication refills)
  - Weight gain/loss
  - Barriers to any of the above
- ☐ Consider food diary (record all foods and time eaten) and use it to counsel on potential dietary modifications
- ☐ Obtain BG in clinic and correlate with glucometer to ensure accuracy.
  *Consider reviewing glucometer values if discrepancy noted.*
- ☐ Review/provide hypoglycemia education including signs/symptoms and management strategies
- ☐ Assess glycemic control:
  - Increase/decrease insulin or metformin as needed to achieve goal BG values
  - In patients with T1DM, avoid large (~20%) increases in insulin due to high sensitivity/responsiveness to insulin adjustments and risk for hypoglycemia
  - If euglycemia cannot be achieved with max-dose metformin, discontinue metformin and initiate weight-based insulin (see Figure 3 and Figure 4)
  - Follow up 3-7 days after medication changes (can be done via telemedicine) to evaluate response
  - Consider inpatient admission for marked hyperglycemia and/or concern for DKA

**Third Trimester**

- ☐ Twice-weekly antepartum fetal surveillance starting at 32 weeks
- ☐ Ultrasound assessment of fetal growth every 4 weeks, beginning at 28 weeks

**Delivery Planning**

- ☐ Offer cesarean delivery if estimated fetal weight (by recent ultrasound and/or Leopold maneuvers) expected to be ≥4500 g at time of delivery
- ☐ Delivery timing:
  - Type 1or 2 DM, well-controlled: 39 0/7 to 39 6/7 weeks
  - Type 1or 2 DM with poor glycemic control, vascular complications, or prior stillbirth: 36 0/7 to 38 6/7 weeks

**Intrapartum/Day of Delivery**

- ☐ Insulin Management:
  - Usual dose of short-acting insulin with dinner the night before scheduled induction of labor or cesarean
  - Usual dose of intermediate-acting or long-acting insulin at bedtime the night before scheduled induction of labor or cesarean. Alternately, long- or intermediate-acting insulin dosing may be cut in half, to reduce the risk of hypoglycemia from being NPO prior to surgery
  - Morning dose of insulin is withheld or reduced based upon the timing of admission for delivery
- ☐ Check BG q 4 hours in latent labor and q 1-2 hours in active labor
- ☐ T2DM: initiate insulin drip for BG >110 mg/dL (goal range of 70-110 mg/dL) to minimize risk of neonatal hypoglycemia (See Intrapartum Management)
- ☐ T1DM: continuous insulin (insulin drip) infusion used in labor
  - Home insulin pumps should be discontinued during labor
  - **A subcutaneous long-acting injectable insulin dose must be given PRIOR TO DISCONTINUING the continuous insulin infusion used in labor**

**Postpartum**

- ☐ T2DM:
  - Check BG q 6 hours while NPO and use sliding scale insulin to cover hyperglycemia
  - Restart insulin at ½ pregnancy regimen or pre-pregnancy regimen once eating regular diet
- ☐ T1DM:

- Check BG q 6 hours while NPO and use sliding scale insulin to cover hyperglycemia
- Continue long/acting basal insulin even while NPO
- Ensure long-acting insulin is administered PRIOR TO DISCONTINUING the continuous insulin infusion used in labor

☐ Ensure transition of care to endocrinology or primary care provider
☐ 4-6 week postpartum clinic visit
☐ BG goals in a non-pregnant setting are 80-130 mg/dL pre-prandial and <180 mg/dL post-prandial[9]

***Table 5.*** *Checklist for antepartum care of gestational DM (A1 or A2)*

**At time of diagnosis of GDM**

- ☐ Counsel on nutrition and exercise and refer to Nutrition Counselor.
- ☐ Counsel on blood glucose (BG) monitoring at home and BG goals and refer to Diabetic Educator:
  - QID BG checks – fasting (upon awakening) and 2 hours after every meal
  - BG Goals: fasting 60-95 mg/dL, 2-hr postprandial (PP) 100-120mg/dL, 1-hr PP <140 mg/dL
- ☐ Schedule clinic follow-up within 7 days (can be done via telemedicine) to ensure patient able to monitor BG at home, identify and address any barriers if present, and review BG log

**At every prenatal visit**

- ☐ Review:
  - BG log
  - Nutrition and exercise regimen/adherence
  - Medication adherence as prescribed (review medications taken and time of day taken)
  - Adequacy of supplies (lancets, test strips, medication refills)
  - Weight gain/loss
  - Barriers to any of the above
- ☐ Consider food diary (record all foods and time eaten) and use it to counsel on potential dietary modifications
- ☐ Obtain BG in clinic and correlate with glucometer to ensure accuracy. Consider reviewing glucometer values if discrepancy noted.
- ☐ Review/provide hypoglycemia education including signs/symptoms and management strategies
- ☐ **Initiate medication when >50% of BG values (fasting and/or post-prandial) are higher than goal range** after a sufficient attempt (~2 weeks) of nutrition therapy/dietary modifications and exercise
  - Insulin is the preferred treatment, metformin is a reasonable alternative (see Table 3)
  - Assess glycemic control 3-7 days after medication initiation (can be done via telemedicine)
- ☐ Assess response to insulin or metformin:
  - Increase/decrease insulin or metformin as needed to achieve goal BG values
  - If euglycemia cannot be achieved with max-dose metformin, discontinue metformin and initiate weight-based insulin (see Figure 3 and Figure 4)
- ☐ Follow up 3-7 days after medication changes (can be done via telemedicine) to evaluate response

**Third Trimester**

- ☐ Antepartum fetal surveillance starting at 32 weeks
  - Once weekly for well-controlled A2DM
  - Twice weekly for poorly-controlled A2DM (eg, frequent increases in insulin or metformin, consistently >50% BG values above target)
  - None for A1DM
- ☐ A2DM: ultrasound assessment of fetal growth at 32 and 36 weeks
- ☐ A1DM: ultrasound assessment of fetal growth around 36-37 weeks

**Delivery Planning**

- ☐ Offer cesarean delivery if estimated fetal weight (by recent ultrasound and/or Leopold maneuvers) expected to be ≥4500 g at time of delivery
- ☐ Delivery timing:
  - A2DM, well-controlled: 39 0/7 to 39 6/7 weeks
  - A2DM with poor glycemic control: late preterm/early term (individualized)
  - A1DM: 39 0/7 to 40 6/7 weeks

**Intrapartum/Day of Delivery**

- ☐ Medication Management:
  - Usual dose of short-acting insulin with dinner the night before scheduled induction of labor or cesarean
  - Usual dose of intermediate-acting or long-acting insulin or metformin at bedtime the night before scheduled induction of labor or cesarean. Alternately, long- or intermediate-acting insulin dosing may be cut in half, to reduce the risk of hypoglycemia from being NPO prior to surgery
  - Morning dose of insulin or metformin is withheld
- ☐ Check BG q 4 hours in latent labor and q 1-2 hours in active labor

| |
|---|
| ☐ Initiate insulin drip for BG >110 mg/dL(goal range of 70-110 mg/dL) to minimize risk of neonatal hypoglycemia (see Intrapartum Glucose Protocol) |
| **Postpartum** |
| ☐ Stop insulin or metformin<br>☐ **Administer 75 gm OGTT on postpartum day #2**<br>☐ 4-6 week postpartum clinic visit<br>• Administer 75 gm OGTT if not done during delivery admission<br>☐ Ensure transition of care to endocrinology or primary care provider if positive 75 gm OGTT |

***Table 6.*** *Checklist for pre-conception consult of Type 1 or 2 DM*

| **Preconception visit** |
|---|
| ☐ Record age at onset of DM<br>☐ History of DM complications:<br>[ ] Ketoacidosis [ ] Retinopathy [ ] Nephropathy<br>[ ] Hypoglycemia [ ] Hypertension [ ] Coronary artery disease<br>[ ] Gastroparesis [ ] Neuropathy [ ] Arterial occlusive disease<br>☐ Physical exam<br>○ Cardiopulmonary auscultation<br>○ Lower extremity Exam<br>Perfusion (color, pulses): _____<br>Sensory exam (touch, pain): _____<br>Proper fit of footwear: _____<br>☐ Referral for retinal examination<br>☐ Pneumococcus vaccine (PCV20)<br>☐ Start a prenatal vitamin<br>☐ Review of medications and safety of use peri-conception/1st trimester<br>☐ Ensure adequate contraception if not planning pregnancy immediately<br>☐ Plan to optimize Hemoglobin A1C (<6.0%)<br>☐ Patient education/counseling:<br>[ ] Relationship between pre-conception glycemic control and adverse pregnancy outcomes (miscarriage, birth defects)<br>[ ] Pregnancy-related risks of maternal/fetal/neonatal adverse effects: fetal anomalies, preterm delivery, preeclampsia, fetal macrosomia, mode of delivery, neonatal complications, hyperglycemia, worsening diabetic retinopathy and nephropathy<br>[ ] Continued use of insulin or metformin once pregnancy confirmed |

# Intrapartum Management

- During labor, maternal hyperglycemia can be controlled with an IV infusion of regular insulin, titrated to maintain hourly readings of blood glucose levels less than 110 mg/dL.
- Avoiding intrapartum maternal hyperglycemia prevents fetal hyperglycemia and reduces the likelihood of subsequent neonatal hypoglycemia.
- For patients with T1DM, a subcutaneous insulin dose MUST be given ~15-30 minutes before IV insulin is discontinued. A continuous insulin infusion pump with continuous short acting insulin meets these criteria. For patients NOT on a continuous insulin infusion pump, long/intermediate acting insulin will be necessary as part of a comprehensive insulin regimen.
- This protocol[13,14] is an example for the management of IV insulin continuous infusions for **intrapartum patients and is based on their total daily dose of insulin on day of delivery.**
    - **For patients with A2DM on metformin, use the medium dose algorithm (applicable to pregnant individual who weigh 61-120 kg)**

## Low Dose Insulin Drip

### Low Dose Algorithm: Total Daily Dose of Insulin ≤ 60 units/24 hours

| Hourly | Continuous Infusion | Initial Dose of Insulin | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | 0 |
| 70-110 | 100 | 0 | 0 |
| 111-130 | 100 | 0 | 0.5 |
| 131-160 | 100 | 1 | 0.5 |
| 161-190 | 0 | 2 | 0.5 |
| 191-220 | 0 | 3 | 0.5 |
| >220 | 0 | 4 | 0.5 |

| Hourly | Continuous Infusion | BG UNCHANGED or INCREASING | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | **Stop** |
| 70-110 | 100 | 0 | No Change |
| 111-130 | 100 | 0 | ↑ 0.5 |
| 131-160 | 100 | 1 | ↑ 0.5 |
| 161-190 | 0 | 2 | ↑ 0.7 |
| 191-220 | 0 | 3 | ↑ 0.7 |
| >220 | 0 | 4 | ↑ 0.8 |

| Hourly | Continuous Infusion | BG DECREASING | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | **Stop** |
| 70-110 | 100 | 0 | ↓ 0.3 |
| 111-130 | 100 | 0 | No Change |
| 131-160 | 100 | 0 | ↑ 0.5 |
| 161-190 | 0 | 1 | ↑ 0.5 |
| 191-220 | 0 | 2 | ↑ 0.8 |
| >220 | 0 | 3 | ↑ 0.8 |

*If blood glucose is <70, **STOP** insulin infusion, notify physician **and** give D50W 50ml (25g) IV push. If infusion is turned off for more than 1 hour notify physician.
** Do NOT bolus from IV pump

**BG: Blood Glucose; D5: Dextrose 5% in water**
**Max Total IV fluids: 150 ml/hour. If max total IV fluids are ≥ 150 ml/hour, notify physician.**
**Max Insulin rate is 10 units/hour. Further increases need to be ordered by physician.**

## Medium Dose Insulin Drip

### Medium Dose Algorithm: Total Daily Dose of Insulin 61- 120 units/24 hours

| Hourly | Continuous Infusion | Initial Dose of Insulin | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | 0 |
| 70-110 | 100 | 0 | 0 |
| 111-130 | 100 | 0 | 1 |
| 131-160 | 100 | 2 | 1 |
| 161-190 | 0 | 3 | 1 |
| 191-220 | 0 | 4 | 1 |
| >220 | 0 | 5 | 1 |

| Hourly | Continuous Infusion | BG UNCHANGED or INCREASING | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | **Stop** |
| 70-110 | 100 | 0 | No Change |
| 111-130 | 100 | 0 | ↑ 0.6 |
| 131-160 | 100 | 2 | ↑ 0.6 |
| 161-190 | 0 | 3 | ↑ 0.8 |
| 191-220 | 0 | 4 | ↑ 0.8 |
| >220 | 0 | 5 | ↑ 1 |

| Hourly | Continuous Infusion | BG DECREASING | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | **Stop** |
| 70-110 | 100 | 0 | ↓ 0.4 |
| 111-130 | 100 | 0 | No Change |
| 131-160 | 100 | 0 | ↑ 0.6 |
| 161-190 | 0 | 2 | ↑ 0.6 |
| 191-220 | 0 | 3 | ↑ 0.8 |
| >220 | 0 | 4 | ↑ 0.8 |

*If blood glucose is <70, **STOP** insulin infusion, notify physician **and** give D50W 50ml (25g) IV push. If infusion is turned off for more than 1 hour notify physician.
** Do NOT bolus from IV pump

**BG: Blood Glucose; D5: Dextrose 5% in water**
**Max Total IV fluids: 150 ml/hour. If max total IV fluids are ≥ 150 ml/hour, notify physician.**
**Max Insulin rate is 10 units/hour. Further increases need to be ordered by physician.**

# High Dose Insulin Drip

## High Dose Algorithm: Total Daily Dose of Insulin 121 -180 units/24 hours

| Hourly | Continuous Infusion | Initial Dose of Insulin | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | 0 |
| 70-110 | 100 | 0 | 0 |
| 111-130 | 100 | 0 | 1.5 |
| 131-160 | 100 | 3 | 1.5 |
| 161-190 | 0 | 4 | 1.5 |
| 191-220 | 0 | 5 | 1.5 |
| >220 | 0 | 6 | 1.5 |

| Hourly | Continuous Infusion | BG UNCHANGED or INCREASING | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | **Stop** |
| 70-110 | 100 | 0 | No Change |
| 111-130 | 100 | 0 | ↑ 0.8 |
| 131-160 | 100 | 3 | ↑ 0.8 |
| 161-190 | 0 | 4 | ↑ 1 |
| 191-220 | 0 | 5 | ↑ 1 |
| >220 | 0 | 6 | ↑ 1.2 |

| HOURLY | Continuous Infusion | BG DECREASING | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | **Stop** |
| 70-110 | 100 | 0 | ↓ 0.5 |
| 111-130 | 100 | 0 | No Change |
| 131-160 | 100 | 0 | ↑ 0.8 |
| 161-190 | 0 | 3 | ↑ 0.8 |
| 191-220 | 0 | 4 | ↑ 1 |
| >220 | 0 | 5 | ↑ 1 |

*If blood glucose is <70, **STOP** insulin infusion, notify physician **and** give D50W 50ml (25g) IV push. If infusion is turned off for more than 1 hour notify physician.
** Do NOT bolus from IV pump

**BG: Blood Glucose; D5: Dextrose 5% in water**
**Max Total IV fluids: 150 ml/hour. If max total IV fluids are ≥ 150 ml/hour, notify physician.**
**Max Insulin rate is 10 units/hour. Further increases need to be ordered by physician.**

# Very High Dose Insulin Drip

## Very High Dose Algorithm: Total Daily Dose of Insulin >180 units/24 hours

| Hourly | Continuous Infusion | Initial Dose of Insulin | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | 0 |
| 70-110 | 100 | 0 | 0 |
| 111-130 | 100 | 0 | 2 |
| 131-160 | 100 | 4 | 2 |
| 161-190 | 0 | 5 | 2 |
| 191-220 | 0 | 6 | 2 |
| >220 | 0 | 7 | 2 |

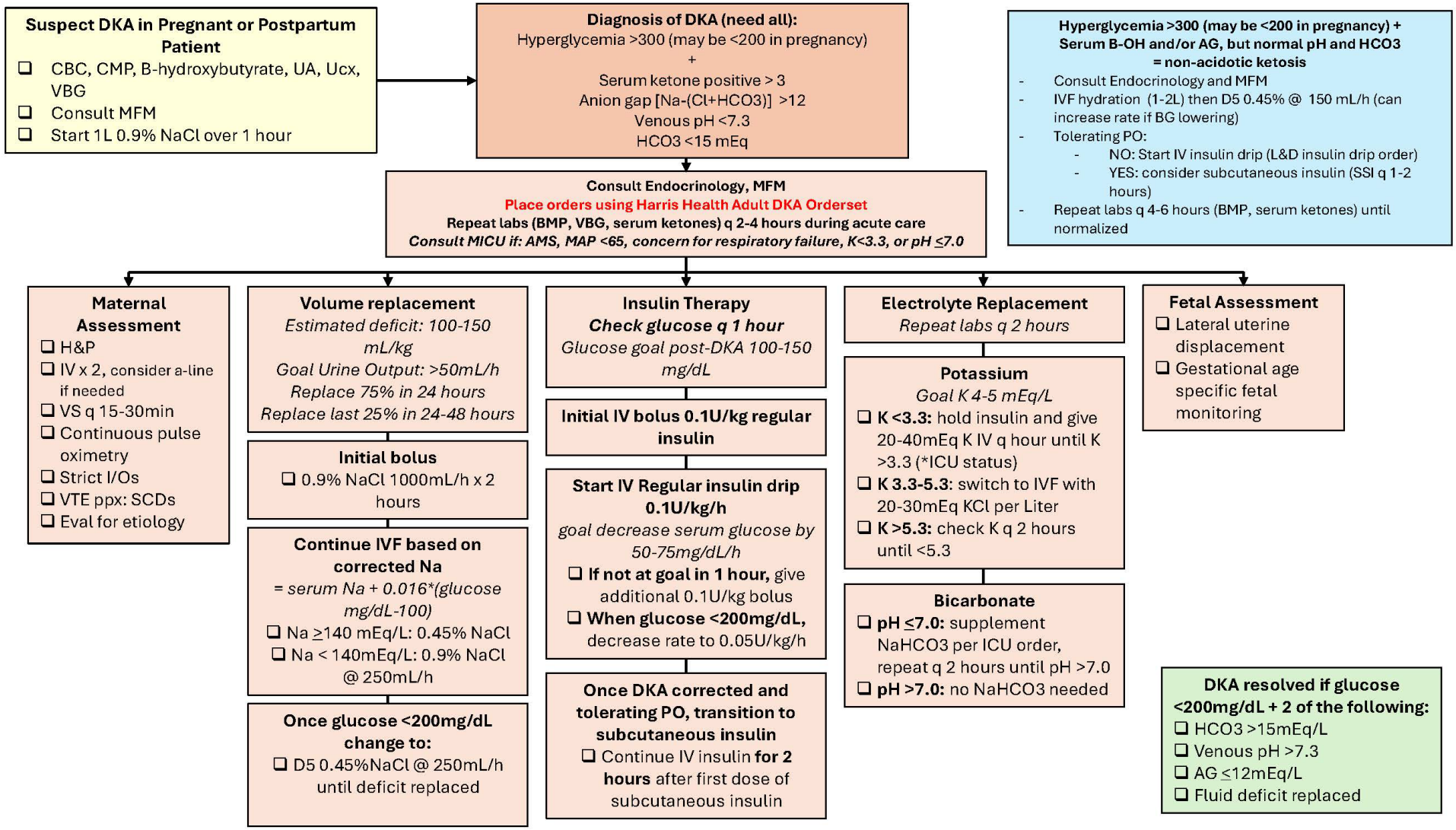
| Hourly | Continuous Infusion | BG UNCHANGED or INCREASING | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | **Stop** |
| 70-110 | 100 | 0 | No Change |
| 111-130 | 100 | 0 | ↑ 1 |
| 131-160 | 100 | 4 | ↑ 1 |
| 161-190 | 0 | 5 | ↑ 1.2 |
| 191-220 | 0 | 6 | ↑ 1.2 |
| >220 | 0 | 7 | ↑ 1.6 |

| Hourly | Continuous Infusion | BG DECREASING | |
|---|---|---|---|
| Glucose Level (mg/dL) | D5W (ml/hr) | Bolus IV Push (units)** | Basal (units/hr) |
| <70* | 100 | 0 | **Stop** |
| 70-110 | 100 | 0 | ↓ 0.6 |
| 111-130 | 100 | 0 | No Change |
| 131-160 | 100 | 0 | ↑ 1 |
| 161-190 | 0 | 4 | ↑ 1 |
| 191-220 | 0 | 5 | ↑ 1.2 |
| >220 | 0 | 6 | ↑ 1.2 |

*If blood glucose is <70, **STOP** insulin infusion, notify physician **and** give D50W 50ml (25g) IV push. If infusion is turned off for more than 1 hour notify physician.
** Do NOT bolus from IV pump

**BG: Blood Glucose; D5: Dextrose 5% in water**
**Max Total IV fluids: 150 ml/hour. If max total IV fluids are ≥ 150 ml/hour, notify physician.**
**Max Insulin rate is 10 units/hour. Further increases need to be ordered by physician.**

# **Figure 5.** Ben Taub DKA in Pregnancy Algorithm



## **Table 7**. Two Bag IV Fluid system for DKA

| Diabetic Ketoacidosis (DKA) Two Bag System | | | |
|---|---|---|---|
| If Serum Potassium ≤ 3.3 mEq/L, always HOLD INSULIN DRIP and notify MD | | | |
| **Blood Glucose (BG) (mg/dL)** | **Bag 1 Non-dextrose fluid** | **Bag 2 Dextrose fluid** | **Insulin Drip** |
| Greater than 250<br><br>If BG decreases by less than 50 mg/dL after first hour of drip, repeat IV bolus insulin once | **250 mL/hr** | OFF | **Continue** current rate |
| 200 - 250 | **125 mL/hr** | **125 mL/hr** | **Continue** current rate |
| 150 - 199 | OFF | **250 mL/hr** | DECREASE insulin by 50% **ONCE if not done already** |
| 70 - 149 | OFF | **250 mL/hr** | DECREASE insulin by 50% **ONCE if not done already** |
| Less than 70 | OFF | **250 mL/hr** | HOLD insulin drip and send blood glucose to lab for confirmation. |

# Index

**Table S1**. Types of Insulin

| Generic Name | Brand Name | Onset | Peak | Duration | Dosing Notes | How Supplied |
|---|---|---|---|---|---|---|
| **Rapid Acting** | | | | | | |
| **Insulin lispro*** | Humalog | <15 minutes | 2 – 3 hours | 5 – 7 hours | Bolus: give at time of meal | • Vial and Kwikpen<br>• 75/25 vial and Kwikpen<br>• 50/50 vial and Kwikpen<br>• KwikPen U-100 pen: 100 units/mL<br>• Junior KwikPen U-100 pen: 100 units/mL<br>• U-100 cartridge: 100 units/mL<br>• U-100 vial: 100 units/mL |
| **Insulin aspart** | Novolog | <15 minutes | 1 – 3 hours | 3 – 7 hours | Bolus: give at time of meal | • FlexPen U-100 pen: 100 units/mL<br>• PenFill U-100 cartridge: 100 units/mL<br>• U-100 vial: 100 units/mL |
| **Short Acting** | | | | | | |
| **Insulin regular*** | Humulin R (SQ) | 30 minutes | 1.5 – 3.5 hours | 8 hours | Bolus: **give 30 minutes** before a meal | • Novolin R® vial<br>• U-500 (Humulin R U-500) - KwikPen and vial<br>• KwikPen U-100 pen: 100 units/mL<br>• U-100 cartridge: 100 units/mL<br>• U-100 vial: 100 units/mL<br>• If >200 total insulin units needed per day<br>  ○ KwikPen U-500 pen: 500 units/mL<br>  ○ U-500 vial: 500 units/mL |
| | Humulin R (IV) | 10-20 minutes | 5 hours | 1.5 hours after stopping infusion | Transition from IV to SQ: continue IV insulin for 1-4 hours after the first SQ dose to avoid rebound hyperglycemia or ketoacidosis | • Standard concentration (continuous infusion): 1 unit/mL in NS |
| **Intermediate Acting** | | | | | | |
| **Insulin NPH*** | Humulin N | 1 – 2 hours | 4 – 12 hours | 14 – 24 hours | Basal: give in the morning and/or at bedtime | • Vial<br>• KwikPen U-100 pen: 100 units/mL<br>• U-100 vial: 100 units/mL |
| **Long-Acting** | | | | | | |
| **Insulin glargine*** | Lantus | 3 – 4 hours | None | 24 hours | Basal: give in the morning and/or at bedtime | • SoloStar pen<br>• SoloStar U-100 pen: 100 units/mL<br>• U-100 vial: 100 units/mL |
| | Toujeo | 6 hours | None | 24 hours | Basal: give in the morning and/or at bedtime | • SoloStar U-300 pen: 300 units/mL |
| **Insulin degludec*** | Tresiba | 30 – 90 minutes | None | >24 hours | Basal: give in the morning and/or at bedtime | • FlexTouch U-100 pen: 100 units/mL<br>• U-100 vial: 100 units/mL<br>• FlexTouch U-200 pen: 200 units/mL |

***PFW formulary; Harris Health outpatient formulary = Yellow highlight**; adapted from Dana Elder, PharmD and Harris Health Pharmacy and Therapeutics Committee Memo, 2/24/2023

**Table S2**: Funding and Diabetic Supplies in Harris Health

# FUNDING & DIABETIC SUPPLIES

INSULIN PENS ARE NOW COVERED BY CHIP/MEDICAID!

| | UNFUNDED OR FAP (GOLD CARD) | MEDICAID/CHIP |
|---|---|---|
| PREFERRED PHARMACY FOR INSULIN | HARRIS HEALTH PHARMACY ($15 FOR 3 MONTH SUPPLY OF INSULIN INCLUDING PENS) | RETAIL PHARMACIES (WALGREENS/CVS MOST COST EFFECTIVE; WALMART MOST EXPENSIVE AT $300/MO) |
| DIABETIC SUPPLIES (GLUCOMETER/LANCETS/STRIPS) | HARRIS HEALTH PHARMACY | RETAIL PHARMACY (WALGREENS/CVS PREFERRED) |
| LANCETS QUANTITY (COMES IN BOXES OF 100) | 200 EACH FOR ONE MONTH SUPPLY | 200 EACH FOR ONE MONTH SUPPLY |
| STRIPS QUANTITY (COMES IN BOXES OF 50) | 150 EACH FOR ONE MONTH SUPPLY | 150 EACH FOR ONE MONTH SUPPLY |
| INSULIN PEN 31G X 3/16" NEEDLES QUANTITY IF ORDERING PENS (COMES IN BOXES OF 100) | 200 EACH FOR ONE MONTH SUPPLY | 200 EACH FOR ONE MONTH SUPPLY |

- REMINDERS -

- ORDER DIABETES EDUCATION & NUTRITION FOR ALL NEWLY DIAGNOSED/NEWLY REFERRED PATIENTS WITH GDM OR T2DM
- CONTACT DIABETES EDUCATOR, MARTHA PENA, BY INBASKET OR EPIC CHAT FOR PATIENTS WHO NEED HELP ACCESSING SUPPLIES/INSULIN, APPEAR NON -ADHERENT W/ CARE PLAN, OR WITH SIGNIFICANT BARRIERS TO CARE

Slide courtesy of Chamaine Penright, NP

## **Table S3.** Insulin conversion chart

| **Clinical Scenario** | **Recommendation/Comments** |
|---|---|
| NPH to long-acting | |
| NPH to insulin glargine U-100 (*Lantus*, *Basaglar*, *Semglee*, *Rezvoglar* [US])<br><br>NPH to insulin glargine U-300 (*Toujeo*) | • NPH once daily: convert unit-per-unit to U-100 insulin glargine and give once daily.<br>• NPH twice daily: reduce total daily dose by 20% and give insulin glargine once daily.<br>• It may take ≥5 days to see the maximum effect of the selected dose of *Toujeo*. Do not increase the *Toujeo* dose more often than every 3 to 4 days.<br>• Do not mix insulin glargine with other insulins. |
| Long-acting to NPH | |
| Insulin glargine U-100 (*Lantus*, *Basaglar*, *Semglee*, *Rezvoglar* [US]) to NPH<br><br>Insulin glargine U-300 (*Toujeo*) to NPH | • Insulin glargine U-100*:* convert unit-per-unit, or reduce dose by 20%.<br>• *Toujeo*: reduce dose by 20%.<br>• Give NPH twice daily (e.g., 50:50 or 2/3 in AM and 1/3 before dinner or at bedtime). |
| Long-acting to long-acting | |
| Insulin glargine U-100 (*Lantus*) to/from insulin glargine U-100 (*Basaglar*, *Semglee*, *Rezvoglar* [US]) | • Convert unit-per-unit. |
| Insulin glargine U-100 (*Lantus*, *Basaglar*, *Semglee*, *Rezvoglar* [US]) to insulin glargine U-300 (*Toujeo*) | • Convert unit-per-unit and give once daily.<br>• Expect that a higher daily dose (about 10% to 18%) of *Toujeo* will be needed to maintain control.<br>• It may take ≥5 days to see the maximum effect of the selected dose of *Toujeo*. Do not increase the *Toujeo* dose more often than every 3 to 4 days.<br>• Do not mix insulin glargine with other insulins. |

| Clinical Scenario | Recommendation/Comments |
|---|---|
| Long-acting to long-acting | |
| Insulin glargine U-300 (*Toujeo*) to insulin glargine U-100 (*Lantus*, *Basaglar*, *Semglee*, *Rezvoglar* [US]) or insulin detemir (*Levemir*) | • Reduce dose by 20%. |
| NPH or long-acting to ultra-long acting | |
| NPH, insulin glargine U-100 (*Lantus*, *Basaglar*, *Semglee*, *Rezvoglar* [US]), or insulin glargine U-300 (*Toujeo*) to insulin degludec (*Tresiba*) | • Convert total daily dose unit-per-unit and give once daily, or reduce dose by 20% (for patients with type 1 diabetes [Canada], twice-daily basal insulin [Canada], or pediatrics [US]) and give once daily.<br>• Do not increase the *Tresiba* dose more often than every 3 to 4 days. |
| Ultra-long acting to NPH or long-acting | |
| Insulin degludec (*Tresiba*) to NPH, insulin glargine U-100 (*Lantus*, *Basaglar*, *Semglee*, *Rezvoglar* [US]), or insulin glargine U-300 (*Toujeo*) | • Reduce dose by 20%.<br>• Give once daily, or divide *Levemir* twice daily.<br>  ○ If converting from *Tresiba* >80 units/day, divide U-100 insulin twice daily.<br>• Give NPH twice daily (e.g., 50:50 or 2/3 in AM and 1/3 before dinner or at bedtime). |
| Regular to rapid-acting | |
| Regular human insulin (*Humulin R* [US], *Novolin R* [US], *Novolin ge Toronto* [Canada], *Myxredlin* [Canada], *Hypurin Regular* [Canada]) to rapid-acting insulin analog (insulin aspart [*NovoLog* (US), *NovoRapid* (Canada), *Trurapi* (Canada), *Fiasp*, *Kirsty* (Canada)] , insulin glulisine [*Apidra*], insulin lispro [*Humalog*, *Admelog*, *Lyumjev*]) | • Convert unit-per-unit.<br>• Rapid-acting insulin analogs have a faster onset of action and a shorter duration of action than human regular insulin. |
| Rapid-acting to regular | |
| Insulin aspart (*NovoLog* [US], *NovoRapid* [Canada], *Trurapi* [Canada], *Fiasp*, *Kirsty* [Canada]), insulin glulisine (*Apidra*), or insulin lispro (*Humalog*, *Admelog*, *Lyumjev*) to | • Convert unit-per-unit.<br>• Rapid-acting insulin analogs have a faster onset of action and a shorter duration of action than human regular insulin. |

| Clinical Scenario | Recommendation/Comments |
|---|---|
| regular human insulin (*Humulin R* [US], *Novolin R* [US], *Novolin ge Toronto* [Canada], *Myxredlin* [Canada], *Hypurin Regular* [Canada]) | |
| Rapid-acting to rapid-acting | |
| Insulin aspart (*NovoLog* [US], *NovoRapid* [Canada], *Trurapi* [Canada], *Fiasp*, *Kirsty* [Canada]), insulin glulisine (*Apidra*), or insulin lispro (*Humalog*, *Admelog*, *Lyumjev*) to insulin aspart (*NovoLog* [US], *NovoRapid* [Canada], *Trurapi* [Canada], *Fiasp*, *Kirsty* [Canada]), insulin glulisine (*Apidra*), or insulin lispro (*Humalog*, *Admelog*, *Lyumjev*) | • Convert unit-per-unit. |
| Regular to long-acting or ultra-long acting | |
| Regular human insulin (*Humulin R* [US], *Novolin R* [US], *Novolin ge Toronto* [Canada], *Myxredlin* [Canada], *Hypurin Regular* [Canada]) to insulin glargine U-100 (*Lantus*, *Basaglar*, *Semglee*, *Rezvoglar* [US]), insulin glargine U-300 (*Toujeo*), insulin detemir (*Levemir*), insulin degludec (*Tresiba*), or NPH | • Calculate the average of the daily insulin requirement over the past five to seven days. Start with 70% to 75% as basal insulin.<br>• Cover meals with oral antidiabetics or mealtime insulin. |
| U-100 insulin to U-500 insulin | |
| All types of U-100 insulin to *Humulin R U-500* (US) or *Entuzity* (Canada) | • U-500 insulin is only for patients needing >200 units of insulin daily.<br>• Determine the total daily dose from all insulin sources combined.Round down to the nearest 5 units.<br>• If A1c is ≤8%, reduce the dose by 20%.<br>• Divide the dose two or three times daily, given 30 minutes before a meal. Recommended dosing ratios are 60:40 (for breakfast/dinner dosing) or 40:30:30 (for breakfast/lunch/dinner dosing). Other ratios may be appropriate.<br>• It is recommended that daily doses of ≥300 to 750 units be divided three times daily. For doses >750 units, divide four times daily (with meals and at bedtime), with the bedtime dose being smaller than the mealtime doses.<br>• For a titration algorithm, see https://www.humulin.com/hcp/dosing-titration#insulin-activity. |

Reference: https://pharmacist.therapeuticresearch.com/en/Content/Segments/PRL/2016/Dec/How-to-Switch-Insulin-Products-10473

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