Insulin Management: Evidence, Tips & Pearls

**Indications for the Use of Insulin**

- Type 1 Diabetes Mellitus (T1DM); gestational diabetes not controlled with diet & activity; Type 2 Diabetes Mellitus (T2DM) not controlled with meal choices, activity & use of oral agents; T2DM with severe infection, major surgery, oral hypoglycemics contraindications, lactating, or requiring corticosteroids; ketoacidosis or hyperosmolar nonketotic syndrome; severe hyperglycemia where rapid glucose reduction/control is desired. (Also: Low rate of drug interactions.)

**Administering Insulin - Subcutaneous (SC) Injection**

- Abdomen (not within a 5cm radius of the umbilicus), upper arms, anterolateral thigh, buttocks.
- Alcohol is no longer recommended for topical preparation of the skin; soap & H2O adequate.
- Give insulin injections at a 90° angle subcutaneously to ensure adequate absorption.
- DO NOT pinch skin (Pinching of the skin prior to injection is only necessary when using a 12 mm pen/syringe needles, if the individual is thin and/or in children. (Most needles 6-10mm)).
- People with a BMI > 27 kg/m² may use the 12mm length needle (Becton Dickson recommendation).
- If leaking is occurring at the injection site, check that the client is:
  - Injecting at a 90° angle & using the appropriate needle length
  - Leaving the needle under the skin for 5 seconds after injecting

**Insulins: Selection Considerations (Evidence & Economic)**

- Rapid Acting IA: lispro, aspart, neutral protamine lente (NPH), human regular.
- Intermediate Acting IA: NPH, detemir, glargine.
- Long Acting IA: detemir, glargine.

**Variables That Can Affect Insulin Action**

1. **Mixing insulin together**
   - Best to mix rapid acting IAs, & not necessary with most devices.
   - Regular & lispro may be mixed; aspart cannot be mixed with NPH.
   - Detemir & glargine should not be mixed.

2. **Insulin dosage and absorption variation factors**
   - Larger doses of insulin may have slightly longer duration of action.
   - Injection site: systemically rotate injection site by at least 1–2 inches to prevent lipodystrophy.
   - The abdomen is often the preferred site; most consistent & fast rate of absorption

3. **Injection Site**: systemically rotate injection site by at least 1–2 inches to prevent lipodystrophy.

**Canadian Guidelines - Notes Regarding Insulins**

- CDA Guidelines 2008 & some specialist researchers advocate for a more prominent role for the newer insulin analogues, if economic and drug plan coverage issues are not major considerations. Primary advantage valued is less hypoglycemia in some patients. (A1C & weight endpoints lack meaningful differences.)

**Insulin Analogue Systematic Reviews (SR):**

- Table 1: IAs: Guide to Advantages/Disadvantages of Insulins
- Table 2: A1C differences of Insulin Analogues (IAs) compared to Regular & NPH:

**Insulins: Selection Considerations (Evidence & Economic)**

- **T1DM – Basal (intermediate or long-acting):**
  - NPH preferred in COMPUS SR; detemir or glargine are suitable if major hypoglycemia history or concern.
  - Consider a Rapid Acting IA especially if meal flexibility and hypoglycemia concerns.
  - Adolescents: lispro & aspart offer convenience, flexibility & ↓ hypoglycemia & preferred over regular HI.

**Insulin Analogue Systematic Reviews (Tables 1 & 2)**

**Table 1: IAs: Guide to Advantages/Disadvantages of Insulins**

<table>
<thead>
<tr>
<th>Insulins</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>HI</td>
<td>more long-term &amp; safety experience</td>
<td>injecting 20-30min pre-meal impractical (short acting but not rapid acting)</td>
</tr>
<tr>
<td>RAAs</td>
<td>more long-term &amp; safety experience</td>
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<tr>
<td>NPH</td>
<td>low cost</td>
<td>rapid acting</td>
</tr>
<tr>
<td>LAAs</td>
<td>↓ glycemia, nocturnal hypoglycemia, adaptive, non-blinded</td>
<td>moderate cost high utility in T2DM (but reasonable cost utility in T1DM)</td>
</tr>
<tr>
<td>Basal</td>
<td>↑ patient satisfaction in T1DM</td>
<td>long-term safety &amp; evidence</td>
</tr>
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**Insulins: Selection Considerations (Evidence & Economic)**

- **A1C differences of Insulin Analogues (IAs) compared to Regular & NPH:**
  - Rapid Acting IA: range from −0.03% to −0.18% vs R; Long Acting IA: range from −0.12% to 0.28% vs NPH.
  - There are no clinically significant differences in A1C control likely to impact clinical outcomes.

- **T1DM – Basal (rapid or short acting):**
  - Adults: regular HI, lispro or aspart may be used. (lis vs reg ↓ severe hypoglycemia (est. NNT=54/syringe dose) vs 32/mo).
  - Consider a Rapid Acting IA especially if meal flexibility & hypoglycemia concerns.
  - Adolescents: lispro & aspart offer convenience, flexibility & ↓ hypoglycemia & preferred over regular HI.

- **T1DM – Basal (intermediate or long-acting):**
  - NPH preferred in COMPUS SR; detemir or glargine are suitable if major hypoglycemia history or concern.
  - Less hypoglycemia with idet BID vs IGla OD: but T F G (7.7 vs 7.0) & ↑ serious adverse events (8.7% vs 6.9%) not dailyТА = value.
  - Preadolescent: a twice daily NPH regimen not requiring a lunch time injection may be useful in some.

- **T2DM – Basal: Regular HI preferred in COMPUS SR;** lispro or aspart suitable if hypoglycemia history or concern.

- **T2DM – Basal: NPH preferred in COMPUS SR;** detemir or glargine suitable if hypoglycemia history or concern.
  - [det vs IGla 32/31; similar A1C; but 55% of det required BID where wt gain advantage lost & 2× daily dose required; ↑ site nsa's with IDet]

- **Pregnancy, Pre-existing T1DM / T2DM or Gestational:**
  - Most safety experience with HI; RAAs also safe & allow for tight PPG control, but no evidence of superiority.
  - Detemir & Glargine do not have sufficient safety data to recommend in pregnancy or preconception state.

- **Evidence for insulin analogues is often limited (small, short-term trials) and benefits modest; anecdotal evidence is favorable.**

- **Compuls systemically evaluates rigorously assessed benefits, risks and incremental cost.**

- **Weight change with LAAs vs NPH: (T1DM: −0.73 to −0.4 kg); (T2DM: idet: −1.27 to −0.8 kg less than NPH; IGlar: no difference) vs NPH.**

- **Hypoglycemia: Most pronounced ↓ risk for LAAs is on nocturnal hypoglycemia. (LAAs vs NPH: NNT=26 (Cl range 4-33).**

**References available online at www.RxFiles.ca**
Monitoring (BG, A1C, Ketones)

Blood Glucose (BG) Targets

• Preprandial: Optimal BG 4-7 mmol/L before meals
• Postprandial (PPG): BG 5-10 mmol/L 2hrs after meals (5-8 mmol/L if A1C target not being met)

(related observational data suggests PPG as a potential risk factor for mortality 15)
• Prevent extreme lows (<3.5 mmol/L) and high BG levels (>14 mmol/L)
• Individualize with each person 16: e.g. ambitious targets may be counterproductive in elderly
  (risk of hypoglycemia, etc.); for patient who has coronary artery disease (CAD), low BG can trigger atrial fibrillation therefore ambitious targets may not always be achievable/beneficial.17

Self Monitoring Blood Glucose (SMBG) 1,5

• No gold standard of testing frequency established.
• Diet Only: may check occasional postprandial
• OHA only: routine self monitoring not necessary in T2DM patients not on insulin & without hypoglycemia 18,19,20 (If done, twice in a day at staggered times, e.g. pre- & post-prandial.)
• OHA & bedtime insulin: testing once daily at variable times is recommended. 5
• OHA & insulin MDI: individualize eg. Tid. pre & post prandial
• Strips: yearly cost (1 test/day) ≥$165; 3 tests/day =>$500; 7 tests/day=$1100-2400 21 consensus: Life, Siemens, Trividax
• Paired meal testing (AC & 2hr PC) helpful to match regimen to BG patterns; may stagger times:
  o Day 1: AC & PC breakfast; Day 2: AC & PC lunch; Day 3: AC & PC supper; Check HS somewhere.
  o This gives a good cross sectional representation of pattern of hyperglycemia, with less testing.
• Test more often: in pregnancy; illness; before driving to detect & treat hypoglycemia; when diet & activity changes; after adjusting insulin/pills over 1-2 wks; if hypoglycemic unawareness; exercise?; driving?
• Rapid-acting insulin analogues, oral glitazones: e.g. repaglinide (Glucotrol®) – may be particularly important to check 2 hours postprandial to determine if the dose is accurate
• Testing at ~3:00am or overnight expected insulin peak time may be required to rule out nocturnal hypoglycemia

Variables Affecting Accuracy Of Self-Monitoring Blood Glucose (SMBG)

• Sample Size: too little blood on test strip may cause problems for some meters
• Test strips: if expired or exposed to extreme temperature or humidity.
• Clean finger needed (especially sensitive to sugar containing foods or drinks).
• Meter inaccuracy: if old, dirty, or exposed to extreme temperatures. Lab/meter comparison recommended (annually). A fasting lab/meter comparison should be done annually to check meter accuracy: acceptable reading could be within 20-30% higher or lower than the lab value.
• Hemocrit: most test strips make allowance for this (results vary from 4-40% for every 10% change in hematocrit)
  o Anemia can falsely ↑ glycemia but can falsely ↓ the BG values obtained by meters
• Alternate site testing or misrepresentations of BG results (clients falsify the test results)

Glycated Hemoglobin (A1C): an indicator of overall glycemic control in the preceding 3 months

• A1c may be measured every 3 months in all clients taking insulin & every 6 months in people on nutrition therapy, oral antihyperglycemic agents (OHA) or during tx & lifestyle stability
• Accuracy affected by: anemia falsely ↑ slow RBC turnover e.g. iron deficiency falsely ↓ fast RBC turnover e.g. hemolyisis;
  PRBC transfusion; Hemoglobinopathies; ESRD (depending on assay used)
• Target A1c for most: ≤7%. A1c targets should consider patient factors & intervention intensity.
  (Overly intensive regimens may cause harm in T2DM populations ACCORD; see Diabetes Trials chart)
• Blood Glucose & A1c relationship: derived from DCCT in T1DM 21
  o Mean BG (mmol/L) = [1.98 x A1C(%)] – 4.29. (E.g. A1c = 10, Mean BG = 19.8-4.29 = 15.5mmol/L)
  ⇒ Estimated Average Glucose (eAG) is another way to reflect A1c; reported as mmol/L 22
  o eAG (mmol/L) = 1.59 x A1C(%) – 2.59

Urine Ketone Testing (Primarily in T1DM)

• Required during significant hyperglycemia periods to assess risk of potentially life-threatening ketoadidosis e.g., when pre-prandial BG >14 mmol/L, nausea, vomiting, abdominal pain, illness &/or if dehydration
• May test urine ketones during pregnancy to ensure mother & baby’s nutritional needs are met
  (Blood ketone testing may be preferred over urine ketone testing, since assas. with earlier detection of ketosis & response to tx.)

Hypoglycemia

• Clinically hypoglycemia is defined as a state that results in:
  o Biochemical low – e.g BG <3.5 or < 4 mmol/L (common definition in DM trials)
  o Autonomic (adrenergic) OR neuroglycopenic symptoms (better recognition if infrequent occurrence)
  (Symptoms may occur at euglycemic BG levels in chronic hyperglycemia; typically resolves with time.)
• Mild: autonomic symptoms: tremors, palpitations, sweating, excessive hunger; able to self-treat
• Moderate: autonomic & neuroglycopenic symptoms – headache, mood, ↓ attentiveness, paresthesias, visual disturbances; may be able to self-treat
• Severe hypoglycemia = distinguished by unresponsiveness, unconsciousness, seizures or coma; unable to self-treat, requires assistance. (Some studies also use thresholds e.g. ≤2.8mmol/L)
• Nocturnal: night sweats, nightmares; patient may not be aware. (Subjectively defined in studies.)
• Causes - iatrogenic: dose of insulin or sulfonylureas is too high; diabetes therapy too intensive; decreased renal function can result in increased frequency of hypoglycemia in those on insulin or sulfonylureas; increase in the level of activity; insufficient carbohydrates in diet; Drug Causes 23
  • insulin, sulfonylureas (acetohexamide & glibenclamide), alcohol delayed, beta-blockers, salicylate, chromium, marijuana
  (Tight glucose control in critically ill hospitalized pts may↑ mortality & ↑↑ risk of hypoglycemia)
• Other: develop meal & activity plan; a bedtime snack may be helpful in those at risk (if BG <7mmol/L)

Treatment For Mild To Moderate Hypoglycemia

• 15g of carbohydrate (glucose or sucrose tablets) should ↑ BG about 2.1 mmol/L in 20 min
  o (Other 15g examples: ¾ cup juice or regular soft drink, 3 teaspoonfuls table sugar or honey, 6 LifeSavers®. 3 sugar cubes, 9 jelly beans. (glucose/dextrose absorbed directly))
• Children ≤3yrs/kg (10g carbohydrate in child <5yrs or <20kg)
• Wait 15 minutes, retest BG and retreat with another 15g glucose/sucrose if BG < 4.0mmol/L
• After initial glucose treatment, another carbohydrate containing snack should be taken within 1 hour. If meal more than 1 hour away, a snack with 15g carbohydrate & protein source is also recommended.
• If on Acarbose - use glucose tablets, milk or honey; (sucrose will not be absorbed!!!)

Treatment For Severe Hypoglycemia Occurring Outside Hospital Setting*

• if conscious and able to take oral treatment:
  o Treat with 20g glucose in tablet form, then wait 15 minutes if possible.
  o Retest BG & retreat with another 15g glucose if BG <4.0mmol/L. (Repeat till sustained >4.0mmol/L)
• if unconscious / unable to swallow: (BG <2.8mmol/L associated with unconscious)
  o Administer glucagon (details below). (Kits available ≥$100; portable for emergencies)
  o Once the individual is conscious & able to take oral food, hospitalization is probably not necessary; however, cause should be determined so that recurrence can be avoided.
  o Glucose gel should NOT be used buccally since minimal absorption through mucosa.
  o Glucose gel is slow to react (<1mmol/L rise in 20 min) & must be swallowed.

Table 2: Glucagon Treatment Of Acute Hypoglycemia

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>Treatment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>glucagon dose SC/IM 1mg (IM in the deltoid or anterior thigh)</td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td>glucagon SC/IM 15-30mcg/kg [MAX 1mg/dose] (&lt;5yrs: 0.25-0.5mg; 5-10yrs: 0.5-1mg; &gt;10 yrs: 1mg)</td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td>(Also: mini-dosing for impending hypoglycemia due to refusal to eat (20mcg/yr of age; Max 150mcg))</td>
<td></td>
</tr>
<tr>
<td>BG response</td>
<td>greater in T2DM than in T1DM. Glucagon side effects: may cause nausea &amp; vomiting</td>
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</table>

Following glucagon administration: turn patient on side to avoid aspiration; never leave alone.

When individual becomes alert, usually 10-15 min after receiving glucagon IM/SC, he/she should be given a fast acting carbohydrate (e.g., glass of juice, or glucose/sucrose tablets) followed by a carb. snack such as crackers & cheese or a sandwich (to prevent recurrent hypoglycemia). Ongoing monitoring is essential!

Table: if abnormal values are noted in the laboratory, additional testing may be required.

(Repeat for BG in 15-30minutes. (The pediatric dose of glucose for IV treatment is 0.5 to 1 g/kg). Follow with D5W IV.)
INITIATING INSULIN

Type 2 DM (adult) on oral medications (see also RxFiles - Approach to Management of T2DM)

- Start low dose for safety, then titrate upward!!
- 5-10 units of intermediate insulin e.g. NPH or 0.1-0.2 units/kg of total body weight (TBW) at hs; titrate by 2 units every 2-3 days. (More cautious with initiation & titration in elderly & non-obese (e.g. start with 5 units))
- Adding insulin to already established metformin may be very useful to ↓ insulin dose required; also may result in less weight gain & less hypoglycemia
- Secretagogues e.g. sulfonylureas useful with hs basal insulin; should be stopped if mealtime insulin given
- Caution/Avoid: TZD glitazones & insulin combinations; ↑ heart failure, weight gain & edema25.

Type 1 DM

- Adult: 0.1-0.5 units/kg of body weight. (Typical requirement 0.5 units/kg.) If newly diagnosed, but not acutely ill or ketotic – start with lower dose (e.g. 0.3 units/kg or 4 units ac meals and hs)
- Adolescent: start similar to adult, but expect eventual higher requirement e.g. ≤ 1 unit/kg (tight follow-up required)

SWITCHING INSULINS* (Temporary 1BG monitoring required; ↓ dose to 80% for more conservative approach)

Short-acting human insulin → Rapid Acting IA may be transferred on a unit for unit basis
NPH OD → glargine OD: may use same total number of units/day
NPH BID → glargine or detemir OD: → total daily dose to 80% of the NPH daily dose
NPH OD → detemir OD: may use up to the same total number of units/day! (↑dose is likely after switch; some may require BID)
Basal only hs → premixed given BID; use same or less total number of units/day (as ↑’d effect)!6
*If hypoglycemia history or reason for switching, may be more conservative in initial dose chosen.

TIPS FOR INSULIN DOSE ADJUSTMENT

1. Fix the lows first & the highs later. Once the lows gone, rebound hyperglycemia often eliminated.
2. Adjust insulin by 5-10% per week, or 1 or 2 units at a time to prevent hypoglycemia.
3. Adjust one insulin at a time. Begin with the insulin that will correct the 1st problem BG of the day.
4. Overnight control is difficult & requires the right basal dose. (Goal: keep BG between 4-8mmol/L from bedtime to morning without causing a low & usually without requiring a bedtime snack.)
5. To assess for Somogyi (nocturnal hypoglycemia with rebound hyperglycemia in the morning) or overnight control, check BG at 0300 or 0400 not just once but for a few nights, especially if experiencing unexplained morning highs. (Dawn phenomena also causes early AM rise but due to hormonal surge.)
6. Nightmares, restless sleep, headache on waking, wet pillow or sheets may be signs of sleeping through a low BG reaction. (One specialist uses BG from both 2AM & 5AM to assess.)
7. Postprandial targets are helpful when assessing the meal insulin. Assessing PPG control provides information to determine which insulin needs adjusting (the meal insulin or the basal insulin). The goal is to achieve PPG of 5-10mmol/L, without lows between meals.
   (Supplemental insulin useful in addition to basal regimen (e.g. 1 unit bolus insulin for every 3mmol/L, greater than 7 mmol/L, but will vary!)

Activity/Exercise Principles:

Patient education important for success!!!

1. In general, insulin therapy does not require adjustment for periods of activity < 30 minutes.
2. If activity > 30 minutes, & the activity is spontaneous & not preplanned, supplemental CHO before and during the activity can be used to balance the effects of ambient (previously injected) insulin.
3. Self Monitoring of Blood Glucose (SMBG) is recommended post event period q1-2h to assess response to activity and food consumption and to avoid post activity hypoglycemia.
4. On days of planned activity, reduction of pre-activity dose of insulin will help prevent hypoglycemia induced by exercise. If exercise will be after breakfast, lower the dose of regular insulin that would be taken before breakfast. If rapid acting insulin is used (aspart or lispro), decrease insulin dose only if exercise takes places within 2.3 hours after injection. (See Table 3.)
5. BG readings before, after, and possibly during exercise should be used to determine the appropriate change in insulin dose or food intake the next time the activity is done.
6. Prolonged activity can have a delayed BG lowering effect; ↓ in basal insulin may be required.

INTENSITY (% VO2 max)

- Light exercise (≥ 50% VO2 max) 50
- Moderate exercise (50-60% VO2 max) 60 min of exercise
- Strenuous activity (75% VO2 max) 75

Table 3: Exercise Intensity & % Of Insulin Dose Reduction

<table>
<thead>
<tr>
<th>Intensity (% VO2 max)</th>
<th>30 min of exercise</th>
<th>60 min of exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild exercise (25%)</td>
<td>50</td>
<td>No insulin</td>
</tr>
<tr>
<td>Moderate exercise (50%)</td>
<td>50</td>
<td>No insulin</td>
</tr>
<tr>
<td>Strenuous activity (75%)</td>
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TRAVEL THROUGH TIME ZONES

- General comment: goal is to switch to new time zone as soon as possible after arrival at new destination. (North-South travel may involve little if any time change so no insulin adjustment required.)
- In North America (3 hours max) → no adjustment
- Travel EAST (lose hours, shorter day): usually need less intermediate or long-acting insulin & less sleep
- Travel WEST (gain hours, longer day): usually need more intermediate insulin on the travel day
- In Europe
- Decrease bedtime dose of intermediate-acting insulin (NPH) by 1/3 or ½ on the travel day (usually on the plane crossing the Atlantic)

SICK DAY GUIDELINES for Patients on Insulin

- Check BG before meals &/or q4h around the clock (more often if necessary); drink extra sugar-free fluids
- Acute illness has variable effect on insulin requirement; management patient & regimen dependent
- t1DM: additional doses of bolus insulin for elevated BG or urine ketones (if BG not low), may ↓ insulin dose to avoid low BG if unable to ingest required amounts of carbohydrate & BG is not high.
- t2DM: ↓ or hold mealtime insulin if not eating; ↑ additional doses of bolus insulin if high BG
- If on oral hypoglycemics, may need to temporarily decrease dose
- If the individual can eat as usual, they should replace solid food with glucose containing fluids. They should try to take ≥10 grams of carbohydrate every hour (see clear fluids below).

PRE-PROCEDURE CONSIDERATIONS e.g. outpatient with diet restrictions pre-gastroscopy 27

- Management depends on: t1DM vs t2DM; duration of fasting; time/duration of procedure; insulin regimen
- E.g. Days Before Test: no change or ↓ basal insulin dose(s) by ~20% → bolus insulin dose(s) by ~50%. BG in range of 5-12mmol/L are OK for 1-2 days. On Day of Test: ↓ morning basal insulin by ~30% (up to 50% if very long procedure) & do not take bolus insulin until test is done & ready to eat. Test BG before giving next insulin.
- Clear fluids containing sugar: (e.g. fruit/sports drink, pop, popsicle, regular Jell-O); test BG more frequently (e.g. q4h); if BG 4mmol/L or symptoms, take 15-20g carbohydrate & retest in 15min

PREGNANCY & PRE-EXISTING DIABETES – Targets & Comments 5

- Stop OHAs, ACEI/ARB & statin prior to conception*,**
- Use intensive insulin therapy - MDI or CSII
- 1-hour PPG (mmol/L) 5.5-7.7
- 2-hour PPG (mmol/L) 5.5-7.7
- Insulin requirements may be up to 20-40% higher during pregnancy & breastfeeding
- Caution/Avoid: Basal insulin may be required.
- Sliding Scale Insulin: practice generally discouraged. Consider basal/bolus & supplemental regimen.
- Example of MDI regimen in GDM (dosing will depend on patient!)

Table: 5

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1. Stop OHAs, ACEI/ARB & statin prior to conception**
2. Use intensive insulin therapy - MDI or CSII
3. SMBG: pre & postprandial at least 4 x per day (hypoglycemia effects, T1: developmental delays; T2: macronutrients, delivery & neonatal complications)
4. Pregestational: insulin may not be required on the day of delivery & up to 24-48 hours postpartum
5. 5-7 days post-delivery, insulin requirements have usually returned to pre-pregnancy levels. Encourage breastfeeding!
7. *There is evidence that glyburide & metformin e.g. in PCOS may be safe & not contraindicated in all cases. **Give 5mg/d folate acid daily
8. Gestational Diabetes (GDM)

- Targets: same as "Pre-existing" in table above. Avoid FGB < 3.3 mmol/L & 1 hr PPG < 5.0 mmol/L.
- Intervention: Diet & light exercise (small plate; walk after meals). If targets not achieved within 2 wks with nutrition, insulin should be initiated. (Glyburide or metformin are 2nd line "off-label" options.) Regimen & dose depends on the pattern of hyperglycemia. Follow up: screen qOT for DM @ 6weeks-6moths post-partum.
- Example of MDI regimen in GDM (dosing will depend on patient!)

- High FGB: NPH qhs 1.0 unit/kg body weight (or start 5-8 units NPH qhs); Avoid Alafas (Glargine, Detemir)
- High PPG: Regular or RAIA of 1.5 units/10g CHO at breakfast due to insulin resistance, & 1 unit/10g CHO at lunch & dinner (or start 5 units bolus insulin for each meal with high PPG)
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Additional references (Post Nov. 2008):

29 Nicholson W, Bolen S, Wilkop CT, Neale D, Wilson L, Bass E. Benefits and Risks of Oral Diabetes Agents Compared With Insulin in Women With Gestational Diabetes: A Systematic Review. Obstet Gynecol. 2009 Jan;113(1):193-205. No substantial maternal or neonatal outcome differences were found with the use of glyburide or metformin compared with use of insulin in women with GDM.


33 Hirsch IB. Sliding scale insulin--time to stop sliding. JAMA. 2009 Jan 14;301(2):213-4.


