

Inpatient Diabetes Management Guide

I. Admitting a patient with DM

- Review home meds, medication adherence, A1C, Home Blood Glucose (BG) levels if available
- Hold oral DM agents and select BG monitoring:
 - QAC + QHS if on PO diet
 - Q6 if NPO or if on enteral feeds or TPN
- Document type of DM if known- Type 1 vs 2 vs other
- Select therapy (choose one approach):**
 - Correctional insulin only:** QAC + QHS x 24 hours
 - If 2 or more BG >180 mg/dL THEN start basal-bolus regimen
 - Initiate Basal-bolus regimen:** either weight-based or based on outpatient insulin doses
 - Basal insulin plus correction scales:** If pt NPO, poor PO intake or has low requirements

****Type 1 DM:** Must always have basal insulin ordered and if eating should be on basal/bolus

****Type 2 DM:** Should be on basal/bolus if on insulin at home, high A1c or high BG

Endo consult as needed-LIEndocrine@northwell.edu

II. Initiating Basal-Bolus (weight-based method)

STEP 1: CALCULATE TOTAL DAILY DOSE (TDD) = Basal + Bolus

0.3 units/kg : Pts with BMI <18.5 or at high risk for hypoglycemia

0.4 units/kg: Normal BMI (18.5-24.9)

0.5 units/kg: Overweight pts (BMI 25-29.9)

0.6 units/kg: Obese pts with BMI >30 or highly insulin resistant

STEP 2: DETERMINE BASAL INSULIN DOSE (Glargine/Lantus)

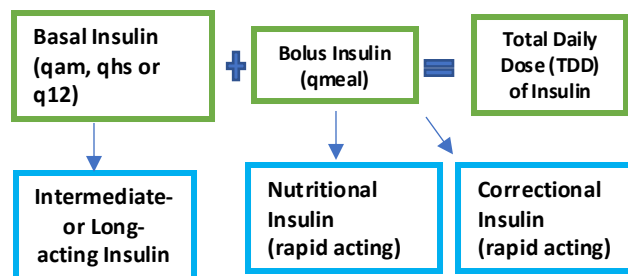
Basal insulin = 50% of TDD

STEP 3: DETERMINE BOLUS DOSE (Lispro/Admelog)

Divide remaining 50% of TDD into 3 equal doses given before meals. Consider variable doses before different meals depending on eating pattern or BG data

STEP 4: SELECT CORRECTIONAL INSULIN (Lispro/Admelog)

Low-dose correction scale: for Insulin naïve, AKI, ESRD, Type 1
Moderate-dose correction scale: Steroids, tube feeds, obese pts, or if requiring high insulin doses.



III. Titrating Insulin

Inpatient BG goal: 100-180mg/dl

Re-evaluate regimen if BG <100 or >180. Modify if BG <70

1. Assess Fasting BG

FBG BELOW GOAL:
<100 mg/dL (x2)
OR <70 (any)

Decrease Basal
Insulin by 20%

FBG AT GOAL:
100-180 mg/dL

No change in
Basal Insulin

FBG ABOVE GOAL:
FBG >180 mg/dL

Increase Basal
Insulin by 50% of
prior 24h total
correctional dose

2. Assess pre-meal and random BG

BG BELOW GOAL:
<100 mg/dL (x2)
OR <70 (any)

Decrease nutritional
Insulin by
20% divided
between meals

BG AT GOAL:
100-180

No change in
nutritional
insulin

BG ABOVE
GOAL: BG>180

Increase in
nutritional
Insulin by 50% of
prior 24h total
correctional dose
divided between
meals

IV. Hypoglycemia Protocol

Rule of 15's: If pt can take PO, give 15g of fast acting carbohydrate (e.g., 4 oz fruit juice). If unable to take PO, give D50 IV push (dose based on BG level) or Glucagon 1 mg IM

Check BG q 15 mins, repeat above steps until ≥100 mg/dl

Assess insulin regimen, nutritional intake, risk factors for hypoglycemia. If at high risk for recurrent hypoglycemia, lower current TDD by 20% and divide as per Basal-Bolus regimen

After BG corrects to ≥ 100 mg/dL, nutritional insulin should still be given prior to each meal (dose adjustment if indicated)

V. Special considerations

- NPO:** Check BG q6h, hold nutritional insulin. Continue 80% Basal + Correctional q6h
Start D5 0.5%NS if NPO >24 hours

Enteral Feeds

Check BG q6 hours. Calculate the TDD of insulin

Continuous 24 hour feeds: Divide TDD into 4 equal doses of NPH q6h (hold dose if feeds held), plus moderate Admelog scale q6h.

Bolus feeds: Divide TDD into 40% Lantus daily and 60% divided among boluses Admelog premeal (typically ordered q6h) plus moderate scale q6h.

Cycled feeds: (< 24 hours): more complex, call endocrine

TPN

Check BG q6 hours. Calculate the TDD of insulin

Regular insulin can be added into bag of TPN, often combined with correction scale q6h. If high requirements may add Lantus in addition.

To titrate: Calculate TDD over past 24 hours and redistribute as per above. If hypoglycemic, reduce TDD by 20%. If feeds held, hold NPH or bolus. Consider D5 infusion at same rate as TF/TPN if held to avoid hypoglycemia, or D10 to minimize volume.

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Glucocorticoid therapy

- In non-DM pts, monitor BG x 48 hrs and if 2 or more BG levels >180 mg/dL, initiate basal-bolus
- Calculate TDD-Give 40% as Basal & 60% as bolus
 - Anticipate post prandial hyperglycemia by increasing the nutritional insulin doses
- Titrate insulin doses as steroids are adjusted
- In general, % of insulin change should be half the % of steroid dose change

Pts on pre-existing Insulin pump

- Obtain Endocrinology consult
- Criteria to continue pump inpt: Pump functioning, pt capable of self- management (A&Ox3), pt agreeable to self-manage, not critically ill, not in DKA, has enough pump supplies (site change q3 days)
- Criteria to dc pump inpt examples- AMS, DKA, severe hyperglycemia, hypoglycemia, pump malfunction, no pump supplies
- If pts are transitioned from pump to subcut insulin, pump should be discontinued 2h after the first dose of basal insulin
- Administration of basal insulin is especially important in patients with type 1 DM who always need insulin on board to prevent DKA

Perioperative

- Target BG in perioperative period is 140-180 mg/dl
- If pt NPO, decrease Basal Insulin to 80%, hold mealtime Insulin
- SGLT2 inhibitors must be dced 3-4 days prior to Sx due to risk of euglycemic DKA while NPO**
 - Canagliflozin, Dapagliflozin, Empagliflozin, Ertugliflozin
 - If inadvertently taken check DKA labs.
- Metformin held on day of surgery

Managing Mild DKA in non-ICU setting

- Differentials: starvation ketosis or other causes of metabolic acidosis (lactic acidosis)
- Check if patient has received SGLT2i within past 3 days
- Give STAT dose of Lantus if not already given. Can use 0.2 units/kg or home dose etc. If Lantus was already given earlier, consider dose of NPH for extra basal insulin.
- Correction scale q 4h, FS q 4h
- NPO/ IV fluids
- Trend DKA labs: BMP/CMP, BHB, VBG
- Once anion gap normalized then resume PO, mealtime Insulin

Managing Euglycemic DKA

- Seen with SGLT2i class
- Diagnosis: BG < 250, Bicarb<18, pH<7.3, ketosis, BHB >3mmol/L
- Treatment: IVF with LR preferred for initial Mx. Replete lytes especially K
- If mild may be managed outside ICU (see above section)
- IV Insulin, Administer D5 with IV Insulin to maintain euglycemia
- Transition from IV Insulin to Basal/bolus once ketosis resolves and gap closes

Discharge Planning: Non-Insulin Agents for CKD

Metformin	Can use full dose down until GFR 45 ml/min. Below 45 do not initiate new usage and maximum 500mg BID. Do not use GFR < 30 or if pt on HD. Hold 48 hours for iodinated contrast.
Glyburide, Glipizide, Glimepiride	Avoid with advanced CKD
Alogliptin (Nesina)	Reduce dose to 12.5mg for eGFR 30-60 mL/min Reduce to 6.25mg for eGFR <30 mL/min
Linagliptin (Tradjenta)	No restriction
Sitagliptin (Januvia)	Reduce dose to 50mg for eGFR 30-<45mL/min Reduce to 25mg for eGFR <30mL/min
Saxagliptin (Onglyza)	Reduce to 2.5mg daily for eGFR <45mL/min Administer post dialysis in HD pts
Repaglinide (Prandin) & Nateglinide (Starlix)	Can be used in CKD. May need dose reduction if eGFR <30mL/min Prandin: Reduce dose with concomitant clopidogrel

Newer agents

SGLT2 inhibitors	DPP4 inhibitors	GLP1 Agonists
Canagliflozin (Invokana)	Sitagliptin (Januvia)	Dulaglutide (Trulicity)
Dapagliflozin (Farxiga)	Saxagliptin (Onglyza)	Liraglutide (Victoza)
Empagliflozin (Jardiance)	Linagliptin (Tradjenta)	Exenatide (Bydureon, Byetta)
Ertugliflozin (Steglatro)	Allogliptin (Nesina)	Semaglutide (Ozempic)

- Newest agent: GLP1/GIP: Tirzepatide (Mounjaro)

Use of Linagliptin for Inpatient use -**NEW

- New society recommendations proposing use of DPP4i inpatient for **mild** hyperglycemia
- Linagliptin 5mg po daily
- Criteria for use:**
 - HbA1c < 7.5%
 - BG < 180-200 mg/dl
 - If on home insulin < 0.6 units/kg/d
- May be used with correction scale or with basal insulin and correction scale
- If glucose remains > 200 with DPP4i alone/correction then add basal insulin.
- If on basal insulin + correction scale + DPP4i and still with ongoing hyperglycemia recommend stop DPP4i and change to basal/bolus insulin plan.
- Avoid DPP4i with history of pancreatitis, pancreatic cancer, biliary disease.

Pearls

- Pt with Type 1 DM will ALWAYS need exogenous basal insulin even if NPO or else will lead to DKA
- Avoid hyperglycemia with BG > 250 for >48 hrs
 - Start basal-bolus insulin!

Coding tips

Metabolic Encephalopathy=MCC
Type 2 MI= MCC
Severe Malnutrition=MCC
Pressure ulcer, stage 3,4 = MCC
AKI, OM, Gangrene= CC
CKD 4, 5=CC

Transitions of care pharmacy services & education

For uninsured, Medicaid pts or pts with difficulty affording medications or have FU at Medicine Specialties at Glen Oaks, can call Endo pharmacist- **Caitlyn Gordon- at 14236 or via Teams**. Please call 24 hours or more prior to discharge

Discharge planning

- Begin dc planning on admission especially if pt will require new outpatient insulin use
- Consider Insulin regimen if A1C>9- Basal plus oral vs Basal/bolus
- While converting from inpt Basal-Bolus regimen to NPH or mixed insulin for dc -convert unit-per-unit or reduce dose by 20%.
 - Give mixed insulin twice daily 2/3 prebreakfast and 1/3 before dinner
- Consider de-escalating DM treatment in elderly if A1c < goal (~ 7-8%)
- Insulin teaching for pts and/or families for pts new to Insulin
- Check coverage & authorization needs for new agents – many insurances require patients be on metformin (or proven contraindication/intolerance) w/ or w/o prior authorization
- Nutritional consult & diabetes education
- Prescribe insulin pens with pen needles, or insulin vials with syringes, and prescribe lancets, test strips, alcohol swabs, glucose tablets, and glucagon kit in the discharge prescription if needed
- FU appointment with PMD or Endo especially for pts new on Insulin and/or with A1C > 9
- Document post dc appt in chart – time & date