

Aim: To improve the care of diabetic children and reduce hospital admission when possible.

*CG8= Na, K, iCa, gluc, hct, pH, pO₂, pCO₂

Note A: Initially for all patients with an insulin pump:

- No pump boluses
- Treat with IV or SubQ insulin
- **STOP** basal rate if treating with IV insulin
- **KEEP** basal rate if treating with SubQ insulin (if no pump failure)

HHS?

- Stop insulin
- Aggressive IVF
- Consult Endo

Osmolality

$2xNa+Glu/18+BUN/2.8$

Patient with concern for new onset diabetes or are known to be diabetic with concern for DKA (Note A):
Step 1: Initiate ED DKA Order Set

- **Labs:** CG8* and POC creatinine (or BMP), Mg, CBC/diff, BHOB (or UA), A1C.
 - New onset diabetes labs: celiac cascade, TSH (reflex to free T4), GAD65 antibody, insulin antibody, islet antigen 2 antibody (ICA512)
- **IV access:** If initial pH ≤ 7.2 or **any** high risk criteria – **two** IVs
- **IVF & Rx:** Isotonic fluids (NS or LR) over 1h (≤ 36 mo 10 mL/kg, > 36 mo 20 mL/kg); consider antiemetic
- **Disposition:** Place admit order or prepare for discharge

LOW RISK (ALL of the following)

- pH > 7.2 or $HCO_3^- > 10$ AND
- Known diabetic (not new onset) AND
- Reliable home care & parent comfort

MEDIUM RISK (ANY of the following)

- pH $7.1-7.2$ or $HCO_3^- 6-10$
 - New onset
 - Unreliable home care or parent discomfort
- Discussion with endocrinologist to determine IV insulin drip vs subcutaneous insulin

HIGH RISK (ANY of the following)

- pH < 7.1 or $HCO_3^- \leq 5$
- Age ≤ 36 mo
- GCS ≤ 13
- Abnormal neuro exam
- Glu > 1000
- BUN > 30
- Osm > 330
- K < 3

Subcutaneous insulin

IV insulin

Place order for fluids and insulin

- **Labs:** POCT glucose; **Fluids:** NS at maintenance if medium risk lab values, begin PO fluids (sugar free)
- **New onset diabetic:** Give long-acting insulin (Lantus) and short acting insulin ordered per endocrine recommendations. Carb free snacks are OK.
- **Known diabetic, no pump:** Provide long-acting insulin per home schedule. Give SubQ insulin correction per home dosing or per endocrine recs.
- **Known diabetic, pump:** SubQ insulin correction per home correction. Check if pump is working.
 - If ketones negative, OK to restart pump after ensuring pump is working.
 - If ketones positive and if new pump set available: change pump and consult endo (refer to page 4), will likely need Lantus
 - If pump not working, give subQ and change pump set, consult Endo

Continue rehydration

- **Labs:** repeat POCT glucose q3hrs (consider repeat CG8)
- **IVF:** Continue maintenance NS

Dispo: ED discharge vs. Admit (Note B)

Admit patients with new onset diabetes (see page 2) or those with known diabetes + ketosis or illness requiring inpatient management per endo and the ketosis protocol (see page 3 or 4).

ED discharge criteria: Not new onset, reliable home cares, parent comfortable, tolerating PO. Discuss home plan with Endo; review insulin, glucose/ketone plan with family; next day clinic or phone follow-up

Place order for IV fluids and insulin drip (note 5, page 6). NPO

- **Labs:** POCT glucose. If initial K is > 5.5 and not hemolyzed, consider EKG and then repeat K level 1 hour after insulin drip is started.
- **IVF:** NS at 1.5 maintenance until bags 1 & 2 available. Continue NS if anuric (not bags 1 & 2). See note 6 on page 6. **Consider further boluses if hemodynamic instability. Do not start maintenance fluids until after the initial NS bolus**

Glucose	IVF and rate
> 350	NS 20K-phos+20K-acetate at 1.5 maintenance
250–350	NS 20K-phos+20K-acetate at $\frac{3}{4}$ maintenance AND D10 NS 20K-phos+20K-acetate at $\frac{3}{4}$ maintenance
< 250	D10 NS 20K-phos+20K-acetate at 1.5 maintenance

pH/HCO ₃	Age	Insulin dose and route
≤ 7.2 or ≤ 10	≤ 36 months	0.05 U/kg/h IV drip (Regular)
	> 36 months	0.1 U/kg/h IV drip (Regular)
> 7.2 and > 10	≤ 36 months	0.05 U/kg/h IV drip (Regular)
	> 36 months	0.1 U/kg SubQ (Humalog)

Prepare for admission (Note B)

- **Labs:** q hour POCT glucose
- **Dispo:** Patients on insulin drips need to be admitted to ICU

NOTE B: Patients with diabetes as a **secondary problem** can be admitted to either campus. Patient placement for diabetes as a **primary problem (including admission for ketone protocol p. 3-4)** is based on need for an insulin drip as follows:

STP ED or outside ED patients, admit to:

- STP PICU if on an insulin drip
- STP floor if not on an insulin drip

MPLS ED, admit to:

- MPLS PICU if on an insulin drip
- STP floor if not on an insulin drip

Insulin therapy during EMS transport to be decided on a case-by-case basis

Children's
Minnesota
Physician Access
866-755-2121

Aim: To standardize the care with patients admitted with a primary hospital problem of diabetes

**Patient with primary problem of diabetes being admitted to med-surg
-OR-
PICU transfer for new onset diabetes/known diabetes with resolved DKA**

Med/Surg Admission Criteria:

pH > 7.1 or HCO₃ > 6, not requiring insulin drip, and decision made with endocrine

Exclusion Criteria:

- DKA with labs outside of admission criteria
- Altered mental status
- Hemodynamic instability
- Likely Type 2 Diabetes, not requiring insulin

From Emergency Department (page 1)

Confirm:

Basal insulin given in ED. Bolus insulin ordered by hospitalist or ED, (see note 1, or note 3 for pumps)* **and**
New onset labs obtained/ordered if applicable (see note 2)

From PICU to Med-Surg (DKA resolved)

Confirm:

Basal insulin given prior to transfer and bolus insulin ordered by hospitalist or intensivist, (see note 1) **or**
Pump resumed prior to transfer (see note 3)

See "Ketone Protocol" page 3 (no pump) or page 4 (pump)

Yes

Is patient a known diabetic being admitted for clearance of ketones due to high risk to progress to severe DKA?

No

Hospital Medicine Orders

- Glucose checks pre-meals, pre-snacks, bedtime, midnight, and 0300.
- Urine Ketones Qvoid until Small or less x 2
- If PIV, continue isotonic crystalloid at maintenance for urine ketones medium or greater
- Placement of PIV after admission often unnecessary if patient is taking PO
- Replacement of Mg/K/phos not necessary in most cases. If K persistently <2.5 could RX 5 day course of oral replacement for home
- Diabetes diet order, Child Life, Social Work

**Daily in-person endo conference 8:45 am
STP Campus**

Established patient with diabetes

- Address underlying reason for diabetes admission (see note 4 for triggers)
- Follow up Diabetes appointment in place if followed by Children's Endocrinology

New Onset Diabetes

- Completion of "Journey to Home" videos
- Completion of the patient education and skills checklist found in the patient's paper chart
- Supplies prescribed to Children's MN pharmacy in advance
- Endocrinology to prescribe home going insulin with final discharge dosages

Discharge Criteria:

Ketonemia small or resolved, maintaining hydration with oral intake, trigger (if identified) addressed, education complete with competency in core skills, follow up plans in place.

Aim: To standardize the care with patients admitted with a primary hospital problem of diabetes

Pediatric DKA Prevention Decision Tree – Patient on Subcutaneous Insulin

Med/Surg Admission Criteria: pH > 7.1 or HCO₃ > 6, not requiring insulin drip, and decision made with endocrine due to risk of progression

Exclusion Criteria:

- DKA with labs outside of admission criteria
- Altered mental status
- Hemodynamic instability
- Likely Type 2 Diabetes, not requiring insulin

Daily in-person endo conference
8:45 am
STP Campus

Known T1DM with illness or with two blood glucoses in a row >300

1. Check ketones (urine or blood)
2. Always give usual Lantus/Levemir dose as scheduled
3. MIVF with isotonic non-dextrose containing fluid

What is patient's ketone level:

Urine ketones small/trace/negative or blood ketones < 1.0

Give usual meal and correction boluses as needed. Continue to check urine ketones and blood glucose q3h if emesis.

Urine ketones moderate or blood ketones 1.0-1.5

Moderate Ketones: order usual correction boluses + 50% extra (ex. For a dose of 2 units, adding 50% would be a total of 3 units)

1. Recheck blood sugar and ketones every 3 hours.
2. Correction boluses may be given every 3 hours if blood glucose remains high based on algorithm above
3. Push fluids (3-4 oz every 30 min) and continue maintenance fluids if ketones still elevated
4. If no oral intake and or emesis, may need MIVF with dextrose or more frequent ketone checks per endo
5. Cover carbs with usual meal bolus

Urine ketones large or blood ketones > 1.5

Large ketones: Double usual correction bolus

Discharge Criteria Met?

Ketonemia small or resolved, maintaining hydration with oral intake, trigger (if identified) addressed, education complete with competency in core skills, follow up plans in place

No

Yes

Discharge with clear follow up from endocrine

Aim: To standardize the care with patients admitted with a primary hospital problem of diabetes

Pediatric DKA Prevention Decision Tree – Patient on Pump

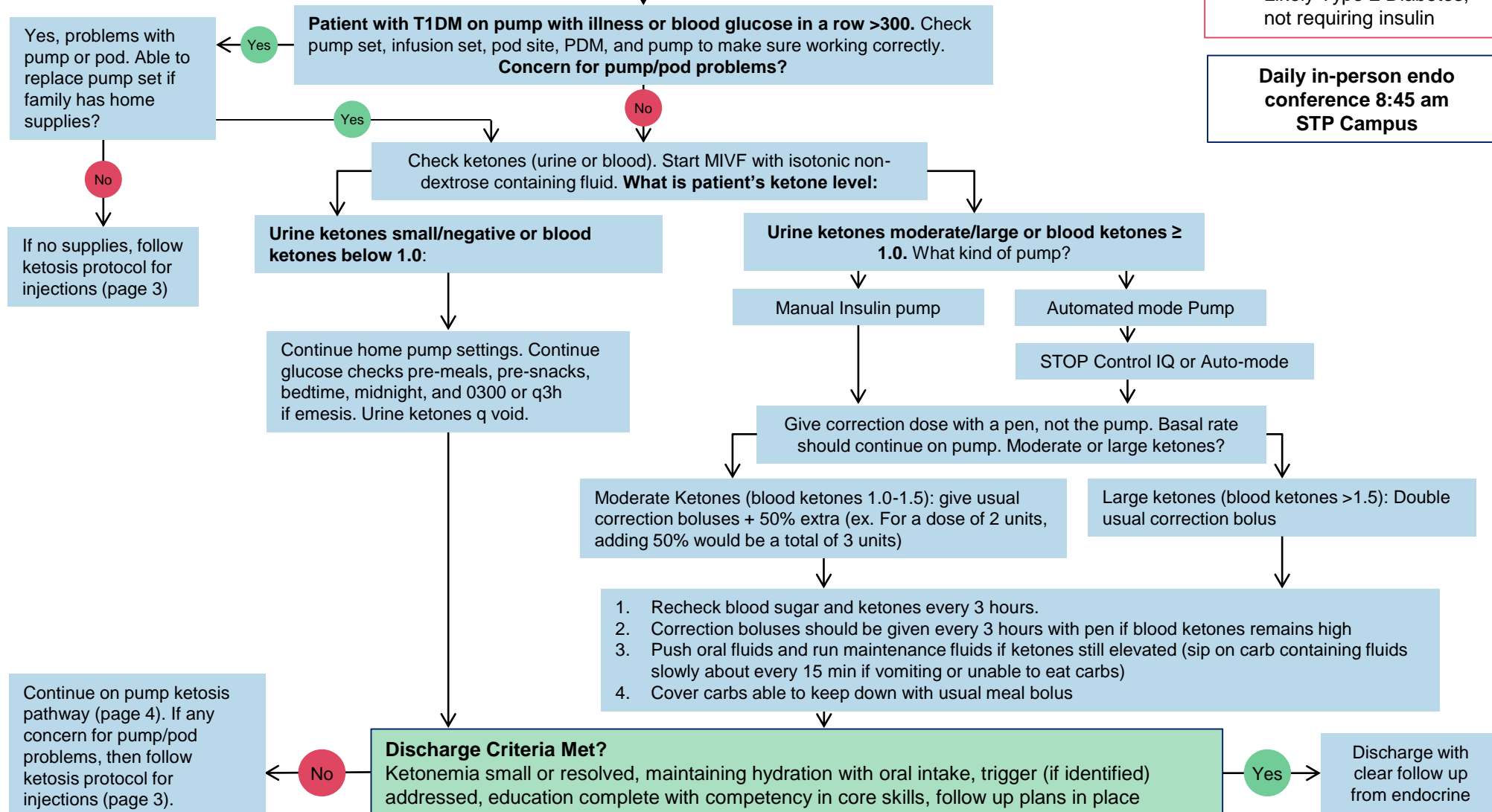
Med/Surg Admission Criteria:

pH > 7.1 or HCO₃ > 6, not requiring insulin drip, and decision made with endocrine due to risk of progression.

Exclusion Criteria:

- DKA with labs outside of admission criteria
- Altered mental status
- Hemodynamic instability
- Likely Type 2 Diabetes, not requiring insulin

**Daily in-person endo
conference 8:45 am
STP Campus**



Disclaimer: This guideline is designed for general use with most patients; each clinician should use their own independent judgment to meet the needs of each individual patient. This guideline is not a substitute for professional medical advice, diagnosis or treatment.

Note 1: Guide for a rough cross-check of insulin doses and orders

- **Total Daily Insulin (TDI):** An estimate of the total number of daily units a patient will need (basal + bolus) can be anywhere between 0.5-1.2 units/kg/day. Typically, the ratio of total long-acting insulin to short-acting insulin are roughly equal.
- **Insulin sensitivity factor (ISF):** This is often referred to as the "correction factor" and is the number that informs the "sliding scale." The ISF is how many mg/dl of blood glucose will drop with 1 unit of insulin given to correct the blood glucose back into range.
- **Carbohydrate Coverage (CC):** This is the number of grams carbohydrate 1 unit of rapid acting insulin will cover.
- **Basal Insulin:** A long-acting basal insulin is typically initiated between 0.25 ± 0.1 unit/kg/day. To avoid hypoglycemia, we often start on the lower end of the range. In the case of a pump, exclusively short-acting insulin is used to provide both basal and bolus coverage.
- Follow this link to learn how to use the Cerner Powerform for placing insulin injection orders: [Insulin Ordering Instructions](#)
- The best way to review orders already entered is in Form Browser
- Endocrinology has special considerations that go into their specific insulin recommendations for each patient. However, the below calculations can serve as a rough guide.

$$\text{TDI} = \text{wt (kg)} \times 0.55$$

$$\text{ISF} = 1800/\text{TDI}$$

$$\text{CC} = 500/\text{TDI}$$

$$\text{Basal} = 0.25 \times \text{wt (kg)}$$

Note 2: New onset labs

- New onset diabetes labs: celiac cascade, TSH (reflex to free T4), GAD65 antibody, insulin antibody, islet antigen 2 antibody (ICA512)

Note 3: Insulin pump orders

- Hospitalist may enter "may use home pump" order. All specific insulin pump orders and pump programming to be ordered by endocrine per hospital policy [349.00](#). Endocrinology has up to 18 hours to place detailed pump orders after admission.

Note 4: Glucose control issues in a patient with known diabetes

- Infection (consider appendicitis, pneumonia, viral infection, etc...)
- pump set failure, expired or damaged insulin, lack of access to effective diabetes supplies
- Medications (new steroid, etc)
- Insulin omission

Note 5: Insulin dwell time?

- Not necessary
- *Consider for stable neonatal patients*

Note 6: When to include potassium in medium and high risk patients in DKA?

- If K+ >5.5: Measure K+ hourly, if rising, evaluate for renal failure
- If K+ 3.5-5.5: continue with IV fluids from ED that have 20mEq Kphos + 20mEq Kacetate per liter
- If K+ <3.5 on arrival: Start NS + 60 mEq potassium (30 mEq Kacetate + 30mEq Kphos)

COMPLETE DIABETES WORKGROUP: Bergmann, Arms, Kylo, Abuzzahab, Oberdorfer, Plager, Bloomquist, Kenefick, Brunsberg