**Inclusion Criteria**
- Suspected DKA
- OR
- Suspected new diabetes

**Exclusion Criteria**
- None

**Suspected DKA or Diabetes**
- Use ED DKA Suspected Plan to
  - Rule out DKA
  - Test for new diabetes

**DKA confirmed?**
- Yes → Treat per DKA Pathway
  - Use ED DKA Suspected Plan
- No → **Diabetes Diagnosis Confirmed?**
  - Yes → Treat Diabetes (Non-DKA)
    - Use ED Diabetes (Non-DKA) Plan
    - If hyperglycemia with ketosis (BOHB ≥ 0.6 mmol/L or MODERATE to LARGE urine ketones), in consultation with endocrinologist consider ordering one-time “insulin for sick day -)” dose, following Sick Day Management Pathway
  - No → Not Diabetes
**Inclusion Criteria**
- Type 1 Diabetes (or at Endocrine attending discretion for CF-related or steroid-induced hyperglycemia) AND
- Moderate to large urine ketones OR Blood BOHB ≥ 0.6 mmol/L

**Exclusion Criteria**
- Diabetic ketoacidosis (DKA) (use instead DKA Pathway)
- Intravenous insulin

**BOHB ≥ 0.6 mmol/L OR moderate to large urine ketones**

**Call Provider to evaluate for Diabetic Ketoacidosis (DKA)**

Has provider ordered Sick Day Management?

**Sick Day Management**
- Continue basal and rapid-acting insulin. Rapid-acting can be given for glucose correction every 2-3 hours.
- Maintain good hydration
  - Give fluids, may require alternating carbohydrate-free and carb-containing fluids
  - Consider IV fluids if patient is unable to tolerate PO
- Do not use glucagon for hypoglycemia while ketones present

**Monitoring**
- Ensure unused IV available for blood draws
- **Check serum BG and serum BOHB every 3 hours**
  - If BOHB results unavailable after 30 minutes, check urine ketones
  - If serum glucose unavailable after 30 minutes or if concern for hypoglycemia, check fingerstick BG
- Watch for signs of DKA (vomiting, persistent ketones not decreasing); evaluate for DKA (pH, electrolytes, BOHB) if signs are present

**Discharge Criteria**
- Sick day management RN teaching and education, in collaboration with Diabetes Nurse Educator

**Insulin dose = insulin to cover carbs + 1.5x(insulin to correct glucose)**

**Insulin dose = insulin to cover carbs + 2x(insulin to correct glucose)**

**Insulin dose = insulin to cover carbs + 1.5x(insulin to correct glucose)**

**Return to Home**
Inclusion Criteria
- Glucose LESS THAN 80 mg/dL
- Patient receiving subcutaneous insulin (by pump or injection) or insulin in parenteral nutrition

Exclusion Criteria
- Patient on IV continuous insulin infusions (including diabetic ketoacidosis (DKA))

Blood glucose less than 80 mg/dL identified

Patient safe to have simple carbohydrates administered orally or by feeding tube?

YES

Treat hypoglycemia (oral)

Hold meal tray
Give simple carbohydrates
Age ≤ 5 years: 10 g (2.7 oz = 81 mL fruit juice)
Age > 5 years: 15 g (4 oz fruit juice)
Check glucose 15 minutes post intervention

Glucose < 80 mg/dL

Check glucose 15 minutes post intervention
Blood glucose 80 mg/dL or greater
Resume routine monitoring per physician order
Cover carbohydrates in meal. Do not correct glucose value after hypoglycemia treatment.

Return to Home

NO

Loss of consciousness or seizure with glucose < 60 mg/dL?

Call a CODE BLUE

Continue glucose checks every 15 minutes
Contact provider for plan. Provider decides to treat?

YES

Treat hypoglycemia (IV, IM)

IV access
Administer D10W bolus
Check glucose 15 minutes post intervention
Blood glucose 80 mg/dL or greater
Resume routine monitoring per physician order
Cover carbohydrates in meal. Do not correct glucose value after hypoglycemia treatment.

NO

No IV access
Administer IM glucagon (may give up to 2 doses per episode)
Check glucose 15 minutes post intervention
Glucose < 80 mg/dL, consider placing IV
If more than one hour until next meal give 10-15 carb snack without insulin coverage

Blood glucose 80 mg/dL or greater
Clinical Changes That Can Affect Glucose

Clinical changes that affect glucose include

- Vomiting/diarrhea
- Change in dextrose rate or concentration of IV fluids
- Change in oral intake
- Changes in dosing or prescribing of medications that are likely to affect glucose, for example
  - Steroids
  - Tacrolimus, sirolimus
  - Cyclosporine
  - Beta-blockers can mask symptoms of hypoglycemia
Monitoring Parameters and Backup Measures

All patients on Sick Day Management will have the following labs at least every 3 hours:

- Blood glucose
- Serum BOHB

**NOTE:** Send BOHB and blood glucose to the lab in a green top tube.

If not resulted in 30 minutes, proceed with backup measures:

- Fingerstick glucose
- Urine ketones
Approved August 2013

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This pathway was developed through local consensus based on published evidence and expert opinion as part of Clinical Standard Work at Seattle Children’s. Pathway teams include representatives from Medical, Subspecialty, and/or Surgical Services, Nursing, Pharmacy, Clinical Effectiveness, and other services as appropriate.

When possible, we used the GRADE method of rating evidence quality. Evidence is first assessed as to whether it is from randomized trial or cohort studies. The rating is then adjusted in the following manner (from: Guyatt G et al. J Clin Epidemiol. 2011;4:383-94.):

- Quality ratings are downgraded if studies:
  - Have serious limitations
  - Have inconsistent results
  - If evidence does not directly address clinical questions
  - If estimates are imprecise OR
  - If it is felt that there is substantial publication bias

- Quality ratings are upgraded if it is felt that:
  - The effect size is large
  - If studies are designed in a way that confounding would likely underreport the magnitude of the effect OR
  - If a dose-response gradient is evident

Guideline – Recommendation is from a published guideline that used methodology deemed acceptable by the team.

Expert Opinion – Our expert opinion is based on available evidence that does not meet GRADE criteria (for example, case-control studies).

**Quality of Evidence:**

- 🌟🌟🌟🌟 High quality
- 🌟🌟🌟 Moderate quality
- 🌟🌟 Low quality
- 🌟🌟🌟 Very low quality

Guideline
Expert Opinion
Summary of Version Changes

- **Version 1 (5/21/2013):** Go live
- **Version 1.1 (8/20/2013):** Sick Day Management added
- **Version 1.2 (8/22/2013):** ED wording changes, clarified sick day lab orders
- **Version 2.0 (2/10/2014):** Sick Day Management: added a yellow alert triangle to for a remind to initiate
- **Version 3.0 (7/30/2014):** Established Diagnosis: added guidance and recommendations for unreliable oral intake (Post-op, NPO) or vomiting
- **Version 3.1 (10/9/2014):** Established Diagnosis: added basal insulin to Unreliable Oral Intake or NPO for clarity
- **Version 4.0 (3/30/2015):** Perioperative Management added
- **Version 4.1 (10/25/2016):** Added warning triangle to hypoglycemia page
- **Version 5 (1/6/2017):** Rapid-acting insulin to be given at 0300 (removed instructions to give only if glucose >300mg/dL)
Medical Disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required.

The authors have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication.

However, in view of the possibility of human error or changes in medical sciences, neither the authors nor Seattle Children’s Healthcare System nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such information.

Readers should confirm the information contained herein with other sources and are encouraged to consult with their health care provider before making any health care decision.
Literature Search
Studies were identified by searching electronic databases using search strategies developed and executed by a medical librarian, Susan Klawansky. Searches were performed in December 2012 in the following databases – on the Ovid platform: Medline and Cochrane Database of Systematic Reviews; elsewhere: Embase, Clinical Evidence, National Guideline Clearinghouse and TRIP. Retrieval was limited to 2007 (date of then-current ISPAD guideline) to date, humans, and English language. In Medline and Embase, appropriate Medical Subject Headings (MeSH) and Emtree headings were used respectively, along with text words, and the search strategy was adapted for other databases as appropriate. Concepts searched were type 1 diabetes mellitus and ketones, ketone bodies, keto acids, hyperglycemia, hospitalization, inpatients. All retrieval was further limited to certain publication types representing high order evidence. Additional articles have been identified by project team members and added to the retrieval.

Susan Klawansky, MLS, AHIP
May 16, 2013

Identification
255 records identified through database searching
14 additional records identified through other sources

Screening
269 records after duplicates removed

268 records screened
160 records excluded

Eligibility
108 records assessed for eligibility
65 full-text articles excluded,
20 did not answer clinical question
29 did not meet quality threshold
16 outdated relative to other included study

Included
43 studies included in pathway

Flow diagram adapted from Moher D et al. BMJ 2009;339:bmj.b2535
This pathway was developed primarily based on:


This supporting literature was also cited:


