Diabetes Established Diagnosis (Non-DKA) v. 5

Inclusion Criteria
- Patient with established diagnosis of diabetes on subcutaneous insulin

Exclusion Criteria
- Diabetic ketoacidosis (DKA) (use instead DKA Pathway)
- New diabetes diagnosis requiring teaching for insulin use (use instead Diabetes: (Non-DKA) Pathway)
- Continuous insulin infusion
- Intravenous insulin (for hyperkalemia, in TPN)
- Sliding scale insulin

Treatment

HYPOglycemia Safety
- Call provider for hypoglycemia: glucose < 60 mg/dL (For patients that cannot tolerate enteral intake or are NPO: glucose < 80 mg/dL)
- Follow Diabetes: (Non-DKA) Hypoglycemia Management for glucose < 80 mg/dL

HYPERglycemia Safety
- For glucose > 500 mg/dL x 1 or > 250 mg/dL x 2
  - Check BOHB or urine ketones
  - Call provider with glucose and ketone results to evaluate for DKA or Sick Day Management

Diet
- Modified Diet Carbohydrate-counted (insulin dependent)
- Consult
- Endocrine (if not primary service)

Discharge Criteria
- Primary care provider and endocrinology follow-up arranged within 3 months

Discharge Instructions
- Call diabetes nurses’ line at (206) 987-5452 to review blood glucose within 48 hours after discharge.
- Call the endocrinologist on call at (206) 987-2000 for urgent questions about blood glucose.

Return to Home

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Last Updated: January 2017
Next Expected Revision: May 2018

Insulin
- Basal insulin once or twice daily
- Rapid-acting insulin at each meal, snacks, bedtime, and 0300

Routine Monitoring
- HbA1c upon admission if not already done in past 2 months
- Check glucose before meals, at bedtime, and 0300 AND
  - At patient/family request
  - If signs of hypoglycemia (pallor, sweating, shaking, irritability, confusion, or seizures)
  - More frequently if vomiting/diarrhea, change in dextrose rate or concentration of IV fluids, change in feeds, or change in medication (steroids, etc)

Intensive Monitoring
- Check glucose
  - Postop hourly for 2 hours after arrival to acute care unit
  - At least every 3 hours if NPO

Insulin
- Basal insulin per home regimen
- Rapid-acting insulin
  - Inject after meals when eating
  - Order every 3 hours PRN other than meal/snack/bed/night doses

Fluids
- Use fixed rate (no IV + PO)
- Consider dextrose-containing fluids (D5½NS or D5NS)
- Alternatively for patients with stable glucose, consider dextrose-free fluids (½ NS)
- Newly post-op:
  - Consider D5NS to prevent hyponatremia
  - Avoid added potassium
  - Discontinue when oral intake is adequate

Discharge Instructions
- Call diabetes nurses’ line at (206) 987-5452 to review blood glucose within 48 hours after discharge.
- Call the endocrinologist on call at (206) 987-2000 for urgent questions about blood glucose.

Return to Home
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)
- Inactive insulin

Treatment

- 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 + 2x(insulin to correct glucose)

BOHB <0.6 mmol/L* OR NEGATIVE to SMALL urine ketones within previous 1 hour

Insulin dose = insulin to cover carbs + insulin to correct glucose

BOHB 0.6-1.5 mmol/L* OR MODERATE urine ketones within previous 1 hour

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

BOHB >1.5 mmol/L* OR LARGE urine ketones within previous 1 hour

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

Call inpatient provider to discontinue Sick Day Management (ED Sick Day calculator will discontinue after each one-time insulin dose is used)

* If BOHB and urine ketone results differ, base correction dose on BOHB

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**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))

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**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
      - Blood glucose 80 mg/dL or greater
    - **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?**
      - **Yes**
        - **Call a CODE BLUE**
      - **No**
        - **Continue glucose checks every 15 minutes**
          - **Contact provider for plan. Provider decides to treat?**
            - **Yes**
              - **Treat hypoglycemia (IV, IM)**
                - **IV access**
                  - **Administer D10W bolus**
                - **No IV access**
                  - **Administer IM glucagon**
                    - (may give up to 2 doses per episode)
                  - **Check glucose 15 minutes post intervention**
                    - **Check glucose every 30 minutes for 2 hours. Consider starting IV**
  - **Blood glucose 80 mg/dL or greater**

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**Signs of hypoglycemia:**
- pallor, sweating, shaking, irritability, confusion, or seizures

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Last Updated: January 2017
Next Expected Revision: May 2018
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

Return to Sick Day
Diabetes Established Diagnosis (Non-DKA) Pathway
Citation and Approval

Approved August 2013

CSW Diabetes (Non DKA) Pathway Team:

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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)
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.
Bibliography

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:


