Diabetes Established Diagnosis (Non-DKA) v5.2

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.

For questions concerning this pathway, contact: DiabetesNonDKA@seattlechildrens.org
© 2018 Seattle Children’s Hospital, all rights reserved. Medical Disclaimer
Last Updated: September 2018
Next Expected Revision: May 2018
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 \(\geq 0.6\) mmol/L

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

BOHB \(\geq 0.6\) 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 3 hours (injection) or 2 hours (pump)
- 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 BG and BOHB every 3 hours (injection) or 2 hours (pump) (capillary POC where available, or serum)
  - 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

Insulin dose = insulin to cover carbs + 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)

Provider consider insulin dose adjustment

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

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

Reminder to initiate, BG \(>250\) mg/dL x 2 (or \(>500\) mg/dL x 1) AND BOHB \(\geq 0.6\) mmol/L (or moderate to large urine ketones)

Watch for signs of DKA, evaluate if present

Return to Home

For questions concerning this pathway, contact: DiabetesNonDKA@seattlechildrens.org
© 2018 Seattle Children’s Hospital, all rights reserved. Medical Disclaimer

Last Updated: September 2018
Next Expected Revision: May 2018
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)
- ge > 5 years: 15 g (4 oz fruit juice)
Check glucose 15 minutes post intervention

NO

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

Call a CODE BLUE

YES

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

YES

Treat hypoglycemia (IV, IM)

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.

Check glucose 15 minutes post intervention
Blood glucose 80 mg/dL or greater
If more than one hour until next meal give 10-15 carb snack without insulin coverage

NO

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

NO

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

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.

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.

If more than one hour until next meal give 10-15 carb snack without insulin coverage

Notify Contact Provider for glucose < 60 mg/dL, OR cannot tolerate enteral intake with glucose < 80 mg/dL

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

For questions concerning this pathway, contact: DiabetesNonDKA@seattlechildrens.org © 2018 Seattle Children's Hospital, all rights reserved, Medical Disclaimer

Last Updated: September 2018
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 for patients on injections, and every 2 hours for patients on a pump:
  • Blood glucose
  • BOHB (capillary POC or STAT serum)

**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
Diabetes Established Diagnosis (Non-DKA) Pathway
Citation and Approval

Approved August 2013

CSW Diabetes (Non-DKA) Pathway Team:

Endocrinology, Owner: Kate Ness, MD
Emergency Department (ED): Anne Slater, MD
Chief Resident: Jeremiah Davis, MD
Chief Resident: Eric Johnson, MD
Endocrinology Fellow: Debika Nandi-Munshi, MD
Endocrinology Fellow: David Weary, MD
Chief Medical Informatics Officer: Troy McGuire, MD
Medical Unit Clinical Nurse Specialist: Kristi Klee, DNP MSN RN CPN
ED Clinical Nurse Specialist: Elaine Beardsley, RN, MD
Pharmacy: Kara Niedner, PharmD

Clinical Effectiveness Team:

Consultant: Jen Hrachovec, PharmD MPH
Project Manager: Jennifer Magin, MBA
Data Analyst: Suzanne Spencer, MBA MHA
Information System Analyst: Heather Marshall
Informatician: Mike Leu, MD MH MHS
Librarian: Susan Klawansky, MLS
Literature Reviewer: Eileen Reichert, ARNP
Program Coordinator: Ashlea Tade

Executive Approval:

Sr. VP, Chief Medical Officer Mark Del Beccaro, MD
Sr. VP, Chief Nursing Officer Susan Heath, MN, RN, CNAA


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)
- **Version 5.1 (4/9/2018):** Added postoperative inpatient provider ordering insulin
- **Version 5.2 (9/12/2018):** Expanded availability of point of care BOHB test
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.
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

Eligibility

- 268 records screened
- 160 records excluded

- 108 records assessed for eligibility

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:


