Diabetes and Perioperative Management
Evidence Summary

Inclusion Criteria
• Patients presenting for elective surgery with acceptable metabolic control (no ketonuria, normal serum electrolytes, and HbA1c within the ideal range for the child’s age).

Exclusion Criteria
• Patients requiring emergent surgery due to trauma or acute surgical conditions, such as appendicitis.

Background
Perioperative management of the pediatric patient with diabetes can be a challenge for the anesthesiologist, surgeon and other members of the surgical team. The collaborative plan must take into consideration each patient’s individual diabetic regimen, glycemic control, planned surgical procedure and the anticipated postoperative course. The aim of the perioperative plan should be glycemic control, maintenance of hydration and serum electrolyte balance, and avoidance of hypoglycemia and other complications.

Critically Analyze the Evidence
The GRADE criteria were used to evaluate the quality of evidence presented in research articles reviewed during the development of this guideline. The table below defines how the quality of evidence is rated and how a strong versus a weak recommendation is established.

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PICO Question 1: In pediatric patients with diabetes in the perioperative setting, should home medication regimen be adjusted in preparation for fasting for the procedure?
   a. Oral
   b. Insulin

Recommendation(s): Consensus recommendation
• Oral
  o Metformin should be discontinued 24 hours prior to procedures with a perioperative period longer than 3 hours, for perioperative risk of hypoxemia, dehydration, and poor tissue perfusion or procedure with anticipated contrast media.
  o Oral diabetic medication should be discontinued on the day of surgery prior to procedures with a perioperative period longer than 3 hours.
• Insulin
  o Patients on long-acting insulin should take their usual morning dose of their long-acting insulin on the day of the procedure.
  o Patients on split/mix insulin (NPH/regular, 70/30, 75/25) should hold their morning dose on the day of the procedure and be administered 50% of their usual morning NPH by hospital staff upon arrival.
  o Patients on NPH should take 50% of their usual morning dose on the day of the procedure.

A review of the literature revealed no research studies on the topic of preoperative medication adjustments for diabetic patients in preparation for the operating room. Four consensus guidelines and/or review articles were found that discussed recommendations for changes to home medications. (1-4) As a result, the above recommendations were made by consensus from experts within the Endocrinology and Anesthesia departments based upon the patient’s procedure length and usual medication regimen.
PICO Question 2: In pediatric patients with diabetes in the perioperative setting, what physical findings, labs or symptoms require surgical delay?

**Recommendation(s):** Strong recommendation with very low quality evidence for the following:
- Patients with glucose >300 mg/dL and moderate-to-large urine ketones (serum ketones >2.5) on the day of surgery should have an endocrine consult and surgery cancellation should be considered due to the risk of complications from uncontrolled diabetes.
- Hemoglobin A1C values should not be the determining factor in the decision to cancel surgery for pediatric patients with diabetes on the day of the procedure.
- During the preoperative, visit consult Endocrine for patients with most recent HgbA1C >11 (must be within the past three months).

A review of the literature revealed eleven observational studies on the relationship between HbA1C and surgical complications. (5-15) All of the studies represented adult populations with many having comorbid conditions to warrant surgical procedures. (5,7-11,13-15) In a 2013 retrospective review, adult patients (n = 40,491) with uncontrolled diabetes (HgA1C ≥7.0%) undergoing total knee replacement had possible reductions in risks for deep infection (OR, 0.55; 95% CI: 0.29-1.06) and pulmonary embolism (OR 0.70; 95% CI: 0.43 - 1.13) compared with patients without diabetes, however neither finding reached significance. (16) Engoren et al. reported that in a retrospective review of 880 adult patients, 43% suffered complications. Hemoglobin A1C levels were similar in those patients with and without complications. (8) A cohort of patients (n = 68,872) retrospectively reviewed revealed that preoperative HbA1C and glucose concentrations were not associated with increased postoperative infection rates. (12) Harris et al. reported that patients with a preoperative HgA1C ≥7% had a 22% higher risk of having at least one surgical complication following total joint arthroplasty. (16) Due to indirectness of the evidence to the PICO question and inconsistency of the results in the body of literature, the recommendation was made to not consider HgbA1C in the decision to cancel surgery for pediatric patients with diabetes on the day of the procedure.

PICO Question 3: In pediatric patients with diabetes in the perioperative setting, how often should blood glucose be checked to maintain optimal glycemic control?

**Recommendation(s):** Consensus recommendation that patients with diabetes undergoing surgery without an insulin infusion should have POC blood glucose checked upon arrival to hospital and every two hours while NPO. Patients with diabetes undergoing surgery with an insulin infusion should have POC blood glucose checked every hour.

There were no research articles found that studied the frequency of glucose checks on the maintenance of glycemic control in diabetic patients undergoing surgery. Therefore, the above recommendation was made by expert consensus considering the need to monitor glucose and the frequency in which hyperglycemic correction doses should be administered.

PICO Question 4: In pediatric patients with diabetes in the perioperative setting, what are optimal glucose targets to maintain glycemic control?

**Recommendation(s):** Strong recommendation with very low quality evidence that patients with diabetes undergoing surgery should have a blood glucose target of 150 mg/dL with a range from 100 to 200 mg/dL.

A review of the literature revealed one meta-analysis and one observational study comparing intensive glycemic control and liberal glycemic control during surgical procedures. Buchleitner et al. found no significant differences between the intensive glycemic control group and standard group for all-cause mortality (RR 1.19; 95% CI: 0.89 - 1.59; p = 0.24) and infectious complications (RR 0.83; 95% CI: 0.45 - 1.52; p = 0.54). The meta-analysis did find an increased risk of experiencing hypoglycemic episodes with intensive glycemic control (RR 6.92; 95% CI: 2.04 - 23.41; p = 0.002). (18) However, there was a large amount of heterogeneity between studies and no standard parameters for the intensive glycemic control groups. Glycemic control was reported to be a significant risk for wound dehiscence in a 2013 retrospective review evaluating hypo- and hyperglycemic episodes on the rate of complications in high-risk patients undergoing surgical wound closure. (7)

PICO Question 5: In pediatric patients with diabetes in the perioperative setting, should insulin pump therapy be continued, suspended or substituted for long-acting insulin?

**Recommendation(s):** Strong recommendation with very low quality evidence Patients on an insulin pump scheduled for procedures with a perioperative period longer than 3 hours should have their insulin pump removed by a parent or guardian immediately before transport to the operating room. An IV insulin infusion should be started within 30 minutes of discontinuing the insulin pump.

There is a paucity of research on the topic of maintenance of insulin pump therapy for diabetic patients undergoing surgical procedures. A retrospective study of 92 cases (n = 72 patients) revealed there was no significant difference in the mean blood glucose per surgical case between patients that continued on their insulin pump infusion at basal rate during the surgical procedure (163.5 ± 58.5 mg/dL; range 48-311 mg/dL), patients that were converted to an IV insulin infusion from their insulin pump (152.3 ± 28.9 mg/dL; range 103-213 mg/dL) and patients with their insulin pump suspended during the surgical procedure (188.3 ± 44.9 mg/dL; range 118-302 mg/dL; p =
The study did find that patients with their insulin pump suspended experienced more cases (84.2%) with one or more intraoperative blood glucose measurements above 179 mg/dL than the patients who were continued on their insulin pump or converted to IV insulin infusions. The study reported that no patients experienced severe hypoglycemia (blood glucose less than 40 mg/dL). (17)

**PICO Question 6:** In pediatric patients with diabetes in the perioperative setting, what IV fluids are beneficial to maintain optimal glycemic control?

**Recommendation(s):** Consensus recommendation that patients with diabetes undergoing procedures >3 hours or requiring an IV insulin infusion during the perioperative period should be administered a 5% dextrose containing crystalloid fluid at their maintenance infusion rate.

A review of the literature revealed no studies evaluating different types of IV fluid infusions on the maintenance of glycemic control during the perioperative period. Due to lack of evidence, the above recommendation was made by consensus from experts in the Endocrinology and Anesthesia departments.

**Critical Points of Evidence**

**Evidence Supports**
- Patients with glucose >300 mg/dL and moderate-to-large urine ketones (serum ketones >2.5) on the day of surgery should have an endocrine consult and surgery cancellation should be considered due to the risk of complications from uncontrolled diabetes. Hemoglobin A1C values should not be the determining factor in the decision to cancel surgery for pediatric patients with diabetes on the day of the procedure. During the preoperative, visit consult Endocrine for patients with most recent HgA1C >11 (must be within the past three months). (5-15) – Strong recommendation with very low quality evidence
- Patients with diabetes undergoing surgery should have a blood glucose target of 150 mg/dL with a range from 100 to 200 mg/dL. (7-16) – Strong recommendation, low quality evidence
- Patients on an insulin pump scheduled for procedures with a perioperative period longer than 3 hours should have their insulin pump removed by a parent or guardian immediately before transport to the operating room. An IV insulin infusion should be started within 30 minutes of discontinuing the insulin pump. (17) – Strong recommendation, low quality evidence

**Evidence Against**
- None

**Evidence Lacking/Inconclusive**
- For patients taking oral diabetic medications, metformin should be discontinued 24 hours prior to procedures with a perioperative period longer than 3 hours, for perioperative risk of hypoxemia, dehydration, and poor tissue perfusion or procedure with anticipated contrast media and oral diabetic medication should be discontinued on the day of surgery prior to procedures with a perioperative period longer than 3 hours. (1-4) – Consensus recommendation
- For patients taking insulin at home, patients on long-acting insulin should take their usual morning dose of their long-acting insulin on the day of the procedure and patients on split/mix insulin (NPH/regular, 70/30, 75/25) should hold their morning dose on the day of the procedure and be administered 50% of their usual morning NPH by hospital staff upon arrival. (1-4) – Consensus recommendation
- Patients with diabetes undergoing surgery without an insulin infusion should have POC blood glucose checked upon arrival to hospital and every two hours while NPO. Patients with diabetes undergoing surgery with an insulin infusion should have POC blood glucose checked every hour. – Consensus recommendation
- Patients with diabetes undergoing procedures >3 hours or requiring an IV insulin infusion during the perioperative period should be administered a 5% dextrose containing crystalloid fluid at their maintenance infusion rate. – Consensus recommendation

*NOTE: The references cited represent the entire body of evidence reviewed to make each recommendation.

**Apply the Evidence**

**Adjusting home medication in preparation for fasting**
- Metformin should be discontinued 24 hours prior to procedures with a perioperative period longer than 3 hours, for perioperative risk of hypoxemia, dehydration, and poor tissue perfusion or procedure with anticipated contrast media.
- Oral diabetic medication should be discontinued on the day of surgery for procedures with a perioperative period longer than 3 hours.
- Surgery for patients requiring insulin as diabetic treatment should be scheduled first case.
- Patients on long-acting insulin should take their usual morning dose of their long-acting insulin on the day of surgery.
- Patients on split/mix insulin (NPH/regular, 70/30, 75/25) should hold their morning dose on the day of surgery and be administered 50% of their usual morning NPH by hospital staff upon arrival.
- Patients on NPH should take 50% of their usual morning dose on the day of surgery.
**Physical findings, labs or symptoms that require surgical delay**

- Patients with diabetes should have a preoperative evaluation, preferably in the PASS clinic, 1 – 2 weeks prior to surgical procedures to assess glycemic control, document total daily dose and correction factor, discuss preoperative medication management, and receive procedural education.
- Patients with glucose >300 mg/dL and moderate-to-large urine ketones (serum ketones >2.5) on the day of surgery should have an endocrine consult and surgery cancellation should be considered due to the risk of complications from uncontrolled diabetes.
- During the preoperative visit, consult Endocrine for patients with most recent HgA1C >11 (must be within the past three months).

**Blood glucose monitoring**

- Patients with diabetes undergoing surgery without an insulin infusion should have POC blood glucose checked upon arrival to hospital and every two hours while NPO.
- Patients with diabetes undergoing surgery with an insulin infusion should have POC blood glucose checked every hour.
- Blood glucose should be checked one hour after insulin pump site change.

**Blood glucose target**

- Patients with diabetes undergoing surgery should have a blood glucose target of 150 mg/dL with a range from 100 to 200 mg/dL.

**Insulin pump therapy**

- Patients on an insulin pump scheduled for surgery or procedures with a perioperative period longer than 3 hours should have their insulin pump removed by a parent or guardian immediately before transport to the operating room. An IV insulin infusion should be started within 30 minutes of discontinuing the insulin pump.
- On the day of surgery, patients on an insulin pump should omit their bolus dose unless it is needed to treat hyperglycemia above 200 mg/dL.
- Site placement of the insulin pump and patient positioning during surgery should be discussed preoperatively with the parents/guardians of patients on insulin pumps scheduled for surgical procedures.

**IV fluids**

- Patients with diabetes undergoing procedures longer than 3 hours or requiring an insulin drip during the perioperative period should be administered a 5% dextrose containing crystalloid fluid at their maintenance infusion rate.

**Measures**

**Outcome**

- Percentage of patients with post-operative complications
- Percentage of patients with pre-operative visit in the PASS clinic
- Intervention within 15 minutes for hyperglycemia and hypoglycemia management
- POC blood glucose within one hour of PACU admit time
- POC blood glucose in the pre-operative area and no more than two hours prior to anesthesia start time
- POC blood glucose every hour for patients on an IV insulin infusion
- POC blood glucose every two hours for NPO patients without an IV insulin infusion
Pt with diabetes needing surgical procedure

Schedule preoperative assessment 1-to-2 weeks prior to surgery

Preoperative assessment at the PASS clinic including:
- Assessment of glycemic control and HgA1C
- Instructions on preoperative medication management and insulin pump placement, if needed.
- Education regarding day of surgery including placement of PIV in Pre-Op area
- Schedule surgery as first case

Yes

Most recent HgA1C < 11 AND within the past two months

No

Order HgA1C

HgA1C < 11

Contact Diabetes

Consider surgery cancellation

Yes

- Proceed with scheduled surgery
- Follow instructions for preoperative medication management
Diabetes and Perioperative Management
Preoperative Medication Management Algorithm for the Day of Surgery

**Insulin Dependent or Insulin Pump user**

**Determine if patient is Insulin dependent or taking oral diabetic medication**

**Day Before Procedure**
- Administer usual doses of insulin

**Day Of Procedure (Patient Instructions)**
- Patient on Long-acting insulin
  - Administer usual dose of long-acting insulin
  - Hold usual AM dose of short-acting insulin
- Patient on premixed insulin
  - Hold AM dose of premix insulin
- Patient on NPH insulin
  - Administer 50% of NPH dose. Hold AM short acting dose
- Patient on Insulin Pump
  - Continue basal rate
  - Give usual correction dose if needed

**All Patients**
- Omit Breakfast

**Day Of Procedure (Holding Area)**
- Follow routine NPO guidelines
- Place PIV

**Day Of Procedure (Patient Instructions)**
- Patient on Long-acting insulin
  - Discontinue metformin 24 hours prior to procedure
- Patient on oral diabetic medication
  - Take oral diabetic medication as ordered

**All Patients**
- Omit Breakfast

**Day Of Procedure (Holding Area)**
- Follow routine NPO guidelines
- For patients on premixed insulin regimen, administer 50% of their usual NPH dose upon arrival to hospital
- Place PIV

**Glucose < 70 †**
- Give D10W bolus at 2 ml/kg
- Start IV D5W containing crystalloid at maintenance rate
- Check glucose in 15 minutes and repeat D10W bolus if glucose remains < 70 mg/dL

**Glucose 70-200 †**
- No intervention needed
- Check glucose in two hours if patient remains in the preoperative area

**Glucose ≥ 201-299 †**
- Administer a SQ correction dose of short acting insulin (Correct to a target of 150 mg/dL)* if the correction dose has not been given within the last two hours
- Check glucose in two hours

**Glucose ≥ 300 †**
- Administer a SQ correction dose of short acting insulin (Correct to a target of 150 mg/dL)* if the correction dose has not been given within the last two hours
- Check glucose in two hours
- Measure urine or serum ketones

**Urine ketones Mod-to-large OR serum ketones > 2.5**
- Consult Diabetes
- Consider cancellation or delay of procedure

**Maintenance Rate for IV Fluids *†**
- D5W containing crystalloid at maintenance rate
- Optimal blood glucose target †
- 150 mg/dL with a range of 100 – 200 mg/dL
- Subcutaneous (SQ) hyperglycemia correction should be given no more than every two hours

**Correction Factor (CF) instructions †**
- Dose of insulin = (current patient glucose – 150)/ CF
- Use patient's CF if known
- If CF unknown, divide 1,500 by the child’s total daily dose (TDD) to obtain CF
- If TDD unknown, use two times the long acting insulin dose for TDD

**Procedure Length †**
- Induction of anesthesia until transport to PACU

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Diabetes and Perioperative Management

Intraoperative Algorithm for Procedure Length greater than 3 hours

**Procedure length > 3 hours** (or major surgery (intra-cavity))

Yes

- Surgery should be scheduled 1st case
- Place dedicated PIVs for insulin drip and dextrose infusion

**Patients on insulin pump**

- Insulin pump should be removed by parent/guardian immediately before transport to the OR
- IV insulin should be started within 30 minutes of discontinuing insulin pump

**All other patients**

- Proceed to next step in algorithm

- Administer an IV drip of short acting insulin starting at 0.05 units/kg/hr (MIN dose: 0.03 units/kg/hr)
- Administer D5W containing crystalloid at maintenance infusion rate

**Blood glucose < 70 mg/dL**

- Give D5W bolus at 2ml/kg or DSW at 4 ml/kg if D10 unavailable
- Check glucose in 15 minutes and repeat dextrose bolus if glucose remains < 70 mg/dL
- Reduce IV insulin infusion by 0.01 units/kg/hr to a MIN of 0.03 units/kg/hr
- If IV insulin infusion is at 0.03 units/kg/hr, increase DSW infusion by 20%

**Blood glucose 70 – 100 mg/dL**

- Increase DSW infusion by 20%
- Check glucose in one hour
- Monitor for hypoglycemia

**Blood glucose 101 – 200 mg/dL**

- No intervention needed
- Check glucose in one hour

**Blood glucose > 200 mg/dL**

- Adjust dose of IV insulin infusion by 0.01 units/kg/hr as needed to keep blood glucose 100-200 mg/dL
- Check glucose in one hour

**Procedure Length**

- Induction of anesthesia until transport to PACU

**Maintenance Rate for IV Fluids**

- D5W containing crystalloid at maintenance rate

**Optimal blood glucose target**

- 150 mg/dL with a range of 100 – 200 mg/dL

**Patients on insulin pump**

- Patients with insulin pump removed preoperatively should have insulin drip started within 30 minutes of discontinuing the insulin pump.

**Follow post-op algorithm once procedure is complete and patient is moved to PACU**

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**Diabetes and Perioperative Management**

**Intraoperative Algorithm for Procedure Length greater than 3 hours**

Patient with diabetes ready for anesthesia induction for procedure

- Procedure length > 3 hours (or major surgery (intra-cavity))
- No
- Off algorithm. Use Intraop algorithm for procedures < 3 hours

**Procedure Length**

- Induction of anesthesia until transport to PACU

**Maintenance Rate for IV Fluids**

- D5W containing crystalloid at maintenance rate

**Optimal blood glucose target**

- 150 mg/dL with a range of 100 – 200 mg/dL

**Patients on insulin pump**

- Patients with insulin pump removed preoperatively should have insulin drip started within 30 minutes of discontinuing the insulin pump.

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**Long Acting Insulin**

- Leveimir
- Lantus
- Premia
- 70/30 or 75/25

**Short Acting Insulin**

- Novolog
- Humalog
- Apirda
- Intermediate
- NPH

**Insulin pump**

- Continuous short acting insulin

**Continued monitoring glucose during intraoperative period**

**At completion of procedure (immediately before to transport to the PACU),**

- For patients NOT on an insulin pump, discontinue the IV insulin infusion
- For patients with an insulin pump, continue the IV insulin infusion in the PACU

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**Diabetes and Perioperative Management**

**Intraoperative Algorithm for Procedure Length less than 3 hours**

### Procedure length < 3 hours²

- **Surgery should be scheduled 1st case**
- **Place dedicated PIV to use for glycemic correction if needed during procedure**

### Patients on insulin pump

- **Continue subcutaneous delivery of insulin via pump**
- **Administer D5W containing crystalloid at maintenance infusion rate¹**
- **Verify pump in appropriate site for procedure**
- **Glucose should be checked one hour after insulin pump site change if needed**

### All other patients

- **Proceed to next step in algorithm**

### Blood glucose < 70 mg/dL

- **Give IV D10W bolus at 2mL/kg² or D5W at 4 mL/kg if D10 unavailable**
- **Check glucose in 15 minutes and repeat dextrose bolus if glucose remains < 70 mg/dL²**
- **Start IV D5W containing crystalloid at maintenance if not already done**

### Blood glucose 70 – 100 mg/dL

- **Start IV D5W infusion at maintenance if not already done**
- **Check glucose in 1 hour**
- **Monitor for hypoglycemia**

### Blood glucose 101 – 200 mg/dL

- **No intervention needed**
- **Check glucose in 2 hours**

### Blood glucose > 200 mg/dL

- **Administer subcutaneous “correction factor” dose of short acting insulin if the correction dose has not been given within the last two hours¹**
- **Check glucose in two hours**

### Correction Factor (CF) instructions

- **Dose of insulin = (current patient glucose – 150)/ CF**
- **Use patient’s CF if known**
- **If CF unknown, divide 1,500 by the child’s total daily dose (TDD) to obtain CF**
- **If TDD unknown, use two times the long acting insulin dose for TDD**

### Maintenance Rate for IV Fluids

- **D5W containing crystalloid at maintenance rate**

### Optimal blood glucose target

- **150 mg/dL with a range of 100 – 200 mg/d**
- **Subcutaneous (SQ) hyperglycemia correction should be given no more than every two hours**

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**Follow post-op algorithm once procedure is complete and patient is moved to PACU**
Diabetes and Perioperative Management  
Postoperative Algorithm

Check glucose on arrival to the PACU and treat per “Preoperative Medication Management Algorithm for the Day of Surgery”

Patient admitted

Patient on Insulin Pump with Procedure length > 3 hours
- When parent available, resume insulin pump with basal rate
- Discontinue IV insulin infusion 30 minutes after insulin pump reconnected.

All other patients
Proceed to next step in algorithm

Patient tolerating PO fluids

- Begin dextrose containing IV fluids at maintenance rate if not already in use
- Monitor blood glucose every two hours while NPO
- Use the “Preoperative Medication Management Algorithm for the Day of Surgery” for blood glucose management
- Correction dose should only be given every two hours
- When oral nutrition resumes, proceed to next step

Long Acting Insulin
- Levemir
- Lantus
- Premix
  - 70/30 or 75/25
Short Acting Insulin
- Novolog
- Humalog
- Apirda
Intermediate
- NPH
Insulin pump
- Continuous short acting insulin

Maintenance Rate for IV Fluids
- D5W containing crystalloid at maintenance rate

Optimal blood glucose target
- 150 mg/dL with a range of 100 – 200 mg/dl
- Subcutaneous (SQ) hyperglycemia correction should be given no more than every two hours

Discharge Criteria per PACU
Consult Diabetes if:
- BG < 70 x 2 corrections
- BG > 300 x 1 correction
- Ketones present

Resume home diabetes medication and oral diet
Discontinue IV fluids if in use
Resume home glucose monitoring schedule

Discharge / transfer when all other criteria met
Off Algorithm
References


Clinical Standards Preparation
This clinical standard was prepared by the Evidence-Based Outcomes Center (EBOC) team in collaboration with content experts at Texas Children’s Hospital. Development of this clinical standard supports the TCH Quality and Patient Safety Program initiative to promote clinical standards and outcomes that build a culture of quality and safety within the organization.

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No relevant financial or intellectual conflicts to report.

Development Process
This clinical standard was developed using the process outlined in the EBOC Manual. The literature appraisal documents the following steps:

1. Review Preparation
   - PICO questions established
   - Evidence search confirmed with content experts

2. Review of Existing External Guidelines
   - ISPAD Clinical Practice Consensus Guidelines, Joslin Diabetes Center and Joslin Clinic, Children’s Hospital Boston

3. Literature Review of Relevant Evidence
   - Searched: PubMed, CINAHL, Cochrane, Medline

4. Critically Analyze the Evidence
   - 1 meta-analysis and 12 observational studies

5. Summarize the Evidence
   - Materials used in the development of the clinical standard, literature appraisal, and any order sets are maintained in a Diabetes and Perioperative Management evidence-based review manual within EBOC.

Evaluating the Quality of the Evidence
Published clinical guidelines were evaluated for this review using the AGREE II criteria. The summary of these guidelines are included in the literature appraisal. AGREE II criteria evaluate Guideline Scope and Purpose, Stakeholder Involvement, Rigor of Development, Clarity and Presentation, Applicability, and Editorial Independence using a 4-point Likert scale. The higher the score, the more comprehensive the guideline. This clinical standard specifically summarizes the evidence in support of or against specific interventions and identifies where evidence is lacking/inconclusive. The following categories describe how research findings provide support for treatment interventions. “Evidence Supports” provides evidence to support an intervention. “Evidence Against” provides evidence against an intervention. “Evidence Lacking/Inconclusive” indicates there is insufficient evidence to support or refute an intervention and no conclusion can be drawn from the evidence.

The GRADE criteria were utilized to evaluate the body of evidence used to make practice recommendations. The table below defines how the quality of the evidence is rated and how a strong versus weak recommendation is established. The literature appraisal reflects the critical points of evidence.

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Recommendations
Practice recommendations were directed by the existing evidence and consensus amongst the content experts. Patient and family preferences were included when possible. The Content Expert Team and EBOC team remain aware of the controversies in the perioperative management of children with diabetes. When evidence is lacking, options in care are provided in the clinical standard and the accompanying order sets (if applicable).

Approval Process
Clinical standards are reviewed and approved by hospital committees as deemed appropriate for its intended use. Clinical standards are reviewed as necessary within EBOC at Texas Children’s Hospital. Content Expert Teams are involved with every review and update.

Disclaimer
Practice recommendations are based upon the evidence available at the time the clinical standard was developed. Clinical standards (guidelines, summaries, or pathways) do not set out the standard of care and are not intended to be used to dictate a course of care. Each physician/practitioner must use his or her independent judgment in the management of any specific patient and is responsible, in consultation with the patient and/or the patient’s family, to make the ultimate judgment regarding care.

Version History

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