“Troubleshooting Diabetes”

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CLINICAL NUTRITION

Texas Children's Hospital

2025 Virtual Diabetes Management Conference for School Nurses

Provided by Texas Children's Hospital

NURSING CONTINUING PROFESSIONAL DEVELOPMENT

Texas Children's Hospital is approved with distinction as a provider of nursing continuing professional development by the Texas Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

This NCPD activity awards up to 6.5 contact hours.

REQUIREMENTS FOR SUCCESSFUL COMPLETION

To receive contact hours for this nursing continuing professional development activity, the participant must:

- Register for the continuing professional development activity
- Attend at least one session of the professional development activity
- Complete the pre-conference survey
- Complete the post-conference evaluation

Print your "Certificate of Successful Completion" once you have completed the post-conference survey online .

LEARNING OUTCOMES

- At the conclusion of this conference, 80 % of attendees will be able to name one concept learned on the post conference survey as it relates to care of the child with diabetes.
- At the conclusion of this conference, 80 % of attendees will demonstrate increased knowledge as evidenced by an increase in scores on the post conference survey when compared to the pre-conference survey.

RELEVANT FINANCIAL RELATIONSHIPS

Explanation: a relevant financial relationships occurs when an individual has an opportunity to affect or impact educational content with which he or she may have a relationship with an ineligible company or a potentially biasing relationship of a financial nature.

All planners and presenters/authors/content reviewers must disclose the presence or absence of a relevant financial relationship relative to this activity. All potential relationships are mitigated prior to the planning, implementation, or evaluation of the continuing education activity. All activity planning committee members and presenters/authors/content reviewers have had their relevant financial relationships assessed, identified and mitigated by the Nurse Planner.

Daniel DeSalvo, MD: Consultant/advisory board: Dexcom and Insulet. Grant/research support: FDA Pediatric Device Consortium, NIH/NIDDK, National Science Foundation, Helmsley Charitable Trust, Insulet, Medtronic. Other/Patents: D3 hypoglycemia prediction algorithm. The relevant financial relationships have been mitigated.

Rebecca Hutchinson, BSN, RN, CDCES: Insulin pump trainer: Insulet and Tandem. The relevant financial relationships has been mitigated.

No relevant financial relationships were identified for any other individuals with the ability to control content of the activity.

Enduring Material Expiration Date: 12/31/2025

****Applicable for learners who view the activity recording after the live session & claim contact hours****

DISCLOSURES

Certified Insulin Pump Trainer	Insulet and Tandem Diabetes

OBJECTIVES

After this session, you should have a better understanding of:

- Addressing elevated blood glucose (BG) levels with and without ketones in students on multiple daily injections (MDI) and Insulin pumps
- Addressing low BG levels with students on MDI and insulin pumps
- Knowing when to administer Glucagon
- Addressing physical activity/recess

TYPES OF INSULIN PUMPS

TYPES OF CONTINUOUS GLUCOSE MONITORS (CGM'S)

↑	**Glucose is rising quickly** (more than 2 mg/dL per minute)
↗	**Glucose is rising** (between 1 and 2 mg/dL per minute)
→	**Glucose is changing slowly** (less than 1 mg/dL per minute)
↘	**Glucose is falling** (between 1 and 2 mg/dL per minute)
↓	**Glucose is falling quickly** (more than 2 mg/dL per minute)

INSULIN PENS & VIALS

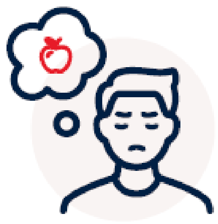
SIGNS & SYMPTOMS OF HYPERGLYCEMIA

Signs and symptoms

Here's what may happen when your blood glucose is high:

Very thirsty

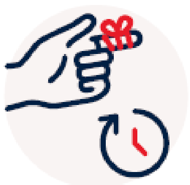
Needing to pass urine more than usual



Very hungry

Sleepy

Blurry vision



Infections or injuries heal more slowly than usual

HOW TO TREAT HYPERGLYCEMIA

1. Check glucose level with a meter

2. Determine when last dose of rapid acting insulin was given

3. Monitor for Ketones if BG is >300, 3+ hours

TREATING HYPERGLYCEMIA: MDI

You have a student that arrives at school for the day complaining of nausea and abdominal pain; no emesis per student. You check his/her BG and find it to be elevated at 380. What's the next step?

A) Allow the student to lay down until they feel better

B) Call parent to pick the student up

C) Check for ketones

D) Immediately give a correction dose of insulin

RIGHT! "C" You checked the ketones. They were **moderate**. Student states that he/she did not have breakfast this morning and did not take any insulin. Last dose of rapid acting insulin was at dinner the previous evening. What's your next step?

- When unsure, the most appropriate thing to do would be to **call the students CDCES/Doctor's office**
- Last dose of rapid acting insulin was *more than 3 hours ago* therefore a correction dose of insulin would be appropriate.
- CDCES will instruct you on a dose to give and suggest giving water/sugar-free fluids (rule of thumb: 1 oz of water per year of life, ie: 12 years old, then give 12 oz of water per hour until ketones are clear)

CALCULATING CORRECTION DOSE

Students Insulin to Carbohydrate Ratio (ICR) is 1:10; Correction Factor is 1:30; Target 100

- BG 380 minus target of 100 divided by 30
- 380-100= 280 / 30 = 9.3 units ~ give 9.5/10 units of rapid acting insulin

*Continue to give water to flush the ketones

Once you've given the insulin and provided water, you may send the student back to class.

They should return to you ~2 hours later to recheck BG & Ketones…sooner if they begin to feel worse or are unable to keep water down.

***Call parent to inform them; they may need to follow up with checking BG/Ketones at home*

HYPERGLYCEMIA CONTINUED…

Student arrives in the clinic mid-morning complaining of fatigue and generally not feeling well. CGM shows "**HI**" so you checked the BG with a meter. BG was found to be elevated at **394**.

You checked ketones (good job!!) and found them to be **negative**. The student states that they took insulin with breakfast about 3 hours ago.

Lunch is in 30 minutes, **what should you do?**

OPTIONS:

You may give a correction now and then only cover the carbs at lunch

Or

You may give water and wait until lunch and give the correction and carb coverage then

(you will need to re-check the BG since the last one was 30 minutes ago)

SIGNS & SYMPTOMS OF HYPOGLYCEMIA

Glucose level at or below 70 mg/dl

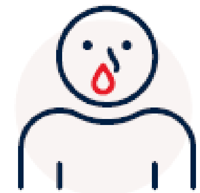
Signs and symptoms

Here's what may happen when your child's blood glucose is low:

Shaky

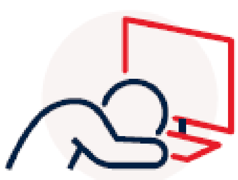
Sweaty

Dizzy



Sudden behavior change

Hungry



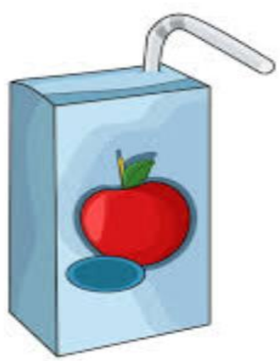
Weak or tired

Headache

Nervous or upset

HOW TO TREAT HYPOGLYCEMIA

- If blood glucose is <70 mg/dL, rapid acting carbohydrates are needed.
- We follow the "rule of 15"
  - Offer 10-15g of fast acting carbs, wait 15 minutes and re-check the glucose level



TREATING HYPOGLYCEMIA: MDI

Student presents to Nurse's office feeling shaky and clammy. Student is on CGM and BG is showing 85 with a steady arrow.

What would you do…

A) BG is 85 and steady, student is ok, send back to class

B) Automatically give juice/snack

C) Manually check BG with a meter

D) Call parent to pick student up

Right, you check the BG with a meter

The reading was **68**. Now you would offer a 15g fast acting carbohydrate snack, wait 15 minutes and re-check the BG level. (the 'rule of 15')

Once stable then send the student back to class.

Student arrives at nurse's office for pre-lunch insulin.

Current regimen is:

- ICR 1:15
- CF 1:50
- Target 100

BG is 150 and they are about to eat 45g carbohydrates

Food: 45/15=3 units

Correction: 150-100=50; 50/50= 1 unit

Total dose is 4 units

Same student has recess or PE right after lunch. Student returns to nurse's office after activity with c/o feeling low. You re-check with the meter and find the BG is now at 65.

You have begun to notice a trend of this over the last few weeks. What should you do?

A) Call parent

B) Call TCH urgent line

C) Treat the low BG and call parent

D) Do nothing as the student isn't going THAT low

C) Treat the low BG and Call parent

Correct, offer a 15g fast acting carbohydrate snack and then call the parent. Likely a call also needs to be placed to the CDCES/Doctor's office to discuss the trend as an insulin adjustment is likely needed for the lunch dose

ICR EXAMPLE….

Difference between using an ICR of 1:15 vs using an ICR of 1:18…

60g of carbohydrates…

60/15 = 4 units

60/18 = 3.3 units ~ 3 or 3.5 units depending on insulin pen type

CORRECTION EXAMPLE…

Difference between a correction of 1:50 vs using a Correction Factor of 1:40; Target 100

BG is 200

200-100 = 100/50 = 2 units

200-100 = 100/40= 2.5 units

REMINDER…

Larger *ratios equal* ***lesser*** *amounts of insulin*

Lower *ratios equal* ***larger*** *amounts of insulin*

Always consult with parent and medical team for adjustments

GLUCAGON

Student arrives at school and has athletics first period. During class the student begins to feel dizzy and passes out; student is NOT on CGM. What would you do ***first***?

A) Call EMS

B) Call parent

C) Immediately give Glucagon

D) Perform a finger stick to check blood glucose level

Ok, “D” you quickly checked the BG with a glucometer and the BG is reading “LOW” on the meter…

Now it’s time to get the **Glucagon** (injectable or nasal spray). Administer the dose and then immediately roll the student onto their side as they will likely vomit. Call EMS and parent

HYPERGLYCEMIA: INSULIN PUMPS

Student is on an insulin pump and shows up in the nurse's office complaining of nausea and abdominal cramping. Student is on CGM and its reading 277. What is your first action?

Two things actually… perform a finger stick to verify BG level and check for ketones.

Ok, finger stick was 263 and ketones are moderate

(May want to call local CDCES/Doctor's office)

- Give a correction via the insulin pump
- Offer water
- Continue to monitor q 2 hours until ketones begin to resolve

Same scenario: You gave a correction through the pump and gave the student a bottle of water; you sent them back to class. One hour later the student is back and is feeling worse. BG is now at 400 and ketones are large. Now what would you do? Suspected cause?

A) Call Pt’s local CDCES/Doctor’s office

B) Change out the insulin pump site

C) Give another correction via manual injection

D) All of the above

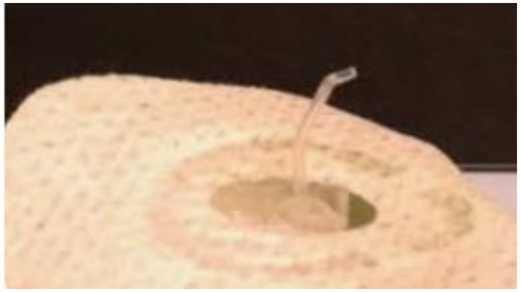
DISCUSSION:

"D", all of the above. Call CDCES/Doctor's office for advice on the amount of insulin to give. If able, you will want to give this with an actual injection.

Change the insulin pump site out as that is the likely cause, a bent cannula or cannula has come out.

Continue to give water and monitor q 1-2 hours.

Call parent

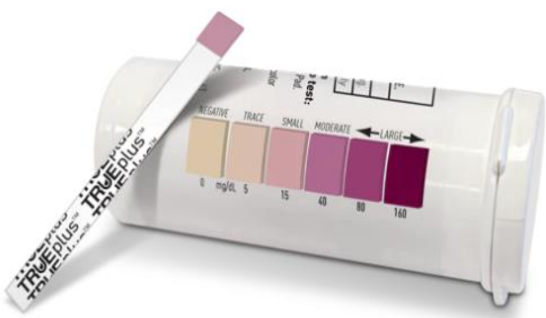


A student that is on an insulin pump arrives at the nurse's office with CGM reading "HI"; the student states that they feel fine, no symptoms, what would you do?

Check BG manually

After checking with a meter you get a reading of 385. you check ketones and they are *negative*. The student states that the last dose of insulin was at breakfast, 2 hours and 45 minutes ago.

You may give a correction via the insulin pump. If there is any insulin still on board from the previous dose, the pump will calculate that out and give the remaining correction. Offer water to keep the ketones from developing and continue to monitor.



TREATING HYPOGLYCEMIA: INSULIN PUMP

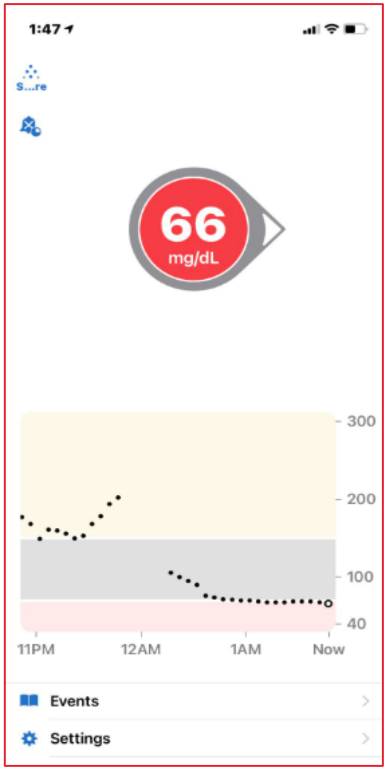
Student arrives in the nurses office complaining of feeling dizzy and ‘not right’. You check the BG and it’s at 65. You look at CGM and see that it’s at 62 with an arrow straight down.

You give a 15g fast acting carbohydrate snack to treat the low. Is there anything else that you can do?

Temp Basal vs Suspend insulin?

HYPOGLYCEMIA: INSULIN PUMP

You have a student that is wearing an insulin pump. You notice that most days following PE class, the student has low BG levels.



Thoughts on what to do?

OPTIONS:

- Give a 10-15g carbohydrate snack prior to PE
- Set a temp basal rate at 10-25% LESS for 1-2 hours
- Have parents set a new profile that turns down the basal around that time
- If lunch is prior to PE class you could adjust the lunch ICR

What do I do when my student experiences Hypoglycemia due to taking insulin and not eating all of their meal?

On MDI: encourage student to eat all carbs first, then rest of meal; may give insulin in 2 doses (not ideal but an option). Try not to give insulin dose after meal as this usually causes elevated BG

On Insulin pump: you may either bolus ½ of dose at beginning of meal and ½ after or you may set an "extend" bolus on the pump. This will deliver part of the dose now and the rest over a specified period of time. You may cancel the extend if needed/did not consume entire meal.

EXERCISE/HYPERGLYCEMIA

Things to consider:

If BG is >250 (on a pump) or >300 (on MDI), check for ketones. If positive for ketones, offer water and have student sit out of activity. If no ketones they may participate

Exercise can initially increase BG levels therefore if ketones are present you don't want exacerbation of hyperglycemia

REFERENCES

- American Diabetes Association. (2025, January). https://diabetes.org/living-with-diabetes
- Frohnert, B. I., & Chase, H. P. (2018). *A first book of understanding diabetes* (14th ed.). Children's Diabetes Foundation.
- Texas Children's Hospital Type 1 Diabetes Education Guide, 2024.

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COMMENTS/QUESTIONS?