

Insulin Pump Therapy Basics

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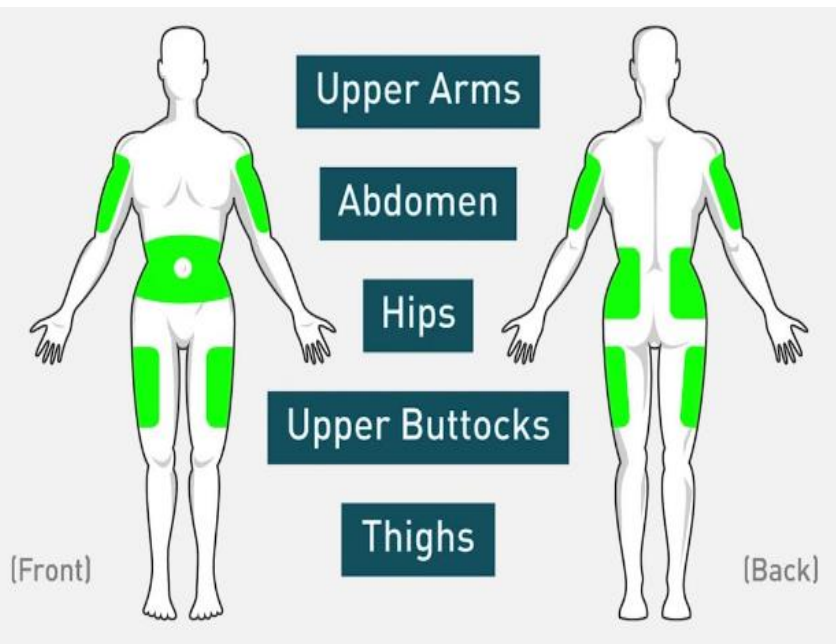
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Basics



- Change the cartridge, tubing, site, or pod every 2-3 days
 - ❖ Insulin can crystallize after 3 days
 - ❖ Insulin vials (opened or unopened) may be left unrefrigerated for up to 28 days before replacing
- Important to rotate the site/pod
 - ❖ To ensure insulin absorption
- Pump site needs to stay 3 inches or further away from a CGM site



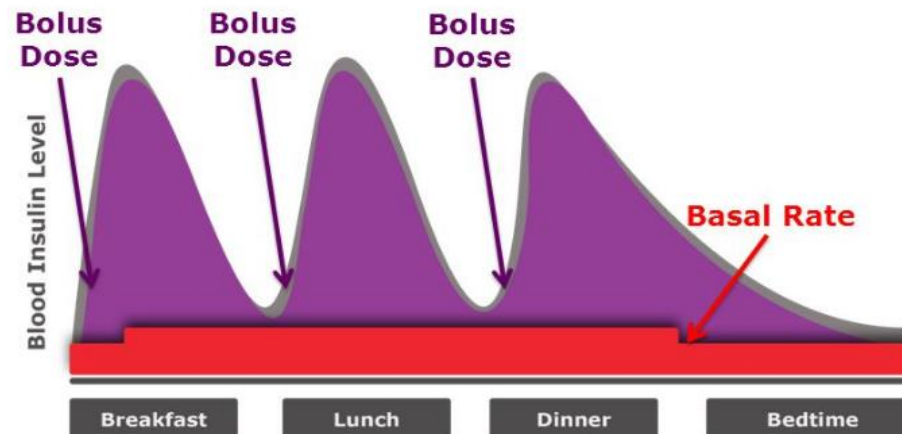
Basal and Bolus Dosing

An insulin pump uses fast acting insulin (Novolog / Humalog)


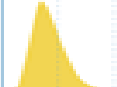
Basal Insulin: A continuous infusion of rapid acting insulin over 24 hours

Bolus Insulin: Rapid acting insulin used for carbohydrate ratio and correction doses

Insulin Pump



Dosing

Type of Insulin	Appearance	Action times after injection (in hours)
Rapid-acting <ul style="list-style-type: none">• Lispro (Humalog)• Glulisine (Apidra)• Aspart (NovoRapid)	Clear 	 Onset: 10 to 15 mins Peak: 1 to 2 hours Duration: 3 to 5 hours

Important:

Give insulin before eating if possible

- ❖ 15 minutes before fast acting insulin starts to work
- ❖ Peaks 1-2 hours after delivery
- ❖ The dose lasts in the body up to 3-5 hours



Dosing

Important:

- Enter in carbohydrates eaten for all meals and snacks
 - ❖ Even if your student wears an Automated insulin pump
- Able to give glucose correction every 2 hours if needed
 - ❖ Insulin on Board(IOB)/Active Insulin – will be applied to calculation to prevent “insulin stacking”
- May use Continuous Glucose Monitor (CGM) readings for dosing if the readings are between 70-300
 - ❖ Refer to page 4 of the Medical Management Form



Insulin on Board

It takes **3 to 5 hours** for the body to use an entire bolus of rapid acting insulin.

Your pump will remember how much insulin is still working in your body and will subtract this from the bolus dose.

This will prevent “**insulin stacking,**” which could lead to a low blood sugar.

Example:

Carbohydrate bolus: 3 units

Correction bolus: + 2 units

Active insulin / IOB: -1 unit

Total bolus recommended = 4 units



Example



7:00 AM

Breakfast: Student was dosed for glucose and carbohydrates



11:00 AM

Lunch: Student was dosed for glucose and carbohydrates



12:30 PM

Snack: Student only dosed for carbohydrates (Too soon for a glucose correction)



2:15 PM

Leaving School: If glucose was elevated could dose for correction only if needed



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Hyperglycemia



Blurred vision



Decreased healing



Drowsiness



Dry skin



Extreme thirst



Frequent urination



Hunger



Fatigue



Numbness/Tingling



Weight loss



Hyperglycemia

Causes of Hyperglycemia

- Illness
- Underestimated carbohydrates dose
- Forgot to bolus
- Pump cartridge/pod empty
- Cannula kinked/occluded under the skin
- Leak in the infusion set tubing
- Stress
- Dead batteries
- Insulin is old/hot
- Other medications
- Not rotating pump sites
- Infusion set/Pod has exceeded 72 hours
- Insulin pump malfunction



Pump Site Problems

What to do:

Redness or swelling

Leaking at the site

Detached from the
body

Suspected cannula
kink or occlusion

- Insulin must be restarted within 1 hour
- Student may replace the site/pod if marked as Independent on the Prescriber Authorization Form and has their supplies
- If the student is not marked as Independent, call the parent/caregiver to the school to assist in replacing the site/pod
 - ❖ If they are unable to come to the school, you can refer to the prescriber authorization form for insulin pen/syringe instructions
- The carbohydrate ratio and correction formula doses stay the same if having to give pen/syringe injections
 - ❖ Remember: You would need to wait 3 hours between correction doses if using an insulin pen/syringe



Pump Failure

Insulin pump no longer working

Damage to the insulin pump

What to do:

- Remove the site/pod
- The student does not have to go home
- Contact the family to inform them of the insulin pump failure
- The student does not need to go longer than 3-4 hours without **ANY** insulin due to risk of DKA
- See if the parent can come to the school to give the Long-lasting insulin dose
 - ❖ Long-lasting insulin is not typically left at the school (Safety concern)
- If the student only has fast acting insulin (Novolog or Humalog) at school, then the patient can receive a correction factor dose every three hours if needed
 - ❖ Refer to the prescriber Authorization Form for doses



Pump Failure



The student will always have a prescription for a long-lasting insulin in case of insulin pump failure.



The parent/caregiver can give the full dose of long-lasting insulin as soon as possible and will go back to injections of their fast-acting insulin.



The parent can contact the insulin pump company to get their replacement pump as soon as possible.

- ❖ If long-lasting insulin is given, the student would need to wait 24 hours before restarting the replacement insulin pump



Ketones

Refer to page 6 of the Diabetes Medical Management Plan

Important:

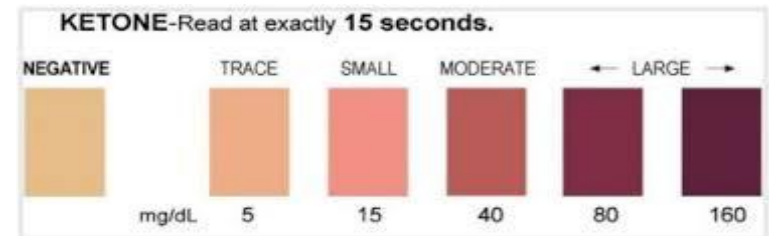
- Check for ketones if blood glucose is greater than **250mg/dl** and/or student complains of nausea/vomiting, stomachache or is feeling ill
- Continue checking for ketones with each void until negative

How to clear ketones from the body:

- Give Insulin
 - ❖ If using the insulin pump give a correction dose every 2 hours
- Drink plenty of sugar free/caffeine free fluids

Make sure the pump site is working:

- If ketones are Moderate/Large assume the pump site is not working and needs to be removed from the body
- Give a correction with fast-acting insulin via pen/syringe
- Call parents to change the site/pod
- If the student is independent, they can then change their site/pod



Ketones

If you are unable to reach the family, you can give a correction dose every 3 hours with a fast-acting insulin injection

Follow the same Prescriber Authorization form for either pumps or injections

The student should not be sent home unless they are vomiting or feeling poorly

If vomiting and unable to reach the family call the Endocrinology office and request a sick day page



Symptoms of Hypoglycemia



Anxiousness



Blurred vision



Dizziness



Fast heartbeat



Headache



Hunger



Irritability



Shaking



Sweating



Weakness/fatigue



Hypoglycemia

Causes of Hypoglycemia:

- Patient was dosed, and did not eat all their food
 - Exercise or unusually high activity
 - Bolus settings need to be adjusted
- ❖ If patterns are noticed, please let the parent know so they can upload to the diabetes educators for adjustments



Hypoglycemia

Treatment of Low Glucose at Lunch

- Refer to page 8 in the Diabetes Medical Management Plan
- If blood sugar is greater than **60mg/dl**, and not symptomatic then the **bolus may be given after lunch**
- Bolus must be given within 30 minutes of first bite
- Make sure to enter the pre meal low glucose number and the carbohydrates eaten into the pump for bolus calculations
- The insulin pump adjusts the bolus to compensate for low blood glucose (Reverse/Negative Correction)
- Do not enter the fast-acting carbohydrates (juice)
- **Do not skip insulin bolus for low blood sugar!!**



Insulin Pumps Available



Tandem t:slim X2 with Control IQ Technology



Medtronic 780G with SmartGuard



Omnipod DASH



Omnipod 5 with Automated Mode



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Automated Options

Insulin pumps that have the automated insulin delivery option:

- Medtronic 780G in SmartGuard Mode (Guardian Connect sensor)
- Tandem t:slim X2 with Control IQ Technology (Dexcom G6)
- Omnipod 5 in Automated Mode (Dexcom G6)



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Automated Insulin Pump Requirements

Automated insulin delivery (AID) or Hybrid closed loop insulin pumps

- Not all automated insulin pump algorithms work the same way
- Must have a CGM that can communicate with the insulin pump
- Automated insulin pumps do not “do everything” for you
- If you do not have a sensor/CGM, then the patient can still use the insulin pump, but it would not have the automated delivery option
- AID have the ability to use CGM readings in order to automatically adjust the basal insulin
- Most systems use predicted CGM glucose values 30 to 60 minutes in the future; they will speed up, slow down, or suspend basal insulin accordingly



Automated Insulin Pump Requirements

Automated insulin delivery (AID) or Hybrid closed loop insulin pump

- Important to enter in any carbohydrates eaten
- Bolus before eating
- Best practice is to enter a glucose reading (CGM or finger stick) into the pump for bolus calculations at least 4 times per day. (Breakfast, lunch, dinner, and bedtime)
- Enter in a glucose reading at mealtimes even if it is below or in target range. This will ensure correct calculations are completed.
- The student still has the ability to correct the glucose every 2 hours if needed (when a glucose reading is manually entered).
- Insulin on Board/Active insulin is still used in calculations for automated insulin pumps.



Websites

For more information:

- Medtronic 780G (www.medtronicdiabetes.com)
- Omnipod DASH or Omnipod 5 (www.myomnipod.com)
- Tandem t:slim X2 (www.tandemdiabetes.com)
- School Nurse Workshop Insulin Pump Videos (www.myschoolnurse.net)



Simulator Apps

Automated insulin pumps have simulator apps in order to practice.

❖ These apps will not control the insulin pump

Medtronic 780G: MiniMed Virtual



Omnipod 5: Omnipod 5 simulator



Tandem t:slim: T:Simulator



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Conclusion

Questions:

- Call Children's of Alabama Diabetes Team
- 205-638-9107 (Diabetes office)
- Can ask for a "sick day page" if needed
- 205-638-9100 (On-Call MD after hours)
- If interested in further education, please contact Mary Cochran to set up class dates and times



Questions

