Acute Complications

Purpose

This section is intended to provide information on the short-term complications of diabetes. Instructions for recognizing and treating hypoglycemia and hyperglycemia will be given. Guidelines for sick day management are provided.

Objectives

At the end of this section, you will be able to:

- State the signs and symptoms of hypoglycemia and hyperglycemia.
- List two foods to treat hypoglycemia.
- Differentiate between hypo- and hyperglycemia symptoms.
- List 3 symptoms of Hyperglycemic Hyperosmolar Nonketotic Syndrome (HHNS) and Diabetic Ketoacidosis (DKA).
- Describe sick day guidelines.

Outline

American Diabetes Association®

*The American Diabetes Association Recognizes this education service as meeting the National Standards for Diabetes Self-Management Education and Support.

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Low blood glucose (hypoglycemia)

Hypoglycemia or low blood glucose is a side effect of using insulin or certain diabetes pills. It is expected that people who use insulin or certain diabetes related medicines would sometimes have hypoglycemia. It is important you know how to treat hypoglycemia.

Safety tips

- Tell your family and friends about hypoglycemia; tell them the signs and symptoms
- Tell them how to treat hypoglycemia; they can often spot hypoglycemia sooner than you can
- Wear a medical ID tag (a variety of styles are available, check with your pharmacy or internet resources (Appendix-7)

Most frequent causes of hypoglycemia

- Ate too little food
- Ate less carbohydrate than usual
- Delayed or skipped meals or snacks
- Increased activity/work
- Took too much insulin or diabetes related medicines
- Took insulin or diabetes related medicines off schedule

If your blood glucose level is low, you may have one or more of the following symptoms.

Early Warning Signs	Late Warning Signs
Extreme hunger	Blurred vision
Shakiness, weakness	Headache, sudden
Nervousness	Abnormal behavior
Lightheadedness	Inability to concentrate
Sweating	Sleep disturbance
Tremors	Tingling or numbness (pins and needle sensation)
Cold, clammy skin	Drowsiness
Restlessness	
Fast heartbeat	
Anxiety	

These are the very late signs of low blood glucose levels

- Slurred speech
- Confusion or disorientation (“mixed up”)
- Passing out or unconsciousness
- Seizures
- Death

False hypoglycemia

“I feel like I am having low blood glucose, but the meter reads normal”.

False hypoglycemia is having the symptoms of hypoglycemia when your blood glucose levels are in normal range or even above normal range.

False hypoglycemia may occur in:

- People with newly diagnosed diabetes whose blood glucose was significantly above normal, and is now lower
- People, previously diagnosed with diabetes, with repeated high blood glucose levels, who now are experiencing improved glucose control

When treatment for the high blood glucose is started, blood glucose may return to normal ranges rapidly. Even though the blood glucose levels are near the normal range, the body feels this level is too low and will present the signs and symptoms of hypoglycemia.

These are not true symptoms of hypoglycemia and are not dangerous to the body.

Treatment for false hypoglycemia

- Wash your hands in warm, soapy water and monitor your blood glucose.
- If the blood glucose is in the normal range or higher, try to tolerate the symptoms rather than eating; if possible rest for a while and the symptoms should pass.
- Try not to drink anything other than a glass of water or a sugar-free beverage; if this does not work and the symptoms are intolerable, try eating a raw vegetable (carrots, celery) or use a minimum amount of simple carbohydrate such as one small piece of hard candy or a single glucose tablet.
- If the blood glucose is less than 70 mg/dl, follow the Rule of 15 for treating hypoglycemia.

Rule of 15 – Treatment for low blood glucose (hypoglycemia)

Monitor your blood glucose if you are feeling any of the symptoms of hypoglycemia.

If your blood glucose is between 50 – 70 mg/dl:

1. Eat 15 grams of fast acting carbohydrate.
2. Wait 15 minutes and recheck your blood glucose.
3. If your blood glucose is still below 70 mg/dl, eat an additional 15 grams of fast acting carbohydrate.
4. Recheck your blood glucose again in 15 minutes.
5. If your blood glucose is still below 70 mg/dl, repeat steps 3 and 4 until blood glucose returns to normal levels.

If your blood glucose is less than 50 mg/dl:

1. Eat 30 grams of fast acting carbohydrates.
2. Wait 15 minutes and recheck your blood glucose.
3. If your blood glucose is still less than 70 mg/dl, eat an additional 15 grams of fast acting carbohydrate.
4. Recheck your blood glucose again in 15 minutes.
5. If still below 70 mg/dl, repeat steps 3 and 4 until blood glucose levels return to normal (more than 70 mg/dl).

Special note: Persons with severe hypoglycemia who are able to swallow food without risk of choking may be talked into drinking juice or regular soda. **If there is a risk of choking, use the glucagon kit. (See page J-8)**

Foods Providing 15 Grams of Fast-acting Carbohydrates

Food	Amount
Glucose tabs	4 tablets
Glucose gel	1 tube
Glucose liquid	2 ounces
Low fat or non fat milk	1 cup
Cranberry or grape juice	⅓ cup
Orange juice	½ cup
Regular soda	½ cup
Lifesavers®	6 – 8 pieces
Sugar, honey, syrup	1 tablespoon

When your blood glucose has returned to normal

1. If no snack or meal is scheduled for the next hour, eat a small snack (example: ½ sandwich or 5 to 6 crackers with peanut butter).
2. Make notes in your blood glucose record such as:
   a. Time of occurrence
   b. Symptoms
   c. Treatment
   d. Possible cause
3. About 15 minutes after recovery, monitor your blood glucose to determine if it is more than 70 mg/dl; if not repeat the treatment for hypoglycemia.
4. If the hypoglycemia episode is mild, it is generally safe to resume normal activity soon after treatment is completed.

10. If the hypoglycemia episode was more significant, it may not be safe to do potentially risky activities, such as driving, for up to 90 minutes after recovery.

Poor food choices to treat hypoglycemia

If at all possible, avoid using complex carbohydrate sources to treat hypoglycemia; especially those containing fat. The carbohydrates in these foods will raise your blood glucose, but at a slower rate, making recovery time longer.

- Ice cream
- Milkshakes
- Candy bars
- Cheese
- Meat
- Chocolate
- Pies
- Cakes
- Nuts
- Peanut butter
- Doughnuts
- Cookies
- Cookie dough
- Pizza

Special notes

- Frequent hypoglycemia: If you have 2 or more episodes of mild hypoglycemia in 1 week call, your health care provider.
- Call if the frequency of mild or moderate hypoglycemia increases. Call if you can see a pattern developing, for example always after exercise, always in the middle of the night.
- Severe hypoglycemia: Can you treat yourself or does someone need to help you? Severe hypoglycemia means you need another person to treat your low blood glucose. Call immediately if you have ANY episodes of severe hypoglycemia.
- Safety: **Be sure to carry a fast acting source of carbohydrate with you at all times, if you use diabetes related medicines or insulin.**

Emergency treatment for severe hypoglycemia – Glucagon

- Glucagon is an emergency medicine someone else will need to give you; family, friends, and co-workers need to know how to mix and inject glucagon before you need it; make sure they know where your glucagon kit is stored.
- Use if a person is having a **severe** insulin reaction (hypoglycemia) or is in a coma and is unable to take sugar by mouth.
- The injection of this medicine will increase the blood glucose level.
- A prescription is needed to buy glucagon.
- Ask your health care provider for correct dose or amount of glucagon you should take; make sure others are familiar with mixing glucagon and how much to give.

General directions for use

Instructions need to be followed carefully. See package insert for directions specific to the glucagon kit you are using.

1. Using your fingertip, pop the flip-off seal on the glucagon bottle.
2. Remove the needle protector or cap from the needle on the syringe.
3. Plunge the needle into the rubber stopper on the glucagon bottle.
4. Inject the entire contents of the syringe into the bottle. **Do not remove the plastic clip from the syringe**. (This prevents the plunger from pulling out.)
5. Remove the needle from the bottle.
6. Gently swirl the bottle until the solution is clear and water-like consistency. The glucagon should not be used unless the solution is **clear**.
7. Using the same syringe, insert the syringe into the glucagon bottle and **gently** pull down on the plunger, withdrawing the correct dose of medicine. After dissolving the glucagon, the medicine needs to be used immediately.
8. Check with your health care provider for your specific dose.
   - Adult: 1 mg (1 unit)
   - Children weighing less than 44 pounds, give ½ the adult dose (0.5 mg)
9. **Inject glucagon immediately**. Into a large muscle such as buttock, thigh, or arm. Injecting into a muscle gives a more rapid response than injecting under the skin as you would with insulin. Make sure the entire dose is given.
10. Withdraw the needle and apply light pressure with an alcohol pad at the injection site.

After glucagon is injected and the person is unconscious

- Make sure the person is breathing and has a pulse (heart beat).
- Turn them on their side, left is preferred, in case of nausea or vomiting.
- If the person does not awaken within 15 minutes call 911 and recheck the blood glucose; a second glucagon injection can be given if necessary.

After glucagon is injected and the person is awake

- Feed the person as soon as they are able to swallow; give them a fast-acting source of sugar (i.e., regular soft drink/pop or fruit juice); then give them a long-acting carbohydrate and protein source (i.e., crackers and cheese or a meat sandwich).
- Notify the person's health care provider promptly of the situation.
- When you have had a severe low blood glucose reaction, you are at an increased risk of having another.

Over the next 24 hours

- Monitor your blood glucose often; it is recommended you test every 2 to 4 hours over the next several hours to detect reoccurring hypoglycemia or hyperglycemia from over treatment.
- Follow your meal plan.
- Follow your medicine schedule, unless your health care provider tells you otherwise.
- If any signs of low blood glucose appear, check your blood, and treat immediately as needed.

If you have used glucagon, notify your health care provider. They may want to adjust your treatment plan.

Points to remember

Storage

- Store the kit at room temperature (68° to 77°F).
- Never leave glucagon in direct sunlight.
- Discard any unused portion of mixed glucagon.

Expiration date/replacement

- Check expiration date and replace kit if expired.
- Use the expired kits to practice mixing technique before discarding.
- Write the expiration date on your calendar.
- Replace expired or used glucagon kits as soon as possible.

Driving safety

Safe driving requires focus, attention, and the ability to make quick decisions and responses. Certain diabetes medicines can cause your blood glucose to go too low (hypoglycemia). This low blood glucose can interfere with your ability to drive safely.

If you are taking any of the following medicines or any combination including these oral medicines, you are at risk for hypoglycemia while driving:

- Insulin
- Glyburide
- Glucovance®
- Glipizide (Glucotrol®)
- Symlin®
- Prandin®, Starlix®
- Glimepiride (Amaryl®)

If you are taking any of these medicines, there are a few simple guidelines to follow to ensure safety on the road.

- Monitor your blood glucose before you start driving. If your blood glucose is less than 70 mg/dl, **Do Not Drive**. Eat a snack and do not drive until your blood glucose is above 90 mg/dl and you can focus and have normal response times.

  If your blood glucose is between 70 and 90 mg/dl, eat 15 grams of carbohydrate (1 carb choice such as a piece of fruit, glass of milk, or 6 saltine crackers) before driving.
- **Have your glucose meter with you when driving**. While driving, if you feel as if your blood glucose is dropping, pull over **immediately**. Monitor your blood glucose. If your blood glucose is below 70, treat yourself with 15 grams of fast-acting glucose such as glucose gel or glucose tabs. Do not resume driving until your symptoms have stopped and your blood glucose is above 90.
- Always have a food emergency kit in the car. This should include sources of fast-acting glucose such as honey, hard candy, sugar, glucose tabs, or gel. The food items of this kit may need to change with the seasons to prevent freezing or melting.
- Plan travel time around meals or snacks when possible. Try to maintain your usual meal/snack time patterns. This may require you to stop for a meal or to carry some foods with you.
- When making long trips, plan to stop to monitor your blood glucose on a regular schedule. You may find your blood glucose levels are dropping without the usual symptoms.
- Wear medical identification that lets others know you have diabetes.

Obtaining and renewing your driver's license

Regulations will vary from state to state. If you have progressive eye disease, such as diabetic retinopathy, you may be required to submit vision reports before you renew your license. To prevent delays in renewing your license, plan for the appropriate tests/examination to be completed. Allow enough time for your doctor to complete these forms and return them to you. More information regarding this can be found on the internet (www.wisc.gov) or by calling the Department of Transportation/Division of Motor Vehicles.

High blood glucose (hyperglycemia)

Signs and symptoms

If your blood glucose level is high, you may experience one or more of the following:

- Feeling very thirsty
- Frequent urination
- Urinating more at night
- Feeling tired or weak
- Blurred vision
- Increased appetite
- Dry itchy skin
- Frequent infections that are difficult to heal or clear up
- Unexplained weight loss

What to do if you are having signs or symptoms of hyperglycemia

- To help limit the dehydration caused by high blood glucose, remember to drink more sugar-free, caffeine-free liquids.
- You will need to contact your diabetes team for specific insulin/medicine directions.
- Watch for signs like nausea and vomiting, confusion, dizziness, abdominal pain, flushed, dry skin, or sleepiness. These are signs of a worsening condition.

Prolonged high blood glucose (hyperglycemia) can lead to 2 types of acute crisis: diabetic ketoacidosis (DKA) or hyperosmolar hyperglycemic state (HHNS). Both of these can be life threatening and may result in altered mental state, loss of consciousness or possible coma and death.

Hyperglycemic Hyperosmolar Nonketotic Syndrome (HHNS)

Symptoms of HHNS are sometimes overlooked or confused with other illnesses or conditions. It is important to recognize the symptoms early and seek medical attention promptly.

Signs and symptoms	
• Dry parched mouth • Extreme thirst • Confusion • Sleepiness • Dry, warm skin (no sweating) • High blood glucose – call your health care provider if your blood glucose is more than 200 mg/dl higher than your usual blood glucose level • If your blood glucose level is over 500 mg/dl, have someone take you to the nearest emergency department immediately or call an ambulance	• Usually occurs with type 2 diabetes • Occurs when the blood glucose levels go higher and higher • Urine amounts increase (or you need to use the bathroom more often) • Dehydration sets in; may go on for days or weeks • Severe dehydration can cause confusion, seizures, coma, and death

Situations that can increase risk of HHNS

- Medicines like glucocorticoids (steroids, prednisone), Cimetidine (Tagamet®), beta blockers (Inderal®), diuretics (“water pills”), and phenytoin (Dilantin®)
- Treatments like intravenous (IV) feedings or peritoneal dialysis where large amounts of glucose could be used
- Situations where people are dependent on another person for fluids or are unable to feed themselves

Diabetic Ketoacidosis (DKA)

Symptoms of hyperglycemia may be present for several days, but the serious metabolic changes found with DKA usually occur within a short time and may mimic other diseases.

Signs and symptoms

- Nausea and vomiting
- Ketones are present in the urine
- Abdominal pain or cramping
- Loss of appetite
- Flushed skin
- Sweet, fruity odor to the breath
- Rapid deep breathing
- Dizziness
- Passing out or unconsciousness

- Usually occurs most often in people with type 1 diabetes
- Diabetic ketoacidosis or DKA occurs when you do not have enough insulin in your body

This is a serious emergency!

Sick day guidelines

Use these guidelines when you have a:

- Minor illness (cold, flu, or upset stomach)
- Dental procedure (tooth extraction or dental work and can not chew)

What you need to do:

- Monitor and record blood glucose every 4 hours, use a sick day record.
- Increase monitoring to every 2 hours if other symptoms occur such as:
  - fever
  - loss of appetite or nausea
  - not feeling well
- Keep taking your diabetes medicine.
- If you have a fever, drink liquids at least every hour.
- If you have type 1 diabetes, test your urine for ketones if your blood glucose level is over 240 mg/dl.
- If you notice any changes in your blood glucose level from your normal pattern, follow any special guidelines you have from your health care provider.

Call your health care provider if you notice any of the following:

- Rising ketone levels (type 1 diabetes)
- Ketones for more than 12 hours (type 1 diabetes)
- Blood glucose levels greater than 300 mg/dl on two consecutive checks (one after another)
- Vomiting and/or other unusual symptoms
- High (101.5°F) or rising fever
- Fever for more than 24 hours

When you call your health care provider

- Have your glucose and ketone records with you.
- Be prepared to report your blood glucose and ketone levels, the amount of insulin you have been taking, your temperature, and the amount of food/fluids you have been able to eat.

Sick day record (example)

Time	Food/Liquids	Insulin/ Medicine (name & dose)	Blood Glucose	Urine Ketones	Symptoms (fever, nausea, vomiting, dizziness, etc.)
5:30 p.m.	½ c water		328	Mod.	102.4°F Nausea
7:30 p.m.	½ c reg. soda	5 Humalog®	384	Mod.	Nausea + headache
10:00 p.m.	½ c reg. soda		436	Lg	Nausea 102.8°F

- If you cannot reach your health care provider, go to the nearest emergency department. Do not wait. Call for help if you are alone and unable to care for yourself.

Taking diabetes medicine when you are sick

- **Do not omit your insulin**, if you take insulin, take your usual dose when you are sick; **call your diabetes team if you have any questions about this**.
- If you take diabetes related medicines, take your usual dose; the stress of being sick raises your blood glucose levels even if you are not eating; this is why it is important to check your glucose (and your ketone levels if you have type 1 diabetes).

What to eat when you are sick

- When you are ill, it is important to eat the same amount of carbohydrates you normally do; if possible, follow your regular meal plan.
- It is also important to maintain hydration, drink at least 8 ounces of sugar-free, caffeine-free liquids each hour while awake.
  - Sugar-free, caffeine-free soda
  - Water
  - Broth
  - Sugar-free Kool-Aid®
  - Herbal teas
  - Decaffeinated coffee
  - Sugar-free Jello®
  - Sugar-free Popsicles®

- If you have had *nausea and/or vomiting*, start with clear caffeine-free liquids
  - Clear liquids are fluids you can see through; this would include broth, regular soft drinks, Jell-O®, apple or grape juice, and Popsicles®.
  - If your blood glucose levels are higher than 240 mg/dl, drink sugar-free, caffeine-free liquids; you may need to take extra insulin; contact your health care provider to get instructions if you do not have guidelines.
  - Space the liquids throughout the day; start with sips every 10 to 15 minutes and gradually increase in volume as tolerated; when you have an upset stomach, drinking frequent small sips of liquid can be easier to tolerate than drinking large amounts.
  - When you can keep clear liquids down, move to full liquids; full liquids include orange juice, tomato juice, ice cream, and cream soups.
  - When you are tolerating full liquids, move to soft foods; this includes oatmeal, toast, plain cooked vegetables, applesauce, rice, noodles, and crackers.
  - If you can not swallow your regular foods, try to eat soft foods; eat soft foods with the same amount of carbohydrate content as your regular diet. (See page J-20)
  - Usually soft and liquid carbohydrates are easier to tolerate until your appetite is back to normal.

When you are feeling better continue to monitor your blood glucose and ketones every 4 hours; do this until you are back to your usual patterns.

If you have not been given a sick day plan, talk with your health care provider.

Carbohydrate content of liquids and soft foods

Food item	Amount	Carbohydrate grams per amount
Apple juice/cider, grapefruit juice, orange juice, pineapple juice	½ cup (4 oz)	15 grams
Cranberry juice, 100% fruit juice blends, grape juice, prune juice	⅓ cup	15 grams
Regular soda (not diet)	½ cup	15 grams
Popsicle®, regular	1	24 grams
Gelatin, regular (Jell-O®)	½ cup	15 grams
Coffee or tea (without sugar or honey) decaffeinated recommended	1 cup	0 grams
Bouillon, broth	1 cup	0 grams
Soup, thin and broth-based e.g. chicken noodle, chicken vegetable or beef noodle	1 cup	15 grams
Cream soup, made with water	1 cup	15 grams
Cream soup, made with milk	1 cup	27 grams
Milk, whole, 2%, 1%, skim	1 cup	12 grams
Yogurt, plain nonfat	⅔ cup (6 oz)	12 grams
Yogurt, nonfat or low-fat fruit-flavored Sweetened with sugar substitute	⅔ cup	12 grams
Ice cream, regular, light, fat-free, or no-sugar added	½ cup	15 grams
Pudding, sugar-free (made with milk)	½ cup	15 grams
Pudding, regular (made with milk)	½ cup	30 grams
Cooked cereal (oatmeal)	½ cup	15 grams
Honey, sugar	1 teaspoon	5 grams

Based from Choose Your Foods Exchange List for Diabetes, 2014, American Diabetes Association, Inc.

Meal examples – 60 grams each

Clear Liquid Diet	Amount	Carbohydrate
Apple juice	1 cup (8 oz)	30 grams
Regular Jell-O® gelatin	1 cup (8 oz)	30 grams
Chicken broth	1 cup	0 grams
	Total	**60 grams**

Soft Foods Diet	Amount	Carbohydrate
Grape juice	⅔ cup	30 grams
Decaffeinated coffee, black (without sugar)	1 cup	0 grams
Cream soup, made with water	1 cup	15 grams
Pudding, sugar-free (made with low-fat milk)	½ cup	15 grams
	Total	**60 grams**

What do you eat for a meal on a sick day?

Food	Amount	Carbohydrate
	Total	

Sick day plan

I should take and do the following, if I have

Cold symptoms _____

Cough _____

Diarrhea _____

Stomach ache _____

Nausea & vomiting _____

Headache _____

Do I...

Change the dose of my medicine: ☐ Yes ☐ No

If so, which medicine and what changes? _____

_____

Test my blood glucose levels: ☐ Yes ☐ No

How often? _____

_____

Test my urine for ketones: ☐ Yes ☐ No

How often? _____

_____

If I can not eat food...

What should I do if my blood glucose levels are 180 mg/dl or greater?

What should I do if my blood glucose levels are 70 mg/dl or below?

What kinds of things would be helpful to have available for sick days?

Notes

When should I call my health care provider?

Sick day record

Doctor phone _____

Pharmacy phone _____

Time	Food/Liquids	Insulin/ Medicine (name & dose)	Blood Glucose	Urine Ketones	Symptoms (fever, nausea, vomiting, dizziness, etc.)

Adapted from *Life with Diabetes (3rd edition)*, 2004, American Diabetes Association, Virginia.