

# Diabetes Mellitus

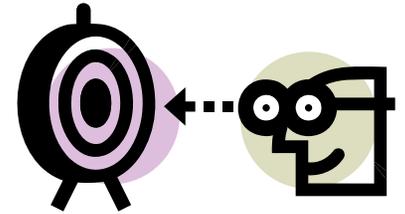
---

University of Illinois at Chicago



# Purpose

---



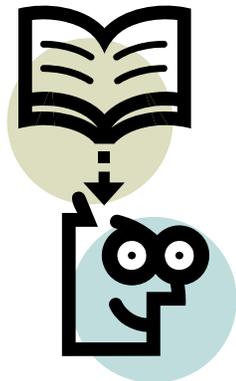
- To present a definition of diabetes
- Provide general knowledge regarding diabetes
- List recommendations for routine care
- Explain medications that need monitoring
- Outline signs and symptoms to watch for, including which ones constitute an emergency and which ones do not
- Provide questions to ask providers



# Why is Diabetes Knowledge and Management Important?

---

- A participant who has diabetes has special needs for meals and diet, blood sugar monitoring, checking their feet and skin, medication management and injections (if needed)
- The participant or caregiver should be able to understand and provide these skills on a daily basis





# Diabetes Facts

---

- Diabetes currently affects 246 million people worldwide and is expected to affect 380 million by 2025.
- 7 million people develop diabetes each year.
- 3.8 million deaths a year are attributable to diabetes. An even greater number die from cardiovascular disease made worse by diabetes-related lipid disorders and high blood pressure.
- Every 10 seconds a person dies from diabetes-related causes. (e.g., foot ulcers, osteomyelitis, sepsis (infection of the bone most likely filtering into the bloodstream))
- Every 10 seconds two people develop diabetes.
- Fourth leading cause of global death by disease.
- Aggressive control of blood sugars reduces risks of long-term complications by 20-50%.

Source: [http://www.idf.org/sound\\_bites](http://www.idf.org/sound_bites)



# World Health Organization's Definition of Diabetes

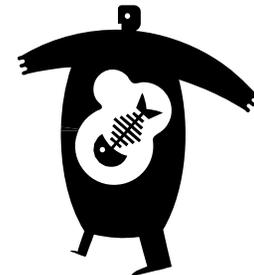
---

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces.

Hyperglycemia, or " high blood sugar", is a common effect of uncontrolled diabetes and over time can lead to serious damage to many of the body's systems, especially the nerves and blood vessels.

Source: <http://www.who.int/diabetes/en/>





# About Insulin in the Body

---

- The body uses the food we eat to power the cells.
- Insulin is a substance that allows or helps this process to occur. In diabetes not enough insulin is produced from the pancreas, or the body cells are unable to properly use the insulin.
- Therefore, people with diabetes may need to be given insulin or other medications that allow the cells to better use the insulin it produces.



# Type 1 and Type 2 Diabetes

---

- Type 1 diabetes mellitus
  - The body makes little or no insulin.
  - These participants are dependent upon receiving insulin to survive.
- Type 2 diabetes mellitus
  - The body does not make enough insulin or can not effectively use the insulin it makes.
  - These participants may need oral medication to help the body use the insulin it already has, and sometimes they may also need insulin.



# Diabetes Type 1: Symptoms

---

## ○ Common

- Sudden weight loss
- Frequent urination (polyuria)
- Frequent thirst (polydipsia)
- Frequent hunger (polyphagia)
- Frequent night-time urination (Nocturia)

## ○ Occasional

- Blurred vision
  - Urinary tract infection
  - Yeast infection
  - Fatigue
  - Acute abdominal pain
  - Flu-like symptoms
- Urine ketones usually present – discussed later
- Participant should see their healthcare provider same or next day if possible.



# Diabetes Type 2: Symptoms

---

## ○ Common

- Blurred vision
- Urinary tract infection
- Yeast infection
- Dry, itchy skin
- Numbness or tingling in extremities
- Fatigue

## ○ Occasional

- Increased urination
  - Increased thirst
  - Increased appetite
  - Frequent night time urination (Nocturia)
  - Weight loss
  - Usually NO urine ketones
- Appointment with healthcare provider should be scheduled for evaluation of these symptoms.



# Goal of Diabetes Management

---

- The goal of managing diabetes is to keep blood sugar (glucose) levels within an acceptable range.
- Both high and low blood sugars cause complications and can eventually lead to life threatening events.



# Diabetes Management

---

If participant has a medical history of diabetes:

- An appointment with the participant's healthcare provider should be scheduled:
  - Within a week of transition.
  - Approximately every 3-6 months depending upon his/her level of control and if he/she has any diabetic complications.
- Participant may be a candidate for Diabetes education through an approved program – have participant ask his/her healthcare provider.

Information can be found at [www.cms.hhs.gov/medicalnutritiontherapy](http://www.cms.hhs.gov/medicalnutritiontherapy)
- Refer to primary care if blood sugars are not controlled, if there are questions about medication, or if there are other complications (i.e. wound).



# Diabetes Management Activities



- Laboratory (blood) testing
  - A1c at least twice a year, frequently noted as HgbA1c.
  - Cholesterol levels
    - LDL goal < 100, may be lower in some participants
    - Triglycerides < 150
  - The healthcare provider may order other tests as needed.
- Annual eye exam that includes dilating the pupil to look inside.
- Frequent foot checks – participant or caregiver should learn to do this daily and healthcare providers should do this at every visit.
  - May need a foot specialist (aka podiatrist) especially with decreased sensation in feet.
- Immunizations should be up to date (especially flu, pneumonia, and tetanus)

# Diabetes Management Activities



- Medical Nutrition Therapy (MNT) or food management – may need to see a dietitian.
  - No more than one (for women) or two (for men) alcoholic drinks a day for those who do consume alcohol.
- Blood pressure less than 130/80.
- Smoking cessation – information on how to stop smoking.
- Exercise if possible – 30 minutes a day most days of the week (4 or more) if approved by healthcare provider.
- Monitoring for depression or behavioral issues may be needed.
- Blood sugar at goal level (see next slide)

# Blood Glucose (Blood Sugar) Goals

---



- Sometimes a healthcare provider may adjust a person's blood sugar goal depending upon their history and living situation
- Recommended goals from the American Diabetes Association are:
  - Before a meal 70-130
  - After a meal < 180
  - A1c or hemoglobin A1c < 7% (this is a 3 month average of the participants blood sugar and is determined by a blood test).

# Medications

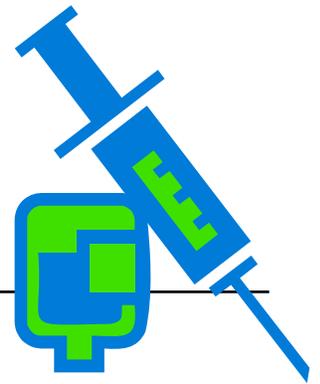
---



- Insulin – if the participant can no longer make any insulin (usually type 1) or have enough of their own insulin (usually type 2)
- Other medications that may require daily injections
- Aspirin or clopidogrel (Plavix) is frequently added to prevent blood clots, heart attacks and strokes
- Diabetics are also frequently treated for other chronic conditions that require multiple medications (i.e. high blood pressure and high cholesterol levels)

# Medication Injections

---



- Does participant have the ability to self inject?
  - Can he/she read the insulin bottle and marks on the syringe?
  - Can he/she manage to draw insulin up into the syringe at correct dose?
  - Can he/she give themselves the injection?
  - Can he/she remember when to take insulin?
  - Can he/she manage a insulin sliding scale?
  - If no to any of the above, is there a caregiver available to help?
- If the participant cannot give himself/herself the injection and there is no caregiver available, consider obtaining prior approval for home health nursing visits for monitoring and education.

# Blood Sugar Monitoring

---



The American Diabetes Association recommends blood sugar checks if you have diabetes and are:

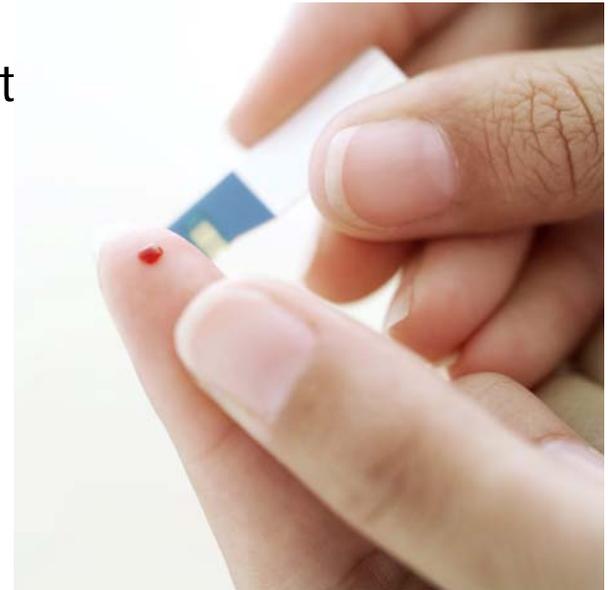
- taking insulin or any diabetes medication
- on intensive insulin therapy
- pregnant
- having a hard time controlling your blood sugar levels
- having severe low blood glucose levels or ketones from high blood glucose levels
- having low blood sugar levels without the usual warning signs – hunger, shakiness, headache, etc.
- Follow your health care provider's recommendations



# Checking Your Blood Sugar

---

- A special needle, called a lancet, is used to prick your finger/arm to get a drop of blood.
- There are spring-loaded lancing devices that make sticking less painful.
- Before using the lancing device, wash hands or site with soap and water. Make sure site is completely dry.
- If using the fingertip, stick the side of the fingertip by the fingernail to avoid sore spots on the bottom of finger.
- It is better to use the second drop of blood.
- Dispose of lancets in a sharps container (most pharmacies have a needle disposal program).



# How Frequently Should I Check My Blood Sugar?

---

This is a good question for the participant to ask his/her healthcare provider:

- If blood sugar is under control, he/she may check it no more than a couple times a week or once a day;
- If blood sugar is not under control, he/she may check his/her blood sugar 2-4 times a day (before each meal and at bedtime);
- If participant is waking up at night sweating and shaking, he/she may need to check his/her blood sugar at that time;
- Participant can check his/her blood sugar any time he/she feels like it may be too high or too low. Many people can recognize how they feel at these times.



# How to Record Blood Sugar Readings

---

- Write down results after each blood sugar check
- The results can be written down in a log book provided to the participant by his/her healthcare provider, or on a notebook or calendar.
- Be sure to include the following:
  - Date
  - Time
  - Before or after a meal and how long after
  - Blood sugar reading



# What to Do With Blood Sugar Results Once They Are Obtained

---

- Closely monitor the blood sugar record
  - Is there a pattern? Are the results high or low at the same time of day for several days in a row?
- Have the participant work with his/her healthcare provider or diabetes educator to interpret these results
- The participant should ask his/her healthcare provider if he/she should report out of a range results via phone. What are those results?
  - Examples: blood sugar < 80 or > 200.
  - Participant may become symptomatic with these abnormal results.



# What Can Cause Changes in Blood Sugar Levels?

---

- Wrong insulin or other medication dose.
- Not eating on a regular schedule or eating too little or too much.
- Increase or decrease in regular exercise/activity level.
- Decrease in medication need – could occur with a large weight gain or loss, stressful situations, or even with an illness.
- Changing insulin injection site.
- Alcohol ingestion.
- Infection.



# Long Term Complications of Uncontrolled Diabetes

---

- Cardiovascular disease
  - Important to also control blood pressure and cholesterol levels to a normal range.
  - 50% of people with diabetes die from cardiovascular disease –heart attack or stroke.
- Nephropathy or kidney disease
  - Diabetes is the leading cause of kidney disease.
  - Can result in a need for kidney dialysis.
  - 10-20% of people with diabetes die of kidney disease.



# Long-Term Complications

---

- Loss of vision (retinopathy) – the longer a person has diabetes the greater his/her risk of retinopathy.
  - After 15 years of diabetes, approximately 2% of people become blind and about 10% develop severe visual impairment.
- Neuropathy is damage to the nerves as a result of diabetes.
  - Affects up to 50% of people with diabetes.
  - Common symptoms are tingling, pain, numbness, or weakness in the feet and hands.
  - Can result in wounds and loss of toes, etc.
- The overall risk of dying if a person has diabetes is at least double the risk of their peers without diabetes and can decrease their life expectancy by 5-10 years.

<http://www.who.int/mediacentre/factsheets/fs312/en/>



# Foot Care

---

- Foot care is extremely important for participants with diabetes.
- If they have neuropathy and cannot feel their feet they can develop severely infected wounds and end up needing an amputation.



# Foot Care Tips

---

- Inspect feet daily for signs of red spots, blisters, warmth, open areas.
- Use mirror to see bottom of feet if necessary.
- Do not soak feet.
- Feet need to be dried thoroughly after bathing, especially between the toes.
- Wear good fitting footwear at all times, inside and outside. Have them look inside them before putting them on to be sure nothing is in there that could stick to the foot.
- Any change in the skin or feet should be reported to the healthcare provider right away with a follow-up appointment.
- A participant with diabetes and changes in foot sensation should see a podiatrist (foot doctor) annually.

Source: <http://www.diabetes.org/type-1-diabetes/well-being/foot-care.jsp>



# Wounds



- A person with diabetes can have a wound or injury and not know it.
- Wounds should be kept as clean as possible.
- At first sign of skin change/wound participant should see his/her healthcare provider.
- Wounds on an extremity is a major cause of amputation.
- Any wound or skin change should be taken very seriously.
- Wound management may require dressing changes one to several times a day.
- Be aware of signs of infection: redness, swelling foul odor, discolored drainage, fever, chills.
- Consider obtaining a doctor's order for home care nursing for wound management.



# Life Threatening Complications

---

- These life threatening complications can happen very suddenly and require hospitalization. \* \*
- *Diabetic Ketoacidosis - Type 1*
- *Hyperosmolar Hyperglycemic Nonketonic Coma - Type 2*
- *Hypoglycemia/Insulin Reaction*
- Hypoglycemia can also be mild to moderate and managed at home.

\* \*These Conditions are defined on the following slides.



# Warning Signs

---

- Blood sugar level less than 80 or higher than 250
  - Less than 60 can be life threatening.
  - Blood sugar levels that are higher than usual may be a sign of illness or infection.
    - A common illness that can have no symptoms other than an elevated blood sugar is a urinary tract infection.



# Hypoglycemia (Low blood sugar)

---

- Blood sugar falls below 60 or 80 with symptoms (see next slide).
- Insulin reaction usually has a sudden onset and rapid progression.
- Hypoglycemia due to not eating can be slower.
- Signs and symptoms are due to impaired brain function and nervous system response.



# Hypoglycemia Symptoms

---

- Mild symptoms of hypoglycemia include:
  - Shaking, Sweating, Fast heart rate, Dizziness, Hunger, Blurred vision, Irritability
- Moderate symptoms of hypoglycemia include:
  - Confusion, Tiredness, Yawning, Poor coordination, Headache, Double vision, Combativeness
- Severe symptoms of hypoglycemia include:
  - Unconscious, Seizures
  - Life threatening event call 911.



# Hyperglycemia (High Blood Sugar)

---

- Fasting blood sugar  $> 126$ ; no calorie intake for at least 8 hours.
- Casual blood sugar  $> 200$  at any time of the day.
- 2 hour testing after oral glucose challenge of blood sugar  $> 200$ .
- Over time a high blood sugar can cause changes to nerves and blood vessel resulting in long-term complications.
- Blood sugars can rise slowly if a person's calorie intake increases or quickly if they stop taking their insulin.

[http://care.diabetesjournals.org/content/30/suppl\\_1/S42.full](http://care.diabetesjournals.org/content/30/suppl_1/S42.full)



# Hyperglycemia Symptoms

---

- Dry mouth
- Extreme thirst
- Frequent urination
- Extreme hunger
- Weakness
- Blurred vision



# Diabetic Ketoacidosis

---

- When there is not enough insulin in the body, the body uses fats for energy to fuel the brain and cells. The use of fats causes an increase in what is called *ketones* in the body. This can be life threatening. This can occur in persons who are dependent upon insulin (Diabetes Type 1).
- For this reason people should not stop taking their insulin.



# Diabetic Ketoacidosis

---

- Blood sugar levels can reach 250-1000 or greater.
- This causes frequent urination which can lead to dehydration and loss of needed sodium and potassium.
- The person will typically have a history of 1-2 days of raising blood sugar levels with frequent urination, feeling of extreme thirst, nausea, vomiting, dehydration, marked fatigue, eventually stupor and coma.
- The person's breath will have a signature fruity smell.
- May experience abdominal pain and tenderness.



# When to Test for Ketones

---

- The participant should ask his/her healthcare provider when to check for ketones.
- They may be advised to check for ketones when:
  - Blood sugar is more than 300 mg/dl
  - Feel nauseated, vomiting or having abdominal pain
  - Are sick (e.g., common cold, flu)
  - Feel tired all the time
  - Thirsty and/or very dry mouth
  - Flushing of the skin
  - Difficulty breathing and/or fruity breath
  - Feeling confused or "in a fog"
- These can be signs of high ketone levels, seek medical care.



# Checking for Ketones

---

- Some participants may need to check their urine for ketones.
- Ketones in the urine is a sign that their body is using fat for energy instead of using sugar because not enough insulin is available to use sugar for energy.
- Ketones in the urine is more common in type 1 diabetes.
- The participant can learn this process from their healthcare provider.



# Urine test for Ketones

---



- Here's how most urine tests go:
  - Check to make sure the strip is not outdated.
  - Get a sample of urine in a clean container.
  - Place the strip in the sample (or pass the strip through the urine stream).
  - Gently shake excess urine off the strip.
  - Wait for the strip pad to change color. The directions will tell you how long to wait.
  - Compare the strip pad to the color chart on the strip bottle. This gives you a range of the amount of ketones in the urine.
  - Record your results.

# Hyperosmolar Hyperglycemic Nonketonic Coma (HHNC)

---

- HHNC is due to not enough insulin or too much sugar (food). It can occur in participants who are not dependent upon insulin-diabetes type 2.
- Blood sugar levels can increase to over 600.



# Hyperosmolar Hyperglycemic Nonketonic Coma (HHNC)

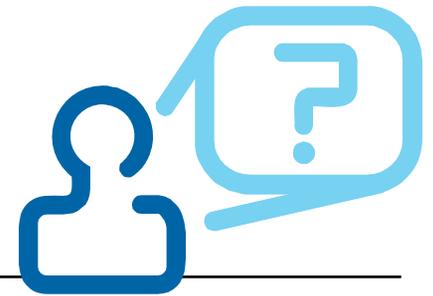
---

- Signs and symptoms are:
  - Dehydration – see [Dehydration Module](#)
  - Neurological- from effects on the brain - seizures, difficulty speaking, muscle twitching, fever or increased body temperature, jerky eye movements, seeing things that are not there (visual hallucinations), excessive urination and excessive drinking of fluids.



# Questions to Ask Prior to Transition

---

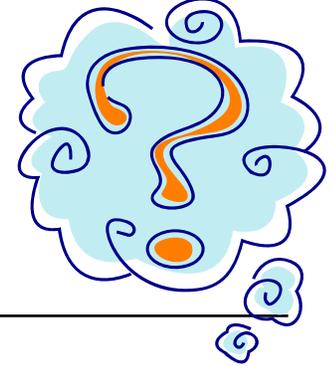


- Are participant's blood sugars within a controlled range?
- Does participant know how to and is able to check his/her own blood sugar level?
- Does the participant have episodes of hypo or hyperglycemia (low or high blood sugar levels)?
- Is there a complete list of his/her medications?
- Does participant understand and know how to take his/her medications?
- If the participant gets insulin injections, is he/she able to do self injections? If not, why not?
- Does participant follow an ADA (diabetic) diet?
- Does participant understand his/her diet restrictions?



# Questions to Ask Prior to Transition

---



- Can participant tell/feel when his/her blood sugar is too high or too low?
- Does the participant know how to check his/her own feet and its importance?
- Does the participant have any sores or open wounds?
- When was the participant's last eye exam? Dental check? Foot check?
- When was his/her last blood work completed?
  - Examples: A1c, Lipid panel, Kidney function tests
- Does participant have an appointment with his/her healthcare provider for follow-up after transition?



# What Can the TC do?

---



- PERS – Personal Emergency Response System
- Healthcare provider visit the first week after transition
  - Have participant ask healthcare provider about referral to an approved diabetes education program.
- Consider obtaining physician's approval for home health nursing:
  - Blood sugars are out of control or participant is not able to check his/her blood sugars
  - Complex medication regime
  - Has difficulty or is unable to perform self-injections
  - Wounds or open skin areas – especially on the feet
  - Recent ED visit, hospitalization or illness
  - Participant needs education on diabetes management
- Participant needs good fitting shoes and should wear them at all times.



# Case Study

---

- Ann is a 52 year old female with diabetes mellitus type 2.
- Her other medical conditions include:
  - Diabetic retinopathy, diabetic neuropathy, asthma, arthritis, abdominal hernia, obesity, hypothyroidism, hyperlipidemia and CAD (coronary artery disease) with cardiac stents.
- Her medications include:
  - Lantus 20 units at bedtime (a long acting insulin),
  - metformin 1000 mg BID,
  - Neurontin 600 mg TID,
  - lisinopril/HCTZ 20/12.5 mg daily,
  - Advair discus inhaler 50/500 BID,
  - simvastatin 40 mg daily,
  - Singulair 10 mg daily,
  - levothyroxine 100 mcg daily,
  - Tylenol 500 mg 2 po every 4-6 hrs prn,
  - Plavix 75 mg daily,
  - Aspirin 325 mg daily,
  - Xanax 0.25 mg at bedtime.



# Case Study

---



- Ann was transferred from the hospital to Maple Nut Nursing Home after she was hospitalized for a blood sugar level of 750 and during hospital admission she had chest pain and underwent cardiac stent placement.
- During Ann's stay at Maple Nut Nursing Home, she developed a wound on her buttocks and when that was almost healed she was found to have one on her heel.



# Case Study

---



- Sensory needs/impairments include.
  - Glasses for decreased vision due to the diabetic retinopathy.
  - A walker for decreased mobility because of weight issues and diabetic neuropathy.
  - Wound care and supplies for her heel wound.
  - Occasional management of pain secondary to the heel wound and diabetic neuropathy-currently she is on Neurontin and Tylenol prn.

# Case Study

---

- Hospitalizations – admitted once 9 months ago only for hyperglycemia, blood sugar > 600.
- Emergency room visits – twice since admission to Maple Nut, most recent fall was 6 weeks ago related to not using her walker.
- Other disciplines involved in care:
  - Dr. Reynolds is Ann's nursing home physician, but will not be managing her care after transition.
  - Physical therapy for mobility training and fall prevention.



# Case Study Questions

---



- Ann takes insulin injections nightly.
  - What might prevent Ann from giving herself injections?
  - What kept Ann in the nursing home after her blood sugars were again normal?
  - What other disciplines should be involved in Ann's care after transition?
  - Is Ann a candidate for diabetes education through an approved diabetes education program that is offered at hospitals and covered by Medicaid?

# What might prevent Ann from giving herself injections?

---

- She has diabetic retinopathy. Depending upon her level of vision she may not be able to see the readings on the glucose meter or the markings on the insulin syringe.
- Neuropathy. Participants with neuropathy can have neuropathy in different places. If she has it in her hands, she may not be able to handle a syringe to fill it with insulin or give herself an injection.



# What kept Ann in the nursing home after her blood sugars were again normal?

---

- Her wounds. First she developed a wound on her buttocks and then she developed a wound on her heel.
  - Participants with diabetes heal slower than non-diabetic persons. Also, they have a higher risk of infection. The higher his/her blood sugar the slower the wound healing and the greater the risk for infection or other illnesses.
  - People with diabetes often develop bladder or urinary tract infections and no one knows it until the person is very sick.



# What other disciplines should be involved in Ann's care after transition?

---

- **Home care nursing** – With prior approval, they can assess Ann's ability to manage her own diabetes including her ability to give herself injections. They can teach her about her disease process, diet, activity and medications. Home care nursing can also help to manage her wounds.
- **Physical therapy** – With prior approval, PT can assess the home environment and make recommendations for modifications as well as do mobility training since Ann is a fall risk with a previous fall.
- **Occupational therapy** – With prior approval, due to Ann's visual impairment, OT can do an assessment and assist with making home modifications such as large clocks, markings on stove, etc.



Is Ann a candidate for diabetes education through an approved program that is offered at hospitals?

---



- Many hospitals offer comprehensive education programs and support groups for adults who have diabetes.
- Participants may need a referral from their primary healthcare provider to attend.
- Programs are often free or available at low cost.
- Determine what disease management educational resources are available in your area.

# Comprehension Questions

---

1. What are the signs and symptoms of low blood sugar, hypoglycemia?
2. What are the signs and symptoms of high blood sugar, hyperglycemia?
3. What skills should the participant have to transition from the nursing home to the community?
4. Why are foot checks so important?



# Answers

---



1. Hypoglycemia symptoms - Mild include: shaking, sweating, increased heart rate, dizziness, hunger, blurred vision, irritability. Moderate include: confusion, tiredness, yawning, poor coordination, headache, double vision, combativeness. Severe include: unconscious, seizures.
2. Hyperglycemia symptoms - dry mouth, extreme thirst, frequent urination, extreme hunger, weakness, blurred vision.
3. Things that are important to know how to do include give self injections, check blood sugars, foot checks, and others.
4. Foot checks are important because a person with diabetes can lose feeling in his/her feet. If they do not check them daily they can develop sores, open wounds, infections that can eventually lead to hospitalization and amputation of the affected area.



## See Also....

---

- Please Take the time to view the MFP Education module on [Transition Planning for Diabetes Management](#).



# Questions

---

- If you have questions about this module please contact your UIC pod leader.



# References

---

- <http://www.diabetes.org/>
- <http://www.diabetes.org/type-1-diabetes/well-being/foot-care.jsp>
- <http://www.diabetes.org/type-2-diabetes/blood-glucose-checks.jsp?WTLPromo=recently&vms=295773680037>
- [http://www.diabetesjournals.org/content/30/suppl\\_1/S42.full](http://www.diabetesjournals.org/content/30/suppl_1/S42.full)
- [http://care.diabetesjournals.org/cgi/content/full/31/Supplement\\_1/S12#SEC5](http://care.diabetesjournals.org/cgi/content/full/31/Supplement_1/S12#SEC5)
- [http://www.idf.org/sound\\_bites](http://www.idf.org/sound_bites)
- <http://www.who.int/diabetes/en/>
- <http://www.who.int/mediacentre/factsheets/fs312/en/>

