Advanced Diabetes Mellitus Education Information

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Understanding Hemoglobin A1C (A1C)

- The A1C test is a blood test that measures the "average" glucose over the previous 6-10 weeks.
- The average is obtained by measuring the percentage of glucose that has attached to the hemoglobin of the red blood cell.
- The higher the amount of glucose attached to the red blood cell, the higher the A1C.
- The "average" is weighted, meaning that 50% of the reading is determined by the previous month's glucose.
- Once diagnosed with diabetes, the target A1c for most adults is <6-7% depending on risk factors*.
- In general, the higher the A1C, the more control is related to elevated fasting glucose.
- As A1C decreases, control is more related to postprandial excursions.

*Individualized A1c goal is recommended based on patient's diabetes disease state, various other disease prognosis, and individual health goals.

A1C%	Estimated Average Glucose	A1C%	Estimated Average Glucose
4%	68 mg/dl	9%	212 mg/dl
5%	97 mg/dl	10%	240 mg/dl
6%	125 mg/dl	11%	269 mg/dl
7%[1]	154 mg/dl	12%	298 mg/dl
8%	183 mg/dl	13%	326 mg/dl

[1] Target is < 7% for most adults. In pregnancy, target is < 6.0% or <6.5%

Target Glucose and A1C After Diagnosis

	American Diabetes Association	**American Association of Clinical Endocrinologist**
A1C	<7%	≤ 6.5%
Preprandial	80 -130 mg/dl	< 110 mg/dl
Postprandial	< 180 mg/dl 1-2 hrs. postprandial	< 140 mg/dl 2 hrs. postprandial

American College of Obstetrics and Gynecology pregnancy targets

Fasting	≤ 95 mg/dl
1 hr. postprandial	≤ 130 mg/dl
2 hrs. postprandial	≤ 120 mg/dl

Monitoring blood glucose*

*The frequency and timing of monitoring glucose should be discussed with your provider.

- Suggested times are: fasting when waking up, before meals, 1-2 hours after the start of a meal, before bed and 2-3 A.M.
- It is important to keep a log for: time of the glucose check, glucose value, carbohydrate consumed and medication taken (if applicable).
- It is difficult sometimes to evaluate glucose patterns using glucometer memory only without viewing a log.

Tips for monitoring glucose:

- Wash hands before testing glucose using soap and warm water to improve circulation and to remove any residue that may cause a false reading.
- Hang hands below heart for 30 seconds to pool blood into hands.
- Lance the side of the finger and gently milk the blood down from the finger using press and release.
- Don’t squeeze around the area that was lanced.

- If using alternate site testing (clear lancet cap) do not check glucose if you suspect low glucose, if you have hypoglycemia unawareness, after exercise, during illness, less than 2 hours after a meal or before driving.
- Greater than a 100 mg/dl difference has been seen between finger and alternate site test.
- Alternate site testing is not recommended if using basal/bolus therapy.

Low glucose (Hypoglycemia) Signs and Symptoms

Low glucose in a diabetic is any glucose value < 70 mg/dl that typically causes unpleasant symptoms such as:

Shaking	Sweating	Slurred speech	Numbing of lips and tongue
Hungry	Irritability	Confusion	Worry
Sleepiness	Weakness	Seizure	Rapid heart beat

Treatment of Hypoglycemia Using the "Rule of 15"

Check your blood glucose to see how low it is using a glucose meter.

Eat or drink something that contains 15 grams of quick acting carbohydrate. Do not treat with foods high in fat such as chocolate or peanut butter due to the fat content that will slow digestion. It is very important to carry a quick acting source of carbohydrate at all times! Consuming protein for the treatment and prevention of hypoglycemia is not recommended.

Wait 15 minutes and then recheck blood glucose to be sure it's above 70mg/dl. Initially consuming more than 15 grams of carbohydrate will not raise glucose more quickly and can result in rebound hyperglycemia! It is very common for individuals with diabetes to panic and treat with large amounts of food which causes high glucose a few hours later. 15 grams of carbohydrate will typically raise glucose ~ 40-60 mg/dl.

If blood glucose is not above 70mg/dl, repeat the same steps.

If glucose is above 70 mg/dl, follow up with a meal or snack if not scheduled to eat within the next hour.

If you become unconscious a family member or friend should call 911 and administer glucagon shot as instructed by the 911 operator.

Meal Planning

It is most important to identify foods that contain carbohydrate and to learn correct carbohydrate portions.

Carbohydrate is another term for starches and sugars.

Carbohydrate is your body's main fuel source and has the greatest impact on blood glucose. Ninety to 100 % of carbohydrate turns into glucose in your body. After eating carbohydrates, glucose starts to rise within 5 to 10 minutes and reaches peak within about 70-80 minutes.

Carbohydrates include ***all*** bread, cereal, corn, peas, potatoes, rice, pasta, dried beans, fruit and milk to name a few sources. Also, sugar free products such as sugar free cookies, cakes and candy contain sugar alcohols which will elevate glucose.

Monitoring glucose 1-2 hours after the start of a meal is a good way to determine how your body handles the carbohydrate consumed.

Use plate method or Healthy Plate to assist with nutrient selection and portion control.

A Healthy Plate

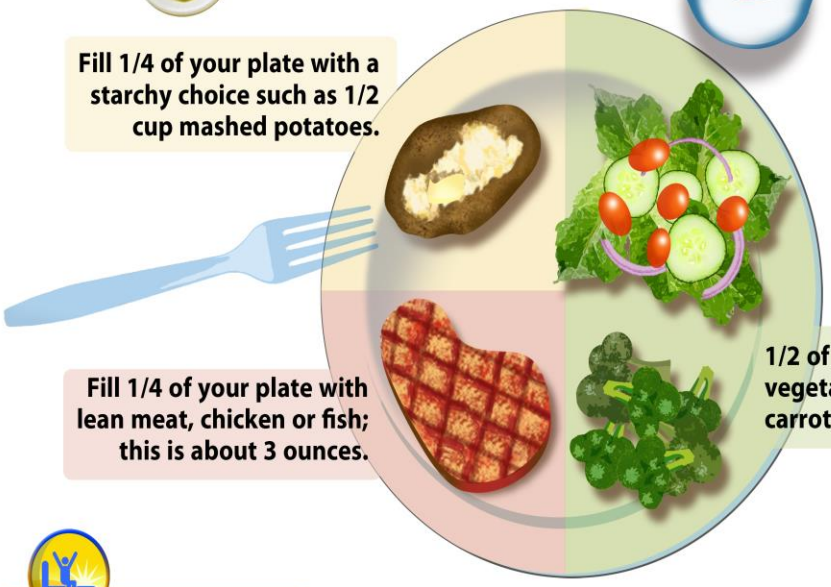
The goal of building a healthy plate is to show how eating a variety of foods will help you feel satisfied, help control blood sugar levels and control weight. We hope to make this as easy as possible for you! As you can see, eating more vegetables and less meat and starch can help meet this goal.

Add a small amount of margarine or oil in cooking or at the table.

Choose 1 serving of milk which is 8 ounces.

Add 1 serving of fruit.

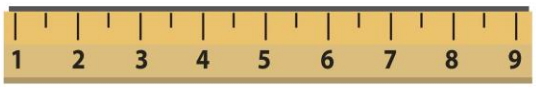
Fill 1/4 of your plate with a starchy choice such as 1/2 cup mashed potatoes.



Fill 1/4 of your plate with lean meat, chicken or fish; this is about 3 ounces.

1/2 of your plate with vegetables such as broccoli, carrots, cauliflower, and salad.

For breakfast, use only half the plate.



For lunch and dinner, use the whole plate.

Label Reading

- When reading a food label, first identify the serving size and then identify the total grams of carbohydrate listed for that serving.

- Do not look at sugar because the sugar is already included in the total carbohydrate listed.

- Do not subtract fiber or sugar alcohol from the total grams of carbohydrate unless the food contains greater than 5 grams of fiber or sugar alcohol. In this case, you can subtract half the grams of fiber/sugar alcohol from the total grams of carbohydrate.

- When doing basic carbohydrate counting one carbohydrate serving is equivalent to 15 grams of carbohydrate.

- 1 CHO serving = 15 grams; 2 carbohydrate servings = 30 grams; 3 carbohydrate servings = 45 grams.

Nutrition Facts

Serving Size ½ Cup

Servings per Container 2

Amount per serving

Calories 256

Total fat 8g

Saturated fat 2g

Cholesterol 0mg

Sodium 180 mg

Total Carbohydrate 17g

Dietary Fiber 1g

Sugars 4g

Protein 5g

Sugar is already included in the total grams of carbohydrate.

It is most important to identify the total grams of carbohydrate.

Sick Day Management

Illness, surgery, infection and some medications can elevate glucose. Some common conditions that may cause high sugars include flu, any illness with a fever and stomach or intestinal virus.

Tips For Managing Glucose When You Are Sick

- Always take diabetes medications and basal insulin such as insulin glargine- (Lantus) even if you are not eating - this is because the stress of illness will cause an elevation in glucose (talk to your healthcare provider).

- Attempt to consume meals and snacks as usual.

- If you have type 2 diabetes check glucose every 4 hours:

    - If glucose is > 300 mg/dl for two consecutive readings call health care provider.

- If you have type 1 diabetes check glucose every 2-4 hours:
    - If glucose is > 250 mg/dl check for ketones every 4 hours.
    - If ketones are positive contact your healthcare provider.
    - If ketones read “high” go to the hospital.
    - It is very important to seek medical attention anytime you have elevated ketones.

- Drink a minimum of 8 ounces of calorie free fluids every hour while awake.

- Rest as much as possible.

- Check with your pharmacist to determine which over the counter medications are acceptable for diabetics.

Diabetes Medications (Anti-diabetics)

Orals:

Sulfonylureas- Stimulates the pancreas to release more insulin for many hours.

Meglitinides- Stimulates the pancreas to release more insulin for a short duration.

Biguanides- Decreases the production of glucose in the liver and improves peripheral insulin sensitivity.

Thiazolidinediones (TZD)- Improves peripheral insulin sensitivity, decreases glucose output from the liver.

DPP-IV inhibitors- Increases the release of insulin and decreases glucagon levels based on blood glucose level.

Alpha- Glucosidase Inhibitors- Blocks the absorption of carbohydrate.

Dopamine 2 Agonists- Reduces glucose production in the liver.

SGLT-2 Inhibitors- Reduces renal glucose reabsorption and increases excretion of glucose in the urine.

Colesvelam- Bile acid sequestrant that works in the digestive tract to assist with glucose control.

Injectables:

GLP-1- Signals the pancreas to release the correct amount of insulin after meals, decreases glucose production in the liver and slows gastric emptying.

Symlin- Slows gastric emptying, decreases glucose production in the liver and reduces appetite.

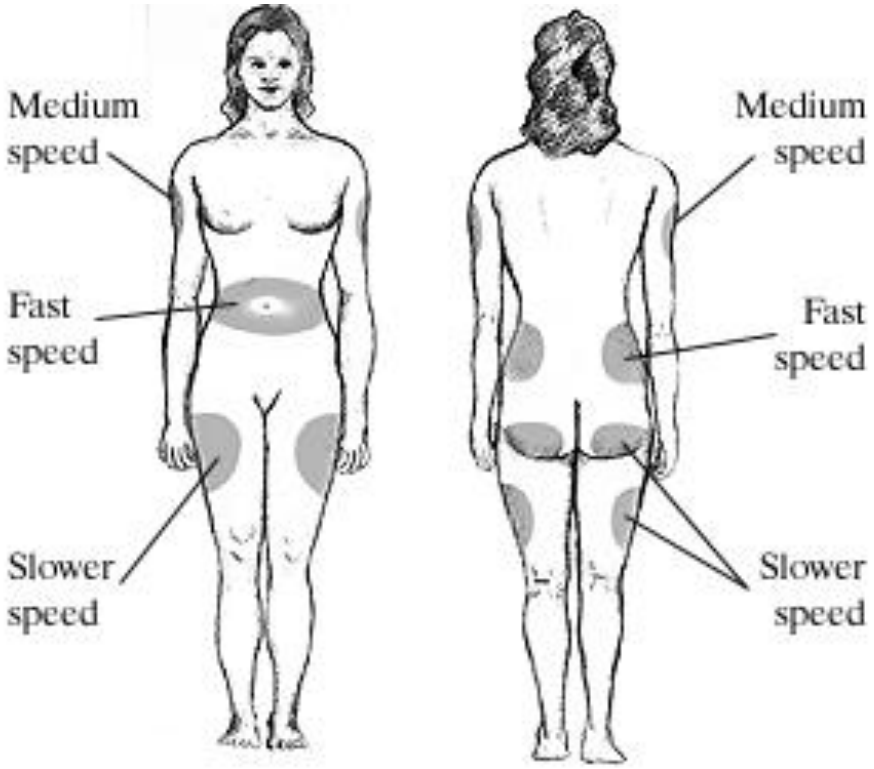
Insulin- Performs as one's own insulin would if it were present. Several types of insulin are available. See Chart below. * Indicates Womack Formulary

Insulin

Type	Color	Onset	Peak	Duration
Rapid Acting				
*Aspart (Novolog) Lispro (Humalog) Glulisine (Apidra)	Clear	5-15 minutes	30-90 minutes	3- 5 hours
Short Acting				
*Regular (Novolin R Humulin R)	Clear	30 minutes-60 minutes	2-3 hours	5-8 hours
Regular U-500 Humulin R U-500 Humulin R U-500	Clear	30 minutes-60 minutes	2-3 hours	11.5-24 hours
Intermediate Acting				
*NPH (Novolin N Humulin N)	Cloudy	2-4 hours	4-10 hours	10-16 hours
Long Acting				
*Glargine (Lantus)	Clear	2-4 hours	None	20-24 hours
*Detemir (Levemir)	Clear	3-8 hours	(dose dependent)	5.7-23.2 hours
*Concentrated Glargine (Toujeo)	Clear	6 hours	None	24 hours
Mixtures				
Intermediate and short NPH/Regular 70/30 (Humulin) (*Novolin)	Cloudy	30-60 minutes	2-10 hours	10-16 hours
Intermediate and rapid *Novolog Mix 70/30 Humalog Mix 75/25	Cloudy	5-15 minutes	1-3 hours	10-16 hours

*Formulary

Insulin Injection sites



Advanced Insulin Management

When using basal/bolus therapy (long acting insulin such as insulin glargine [Lantus] and quick acting insulin such as insulin aspart [Novolog] it is often beneficial to use a carbohydrate to insulin ratio and insulin sensitivity factor to determine meal time insulin dose. Using basal/bolus therapy provides greater flexibility with eating and overall tighter control of glucose. When using a fixed insulin dose with each meal it is necessary to consume the same amount of carbohydrate for each meal in order to prevent glucose excursions.

Carbohydrate to insulin ratio (IC)- The number of grams of carbohydrate covered by 1 unit of insulin.

Insulin sensitivity factor or correction factor (ISF)- The number of mg/dl lowered by 1 unit of insulin.

Target glucose- The blood glucose value desired when calculating a correction dose.

Example:

An individual has the following settings:

Carbohydrate to insulin ratio = 1:15 or 1 unit for every 15 grams of carbohydrate consumed.

Insulin sensitivity factor = 50 or 1 unit for every 50 mg/dl above target.

Target glucose = 100 mg/dl or desired glucose value.

If patient is going to consume 45 grams of carbohydrate, the formula to calculate the amount of insulin required to treat the glucose would be:

45 grams of carbohydrate ÷ 15 = 3 units

If patient's glucose before the meal is 200 mg/dl the formula to calculate the amount of insulin to correct the high sugar to a target of 100 would be:

[200 mg/dl – 100 mg/dl] ÷ 50 = 2 units

Therefore, patient would give a total of 5 units before the meal (3 units for the carbohydrates consumed and 2 units for the correction.

Most Commonly Used Insulin Pumps, Therapy management Software and Continuous glucose monitoring systems*/**

***WAMC does not endorse the various insulin pumps and continuous glucose monitoring systems listed below. Products listed are for educational purpose only.**

****Insulin pumps calculate the amount of insulin needed based on the above formulas but it is important to be familiar with the concepts in case of insulin pump failure.**

Insulin Pumps

Medtronic- Uses Carelink management software

Animas- Uses Diasend or EZ Manager software

Omnipod- Uses Co-pilot or Nu-Medics software

Accu-chek- Uses Pocket Compass with Bolus Calculator, insulin pump configuration software, IR Communication Port

T-Slim- Uses T-connect therapy software

Dana Diabecare IIS- No data management software available

Continuous Glucose Monitors

MiniMed Real-Time Continuous Glucose Monitoring System.

Dexcom G5 Platinum Continuous Glucose Monitoring System

Through telemedicine at WAMC, patients are able to download their devices from home and data can be analyzed by diabetes staff. Treatment adjustments are made via e-mail or telephone.

Reducing Diabetes Complication Risks

A1C- (6-10 week average)	Frequency- Every 3 months or twice per year if at goal
	Goal - <7% if > 20 yrs. age (average meter glucose 154 mg/dl)*
Blood pressure	Frequency- Each M.D. visit
	Goal- <140/80 mm Hg
Lipids	Frequency- Yearly
	Goal- HDL > 40 mg/dl for men and > 50 mg/dl for women
	LDL < 100 mg/dl or < 70 mg/dl with heart disease
	Triglycerides < 150 mg/dl
Microalbumin- (kidney)	Frequency- Yearly
	Goal- < 30 mg/dl
Foot exam	Frequency- Yearly
Dilated eye exam	Frequency- Yearly
Dental exam	Frequency- Twice per year
Medical nutrition therapy	Frequency- Initially and then as needed.
Body mass index	Frequency- Every M.D. visit
	Goal- < 25
Pneumonia vaccine	At least once (revaccination may be required)
Hepatitis B vaccine series	Once
Flu vaccine	Yearly

Physical Activity

There are many benefits of physical activity to include increased insulin sensitivity, weight loss, improved mood and lower blood pressure.

Before starting an exercise program it is important to be evaluated by your provider especially if you are >35 years of age, have had diabetes >10 years, have complications such as heart disease or have been sedentary.

Always check glucose before, during and after exercise and carry a quick acting source of carbohydrate due to the lowering effect of exercise. Always treat a low glucose reaction following the "rule of 15." Wear a medical alert bracelet or necklace notifying people that you have diabetes.

Basic goal is to aim for 150 minutes of moderate activity per week with no more than 2 consecutive days off.

Type 1 diabetes exercise recommendations- If free of complications then exercise recommendations are the same as those individuals without diabetes.

Type 2 diabetes exercise recommendations- Similar to exercise guidelines for sedentary and older adults.

FITT principle for aerobic activity

Frequency

Type 2- Spread over minimum of three consecutive days per week, with no more than 2 consecutive days of inactivity. Five days a week is more effective.

Type1- Spread over minimum of three consecutive days per week, with no more than 2 consecutive days of inactivity. A regular exercise routine assists in establishing glucose patterns.

Intensity

Type 2- Moderate to vigorous (55%-90% of age-adjusted maximal heart rate).

Type 1- Moderate to vigorous (55%-90% of age-adjusted maximal heart rate).

Type

Aerobic activity such as walking, jogging, cycling, swimming etc.

Time

Type 2- A minimum of 150 minutes per week (no less than 10 minutes per session with a goal of 30 minutes of more).

Type 1- A minimum of 150 minutes per week (minimum of 10 minute sessions), although individuals with higher aerobic capacity may exercise more intensely for a less amount of time and obtain the same benefits.

FITT principle for anaerobic activity

Frequency- 2-3 times per week.

Intensity- Moderate to vigorous (50-80% of 1 repetition max).

Type- 5-10 exercises that cover the major muscle groups.

Time- 1 to 3 sets of 15 repetitions. Progress to 8-10 harder repetitions and then 3 sets of 8-10 repetitions.

Recommended Diabetic Supplies (formulary) from WAMC

- **Freestyle Freedom Lite glucose meter**: (total 1, no refill)
- **Freestyle Lite test strips (supplied in boxes of 50)**:
    - Type 1: start checking glucose 8 times/day (fasting, before each meal, 2 hours after each meal and before bed); patients with type 1 diabetes must always check glucose a minimum of 4 times/day (fasting, before each meal and before bed)
    - Type 2: should monitor glucose 1-4 times/day per provider recommendations
    - 1x/day: order #1, refill11
    - 8x/day: order #5, refill 11
- **Lancets**. Supplied in boxes of 100
- **Alcohol pads**. Supplied in boxes of 200

If prescribed insulin

- **Insulin pen needles**. Supplied in boxes of 100. Recommend 31 gauge 3/16 needles (5 mm) regardless of BMI.
- **Lantus pens** (100 units in each pen). Pen can be used for 28 days once opened and can be stored unrefrigerated at a temperature below 86 degrees.
- **Novolog pens** (100 units in each pen). Pen can be used for 28 days once opened and can be stored unrefrigerated at a temperature below 86 degrees.
- **Glucagon**- Type 1 diabetes or patients with type 2 diabetes using insulin. Expires in 1 year. Additionally, any patient with type 2 diabetes taking a sulfonylurea should have glucagon. Examples of sulfonylureas include glyburide, glipizide and glimepiride.
- **Ketone strips**- For type 1 diabetes

List of Diabetes Education Offered at Fort Bragg

Fort Bragg currently offers the following Diabetes Education Classes:

A. Individualized/group diabetic education and Gestational diabetes education offered by Nutrition Care. Please contact Mrs. Ruffin at 907-3438 (DIET). Offices are located on the ground floor of WOMACK. Group classes are offered on three consecutive Mondays of every month from 0900-1100.

B. WAMC Chronic Disease Management classes initiated by your Primary Care Physician. Office is located Internal Medicine Clinic 2nd Floor, Medical Mall. Appointments are Monday-Friday 0800-1630. Classes are Tuesdays from 1300-1600. Phone number 910-907-8360 or fax number 910-907-8360.

C. Jon Cucura Certified Diabetes Educator (CDE), located in the Internal Medicine clinic. The CDE's primary responsibilities are prioritized as follows:

1. All active duty with type 1 diabetes.

2. Active duty with type 2 diabetes requiring multiple daily injections, e.g. Novolog and Lantus.

3. Perinatal insulin pump patients.

4. Perinatal patients that are not on insulin pumps that require insulin.

5. Pediatric diabetic patients enrolled in the Pediatric Diabetes Clinic.

6. Type 1 diabetic patients on an insulin pump that are dependents of active duty service members.

7. Type 1 diabetic patients not on an insulin pump that are dependents of active duty service members.

8. Retiree or dependent of retiree on an insulin pump.

9. Retiree or dependent of retiree requiring multiple daily injections, e.g. Novolog and Lantus.

10. All other diabetic patients.

Responsibilities of the CDE will not include dietary instruction, insulin injection teaching, glucometer teaching, and basic diabetes education for hypoglycemia or hyperglycemia. Such counseling needs should be referred to the Nutrition Care Division or site specific personnel.

All outpatient consults should be entered via CHCS under "consult" by entering "diabetes."

All inpatient consults require direct contact by calling 907-6335 or paging 6335 for Mr. Cucura.

Additional Information Can Be Obtained By Visiting:

American Diabetes Association	www.diabetes.org
Juvenile Diabetes Research Foundation	www.jdrf.org
Diabetes Health	www.diabeteshealth.com
Children with Diabetes	www.childrenwithdiabetes.com
Insulin Pumpers Group	www.insulin-pumpers.org
Topix.net	www.topix.net/health/diabetes

Handouts On File To Print:

What is low blood glucose?

What is glucagon?

Sick day management

Sick day kit

Use of ketone strips

Self-Monitoring of blood sugar

Online glucose, insulin and carbohydrate log

What is carbohydrate counting?

A Healthy Plate

Benefits of Exercise

VA/DoD Self-Care Skills for the Person with Diabetes booklet

Chronic Disease Management Flyer