

## Optimal Glucose Control in Patients with Diabetes to Prevent Complications

Presented by Avni Vora, MD of Palos Medical Group

Led by Dr. Vora, our group learned the physiology of insulin function and factors that affect glucose levels, how diabetes control relates to lower extremity disease, diabetes management, medication related issues and barriers to optimal glucose management and ways to provide better diabetes care for patients.

Insulin is a hormone made by the pancreas that helps glucose enter the body's cells. Diabetes develops when blood sugar is not regulated. Type 1 diabetes means the destruction of insulin-making cells; there is not enough insulin to control blood sugars. These patients are insulin sensitive, and can easily go too low or too high.

Type 2 diabetes is evidenced by a resistance to insulin produced by the pancreas, leading to elevated blood sugar. These patients are insulin resistant and require higher doses of insulin. They typically stop making insulin after a few years.

Blood sugar comes from both food and the organs, the liver and kidney. The blood sugar your body produces stay relatively stable throughout the day and night, but the blood sugar caused by eating results in spikes throughout the day.

### **Blood sugar rises because of:**

- Eating carbohydrates and sugars
- Stress
- Illness
- Hormonal changes
- Medication such as steroids, psychotropics, anti-rejection meds and HIV meds
- Low blood sugar

### **Blood sugar falls because of:**

- Exercise and activity
- Insulin
- Medications
- Hormone deficiencies

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### **Why is controlling diabetes important?**

- Diabetes is the leading cause of blindness among adults aged 20–74 years
  - Diabetes is the leading cause of kidney failure
  - People with diabetes are 3 times more likely to have heart disease and it is the number one cause of death in diabetics.
  - Almost 30% of people with diabetes aged 40 years or older have impaired sensation in the feet
  - More than 60% of non-traumatic lower-limb amputations occur in people with diabetes
- Studies show that early intensive management substantially reduces risks of complications including eye disease, kidney disease and heart disease. While diabetic patients typically have multiple risk factors for neuropathy, early intensive diabetes management can reduce the incidence of neuropathy by 64%.

### **How do we properly diagnose diabetes or pre-diabetes?**

A diagnosis of diabetes should require:

- Fasting blood sugar >126 twice
- Random blood sugar >200 twice
- Blood sugar >200 after 75 grams of glucose
- Hemoglobin A1c > 6.4

A diagnosis of pre-diabetes should require:

- Fasting blood sugar between 100-125
- Blood sugar of 140 to 199 after 75 grams glucose
- Hemoglobin A1c from 5.7 to 6.4

LADA (latent autoimmune diabetic of adults), a form of Type 1 diabetes, can be misdiagnosed. Young or middle-aged patients may present with high sugars and often DKA. When oral meds are started, patient is able to control sugars well for 6 to 24 months. Suddenly, sugars go high and are unable

to be controlled despite multiple medications. These patients usually have a normal BMI, are compliant with treatment and have a sparse family history of Type 2 diabetes. Test for C-peptide, GAD antibodies, Islet cell antibodies, insulin antibodies, and zinc transport antibodies.

### **Get a full history at your appointments.**

Ask questions to get a full picture of your patient's diabetes management.

#### **Medications**

- What medicines are they taking?
- When are they taking them?
- Are they taking them?
- Why or why not?

#### **Diet**

- What are they eating for each meal?
- How much are they eating?
- How much snacking?
- What are they drinking and how much?

#### **Exercise**

- Are they active?
- When are they active and for how long?

#### **Blood Sugar**

- When are they low and how low?
- When are they high?
- How does fear play into management?

### **What are healthy blood sugar goals?**

Your patients should have a blood sugar reading of 80-130 when fasting and before meals. Two hours after meals, your patients' reading should be less than 140 with a peak post-prandial sugar less than 180.

These are general goals that should be modified for each individual patient. Pregnant women should have stricter goals and seniors may have relaxed goals. Tests should be averaged over the course of 3 months.

### **What goals should we have for diabetic care?**

- Avoid hypoglycemia
- Get blood sugars under control
- Weight management
- Avoid medication side effects
- Be aware of medication cost
- Attention to complications: Eye exam, Foot exam, Microalbumin, Lipids and Blood pressure

### **What are the best methods of treatment?**

Start by discovering when and why they have hyper or hypoglycemia. Ask patients to reduce the frequency of their checks, but vary the time of day throughout the week.

Adjust medications and advise lifestyle changes to make to correct sugars.

Strongly encourage lifestyle changes that will lessen diabetic symptoms. Offer your patients nutrition education, instruct them about incorporating activity into their day, especially short spurts and discuss stress reduction. Offer concrete examples of how to change, like switching to water to drink or walking for 10 minutes after each meal.

Discuss and consider medication options such as:

#### **• Medicines that help with basal and post-prandial coverage**

- Metformin, Sulfonylureas, Glitazones, Long acting insulin, SGLT2 inhibitors

#### **• Medicine that help with post-prandial coverage**

- Metformin, Sulfonylureas, Glitazones, SGLT2 inhibitors

- DPP-4 inhibitors, GLP-1 agonists, Acarbose, Meglitinides

- Short-acting Insulins

#### **• Medications that help with weight loss:**

- SGLT2 inhibitors, GLP-1 agonists, Metformin

When sugars are not controlled by these treatment methods, start insulin.

### **Which insulin, long- or slow-acting, is needed?**

#### **Long Acting Insulin**

- Gives patients a small, consistent amount of insulin over approximately 24 hours
- Cover the endogenous glucose production
- Fasting sugars reflect how well long-acting insulin is working
- Remember adjusting long-acting insulin affects all blood sugars for the next 24 hours!

#### **Short Acting Insulin**

- Meant to cover carbohydrate intake at meals
- Should be given no more than 15 minutes before initiation of meal and can be given during the meal or right after
- Remember that if blood sugar is normal at mealtime (80-120) and insulin is held, blood sugar will go up

- Allows for flexibility of mealtimes and adjustment for carbohydrate

### ***Insulin sliding scale, or corrections.***

- Is meant to correct high blood sugars
- Does NOT cover meals
- Should not be used alone if patient is eating
- Can be given in combination (same time) with mealtime insulin
- Most patients with diabetes needs long acting insulin in addition to short acting insulin

### ***How should we handle following up with patients?***

Adjust medication when necessary and continue education. Make frequent appointments to look at sugars and adjust medications again. Watch for mitigating factors that could affect blood sugar, such as changing seasons, life changes, stress, pain, inflammation, illnesses and steroid intake.

### ***What are my patients' barriers to diabetes control?***

Cost is an issue for many patients. While Metformin, Sulfonylureas, Metiglinides, Glitazones are cheap, everything else is expensive especially for Medicare patients. Savings coupons offered by manufacturers cannot be used with government insurance and many patients run into the "Medicare donut" of insulin cost coverage and are unable to supplement costs themselves.

Look into patient assistance programs and consider generic NPH and R insulin (separate vials, not pre-mixed).

Side effects of diabetes medications can include:

- Metformin: GI upset; Try extended release
- Sulfonylureas: Hypoglycemia, Weight Gain, Fluid retention
- Glitazone: Possible Heart disease risk, Possible Bladder Cancer risk, LE edema, CHF exacerbation
- GLP-1 Agonists: Nausea, GERD, Constipation, Pancreatitis
- DPP-4 Inhibitors: Pancreatitis
- Acarbose: Flatulence
- SGLT2 Inhibitors: Dehydration, UTI/Yeast infection, DKA, Foot amputation, Fournier's gangrene

There are also psychological barriers. Every aspect of a patient's life affects their blood sugar, from diet and activity to stress and time of year. Patients can simply get tired of properly managing it. Eating

and activity habits established over decades are very difficult to change. Many patients are anxious about getting complications from the medications themselves.

Lack of education is also a significant barrier. As a physician, it's important that we help patients understand how diabetes and insulin work and how diet and carbohydrates will impact their blood sugar. It's also vital physicians clearly understand how patients are taking their medications and to thoroughly answer any questions about taking medications with food, rotating insulin sites and proper usage of an insulin pen. Review medication side effects with patients and explain symptoms that will be a cause for concern and action.

### ***Could insulin pumps and continuous glucose monitors be the answer for everyone?***

Insulin pumps are great for insulin sensitive patients but they are not less work for your patients. While there are fewer injections and fewer incidents of hypoglycemia, carb counting and checking sugars 3-4 times a day is still necessary.

Continuous glucose monitors can reduce the burden of diabetes because they help improve diabetes control and reduce episodes of severe hypoglycemia, they can also increase patient anxiety and lead to medication overcorrections.

### ***What's driving the diabetes epidemic?***

As obesity has increased, so has diabetes. In 1994, about 14% of country was obese and about 4.5% had diabetes. In 2010, about 25% of country was considered obese and nearly 9% had diabetes.

Weight loss is vital to diabetes management. Losing just 10-15 pounds can reduce blood pressure, cholesterol and help control blood sugars. While low carb diets work, patients must be able to sustain them for long-term weight management. Consider weight loss drugs or weight loss surgery to help your patients achieve healthy waist circumferences: men should be less than 40 inches and women should be less than 35.

Encourage your patients to read food labels for healthy weight loss, paying attention to both the serving size and the number of servings in the package. The vast majority of adult Americans don't

need the 2,000 calories that we typically ingest every day.

Educate your patients about portion size and recommend they switch to smaller plates and bowls. Encourage the use of a measuring cup to visually understand how portions are really sized. Tell your patients to, when eating out, order a doggie bag with the meal and immediately put half of the meal into the doggie bag to take home.

Push your patients to change their beverage of choice to water, helping to fight diabetic dehydration, which is aggravated by caffeinated beverages and high blood sugars. Water has no sugar, no carbs, no fat and no calories!

Recommend that your patients exercise regularly, with 30 minutes of moderate activity (brisk walking) 5 days a week with muscle strengthening activity 2 days a week OR 15 minutes of vigorous activity (running/jogging) 5 days a week with muscle strengthening activity 2 days a week.

Urge post meal exercise, about 10 minutes of brisk walking after every meal. Studies show those who walk 10 minutes after each meal have 12% lower blood sugars after breakfast and lunch and 20% lower blood sugars after dinner.

***Understand that diabetes management is a uphill battle, all day and everyday with multiple barriers to proper care.***

It's vital that we discuss patient goals both for diabetes and general health. We need to be thorough and attentive, asking multiple questions to get a detailed history and following up with phone calls to ensure compliance and answer any concerns. It's also important to take mitigating factors into account and remove our judgment.

Don't wait to refer a patient to a Diabetes Center or an Endocrinologist. As stated in the beginning, early intensive intervention is the best way to reduce the risk of disease and amputation.

### **Questions?**

Contact Avni Vora, MD, Endocrinology, Diabetes and Metabolism at [avora@paloshealth.com](mailto:avora@paloshealth.com).

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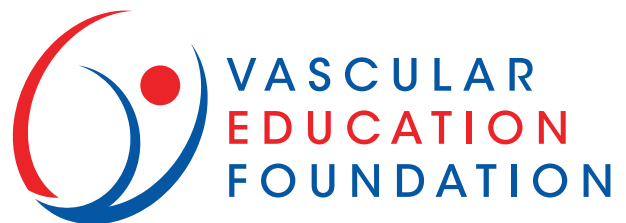
## ***You're invited to LEA-UP Lower Extremity Amputation and Ulcer Prevention***

LEA-UP meets quarterly to learn from experts in the fields of podiatry, infectious disease, primary care, nephrology, vascular surgery and more.

**Thursday, January 17, 2019 at 6:30 pm  
Sherazuddin Qureshi, MD**

*discussing vascular disease management  
for the primary care physician*

**Reserve your seat with Julie Rivera  
[julie.rivera.vef@gmail.com](mailto:julie.rivera.vef@gmail.com)  
or text to 219-314-1644**



[vasculareducationfoundation.org](http://vasculareducationfoundation.org)

### ***About Vascular Education Foundation founder, Dr. Eugene Tanquilut***



Award-winning and recognized as a Vitals Top 10 Doctor and a Patient's Choice Doctor, **Dr. Eugene Tanquilut** is board-certified in both vascular and endovascular surgery. He earned Vascular and Endovascular Fellowships at Cleveland Clinic. Dr. Tanquilut is the President of Vascular Specialists.

The Vascular Education Foundation was established to increase awareness of the dangers and severity of vascular disease through the education of both the community and healthcare professionals.