

# Connecting The Dots Between Wound Care and Nutrition

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# Objectives

1

Identify important nutrients that play a role in wound healing

2

Know nutrition assessment and intervention guidelines to implement in practice

3

Understand different types of wounds and how they are managed by interdisciplinary team

4

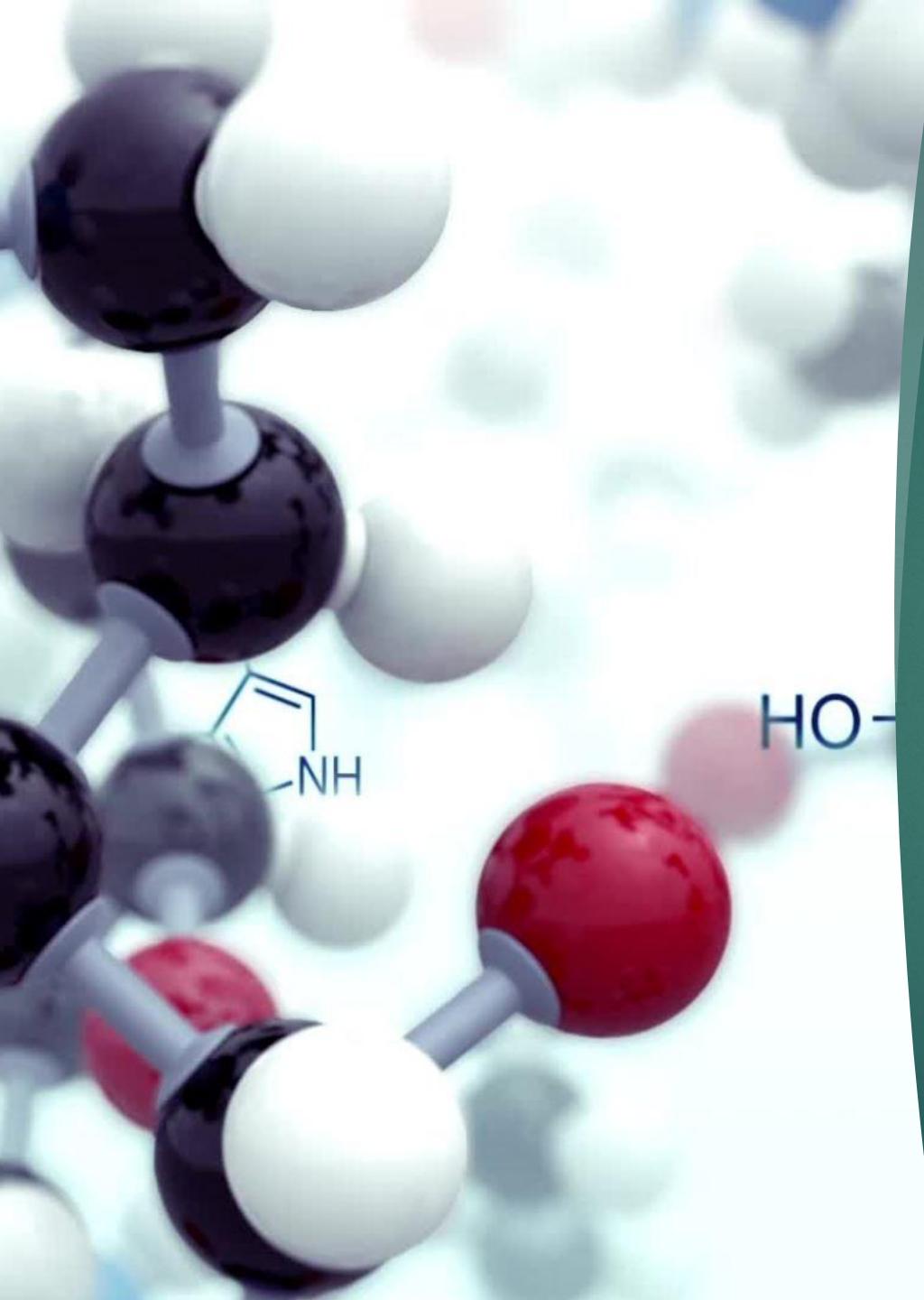
Understand importance of diabetes management with wound healing

# Nutrition and Wounds/Pressure injury

- ▶ **Nutrition Risk factors**

- ▶ Unplanned weight loss
- ▶ Inadequate oral intake/suboptimal nutrition
- ▶ Dehydration
- ▶ Elevated blood sugar

**Patients that are at risk of malnutrition are also at risk for pressure injury development**



## Important nutrients to consider for healing

- ▶ Energy (calories)
- ▶ Protein
- ▶ Zinc
- ▶ Copper
- ▶ Vitamins A and C
- ▶ Conditionally essential amino acids Arginine and Glutamine
- ▶ Hydration/water

# Important Nutrients

- ▶ Energy – CALORIES!!
  - ▶ Need all macronutrients – carbohydrate, fat, and protein
  - ▶ In absence of adequate calories, protein calories will be used as energy and not support healing
- ▶ Protein
  - ▶ Elevated protein needs – depending on patient profile could reach up to 2 g/kg (or more!!)

# Important Nutrients

Zinc	Copper	Vitamin A	Vitamin C
<ul style="list-style-type: none"><li>• Important for collagen synthesis</li><li>• Not recommended in supplement form in amounts over 40 mg/day - this will compete with copper for binding albumin</li><li>• Food sources: Oysters, red meat, chicken, beans, fortified cereals, nuts/seeds</li></ul>	<ul style="list-style-type: none"><li>• Promotes new blood vessel formation</li><li>• Food sources: Shellfish, seeds/nuts, organ meats, whole grains, chocolate</li></ul>	<ul style="list-style-type: none"><li>• Important in stimulating growth of epithelium</li><li>• Food sources: Liver, sweet potato, spinach, pumpkin, carrots, milk, melon, bell peppers, mango</li></ul>	<ul style="list-style-type: none"><li>• Important in collagen synthesis</li><li>• Food sources: Citrus foods, bell peppers, strawberries, tomatoes, cruciferous vegetables</li></ul>

# Important Nutrients

- ▶ Arginine and Glutamine
  - ▶ Conditionally essential amino acids
  - ▶ Required during severe stress (ex: sepsis, trauma, pressure injury)
  - ▶ Modulate Nitrogen balance, promote blood vessel formation and collagen synthesis

# Arginine & Glutamine - literature

- ▶ Arginine study: Patient's with PI received 3-6 grams daily in supplement form; reached statistical significance at 8 weeks
  - ▶ van Anholt RD, Sobotka L, Meijer EP, Heyman H, Groen HW, Topinková E, van Leen M, Schols JM. Specific nutritional support accelerates pressure ulcer healing and reduces wound care intensity in non-malnourished patients. *Nutrition*. 2010 Sep;26(9):867-72. doi: 10.1016/j.nut.2010.05.009. Epub 2010 Jul 3. PMID: 20598855.
- ▶ 2021 Systematic Review of Arginine and Glutamine
  - ▶ Wound healing time
  - ▶ Length of Hospital Stay
  - ▶ Patient Mortality
  - ▶ Inflammatory markers (CRP, T-Cell Lymphocytes, etc)
  - ▶ Arribas-López E, Zand N, Ojo O, Snowden MJ, Kochhar T. The Effect of Amino Acids on Wound Healing: A Systematic Review and Meta-Analysis on Arginine and Glutamine. *Nutrients*. 2021; 13(8):2498. <https://doi.org/10.3390/nu13082498>

# Important Nutrients

- ▶ Hydration!!
  - ▶ Adequate hydration promotes delivery of nutrients in the body
  - ▶ How to calculate hydration needs??
    - ▶ 1 mL/kcal
    - ▶ BSA x 1500
    - ▶ Holliday-Segar method:
      - ▶ Under 50 yr old: 1500 mL + 20 mL fluid for each kg over 20 kg body weight
      - ▶ Over 50 yr old: 1500 mL + 15 mL fluid for each kg over 20 kg body weight

# Nutrition guidelines for Pressure Injury

- ▶ National Pressure Injury Advisory Panel (NPIAP)
  - ▶ Most recent guidelines released 2019
  - ▶ Grade evidence for many aspects of wound care, including nutrition!
  - ▶ Rate the strength of the recommendation
    - ▶ Strong positive – definitely do this
    - ▶ Weak positive – probably do this
    - ▶ Neutral – no definite recommendation
    - ▶ Weak negative – probably don't do this
    - ▶ Strong negative – definitely don't do this

# Nutrition for Wounds – Assessment

- **Strongly recommended to do:**
  - **Screen all patients that are at risk of a pressure injury**
    - Validated screening tool – MST

<b>1 Have you recently lost weight without trying?</b>	
No	0
Unsure	2
<b>If yes, how much weight have you lost?</b>	
2-13 lb	1
14-23 lb	2
24-33 lb	3
34 lb or more	4
Unsure	2
Weight loss score: <input type="text"/>	
<b>2 Have you been eating poorly because of a decreased appetite?</b>	
No	0
Yes	1
Appetite score: <input type="text"/>	

**MST = 0 OR 1  
NOT AT RISK**

Eating well with little or no weight loss

If length of stay exceeds 7 days, then rescreen, repeating weekly as needed.

**MST = 2 OR MORE  
AT RISK**

Eating poorly and/or recent weight loss

Rapidly implement nutrition interventions.  
Perform nutrition consult within 24-72 hrs,  
depending on risk.

# Nutrition for Wounds – Assessment

- **Strongly recommended to do:**
  - Complete a comprehensive nutrition assessment on those who are at risk of malnutrition
    - Medical history
    - % weight loss, other anthropometrics
    - Nutrition focused physical exam
    - Diet recall/intake history
    - Presence of inflammation/lab values

# Nutrition for Wounds - Interventions

- **Strongly recommended to do:**
  - Individualize the nutrition care plan!!
    - Things to consider:
      - Food preferences
      - Timing of meals/snacks
      - Need altered textures/thickened liquids
      - Treatment/medication interactions/side effects

# Nutrition for Wounds - Interventions

- ▶ **Strongly recommended to do:**
  - ▶ Protein needs: 1.25-1.5 g protein/kg body weight per day
- ▶ **Probably do:**
  - ▶ 30-35 kcal/kg body weight per day

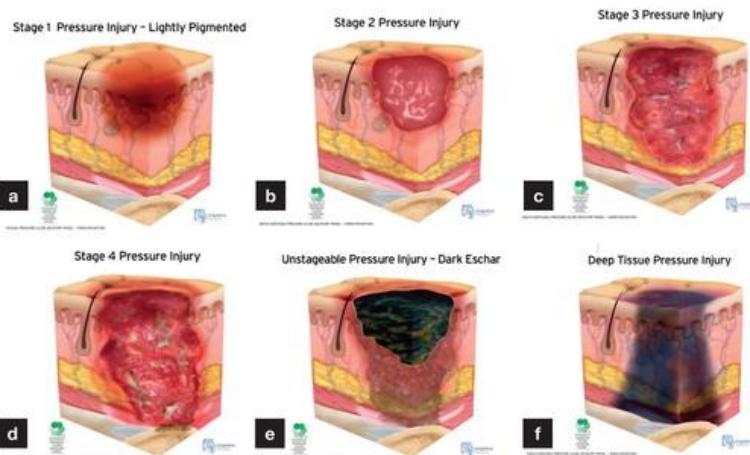
# Nutrition for Wounds - Interventions

- ▶ **Probably do:**
  - ▶ Offer high calorie, high protein oral nutrition supplements in addition to usual diet if unable to reach requirements through diet alone for those who are at risk of developing PI
- ▶ **Strongly recommended to do:**
  - ▶ Offer high calorie, high protein oral nutrition supplements in addition to usual diet if unable to reach requirements through diet alone for those who have a pressure injury and/or are malnourished

# Nutrition for Wounds - Interventions

- ▶ **Probably do:**
  - ▶ Provide high calorie, high protein, arginine, zinc, and antioxidant oral nutrition supplements or enteral formula for adults with Stage 2 or greater pressure injury who are malnourished or at risk of malnutrition

# What is this wound?



## ARTERIAL VS. VENOUS

**Cause-** insufficient blood supply to area, causing ischemia (tissue death)

**Risk Factors**

- vascular insufficiency
- uncontrolled blood sugars in people with diabetes mellitus
- limited joint mobility or mobility problems
- improper footwear

**Characteristics**

- Punched out appearance
- Smooth wound edges
- Pain at night and relieved by elevating leg
- Usually occurs on the lateral foot but can occur anywhere on the lower legs
- Lower extremities are cool to touch
- Pale, shiny, thin skin
- Minimal to no hair growth
- Minimal drainage from wound

**Cause-** pooling of blood causing increased pressure in veins

**Risk Factors**

- varicose veins
- deep vein thrombosis
- incompetent valves
- muscle weakness in legs
- immobility
- pregnancy

**Characteristics**

- Shallow and superficial
- Irregular shape
- Painful from edema, phlebitis or infection
- Usually in the lower legs or ankles



## **Diabetic ulcers/Neuropathic ulcerations:**

- ON feet or toes of diabetics
- Can be multifactorial
- Highly draining wounds
- Neuropathy can be alcohol induced

### **Classic assessment findings:**

- Decreased sensation
- Dry, cracked skin of feet, may have large fissures
- Caused by painless trauma
- In a diabetic, ANY sore on feet or toes is a diabetic foot ulcer

### **Measurement:**

- Measure ulceration:
  - head to toe: length
  - Side to side: Width
  - deepest straight in point: depth



## **Arterial Ulcerations:**

- Cookie cutter appearance, can be on toes or lower legs
- Very painful
- Wounds can be drier, not a lot of drainage

## **Classic assessment findings:**

- Feels better to keep legs dependent
- Hair will be decreased on lower legs
- Typically a drier wound than venous stasis
- Legs and feet will feel cool, can be bilateral or unilateral

## **Measurement:**

- Measure ulceration:
  - head to toe: length
  - Side to side: Width
  - deepest straight in point: depth



## **Venous stasis ulcerations:**

- due to impaired venous return from feet back to heart
- classified as partial or full thickness
- lower legs, generally on shin or near ankles
- present as a cluster or areas of breakdown, borders are irregular
- typically large amounts of drainage



## **Classic assessment findings:**

- pigmentation of lower leg
- feels better elevated
- swelling will be involved
- reported to start from trauma



## **Measurement:**

- Measure ulceration:
  - head to toe; length
  - Side to side; width, if ulceration extending circumferentially, calf circumference is measurement of width
  - Deepest straight in point; depth



# Pressure Injuries

## Stage I

- Intact, non blanchable redness over a bony prominence
- Can be caused in non bony area related to device or increased edema
- Difficult to detect in persons with darker skin tones



## Stage II

- Partial thickness loss involving epidermis and possibly dermis
- Shallow open ulcer red/pink wound bed, NO slough
- May be a serum filled blister



# Pressure Injuries

## Stage III

- Full thickness skin and tissue loss
- Subcutaneous fat but NO bone, muscle or tendon
- May include undermining and tunneling



## Stage IV

- Full thickness tissue loss **WITH** exposed bone, muscle or tendon
- Slough and eschar may be present on some areas of wound bed
- May include undermining and tunneling



# Pressure Injuries

## Unstageable

- Full thickness loss in which base of ulcer is covered with slough or eschar in the wound bed



## Deep Tissue Injury

- Purple or maroon localized area of discolored intact skin or blood filled blister due to damage of underlying soft tissue
- Tissue may be boggy, painful, firm, mushy and have a temperature change from surrounding tissues



## Moisture associated skin damage

- Inflammation or skin erosion caused by prolonged exposure to a source of moisture such as urine, stool, sweat, wound drainage, saliva, or mucus
- Possibilities include mechanical factors (friction), chemical factors (irritants contained in the moisture source), or microbial factors (microorganisms)
- The four types of moisture-associated skin damage periwound moisture-associated dermatitis, peristomal (around ostomy) moisture-associated dermatitis, incontinence-associated dermatitis, and intertriginous(folds) dermatitis
- Often resembles "kissing ulcers" symmetrical on bilateral buttock

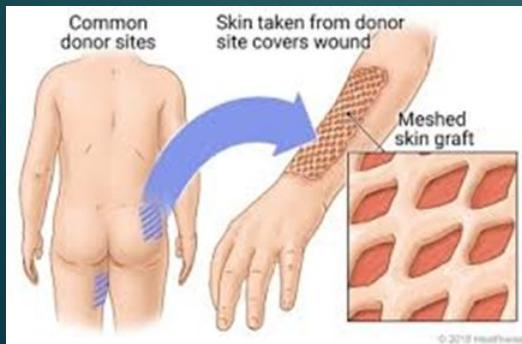


# 7 Steps of Wound Management



# Wound Care treatments

- ▶ Prevention is the best treatment
- ▶ Offloading pressure points
- ▶ Moisture management
- ▶ Good nutrition
- ▶ Glucose at point allowing for healing
- ▶ Various dressing options based on wound presentation
- ▶ Goal: If wound is wet—dry it
- ▶ If wound is dry – moisten
- ▶ What is the patient's goal for wound?
- ▶ Healing?
- ▶ Stable and uninfected?





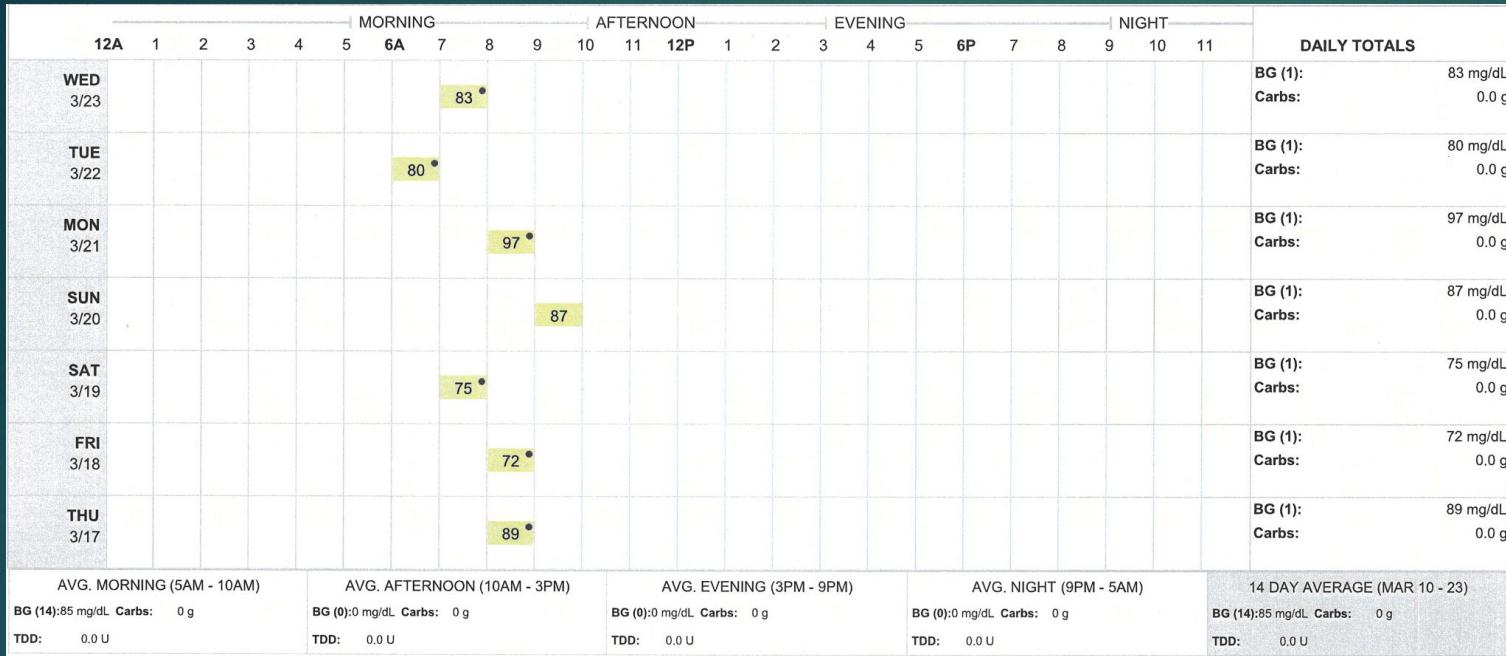
# Breaking down barriers

- Barriers to wound healing
  - Is the patient ready to accept assistance?  
Possible lifestyle changes
  - Does the patient want treatment interventions? Possible surgery
  - Can the patient manage nutritional needs to heal?
  - Collaboration... Who can join the journey of healing?

# Glucose management

- ▶ Glucose goals
  - ▶ Pre-meal 80-130 mg/dl
  - ▶ Post-meal <180 mg/dl at 1 hour; <150 mg/dl at 2 hour
  - ▶ A1c <7%
  - ▶ TIR >70%
  - ▶ >180 mg/dl, wound healing is difficult
- ▶ Review reports
  - ▶ Testing being done?
  - ▶ Understanding of what is being seen?
  - ▶ Determine what may be best/most-impactful first area of focus

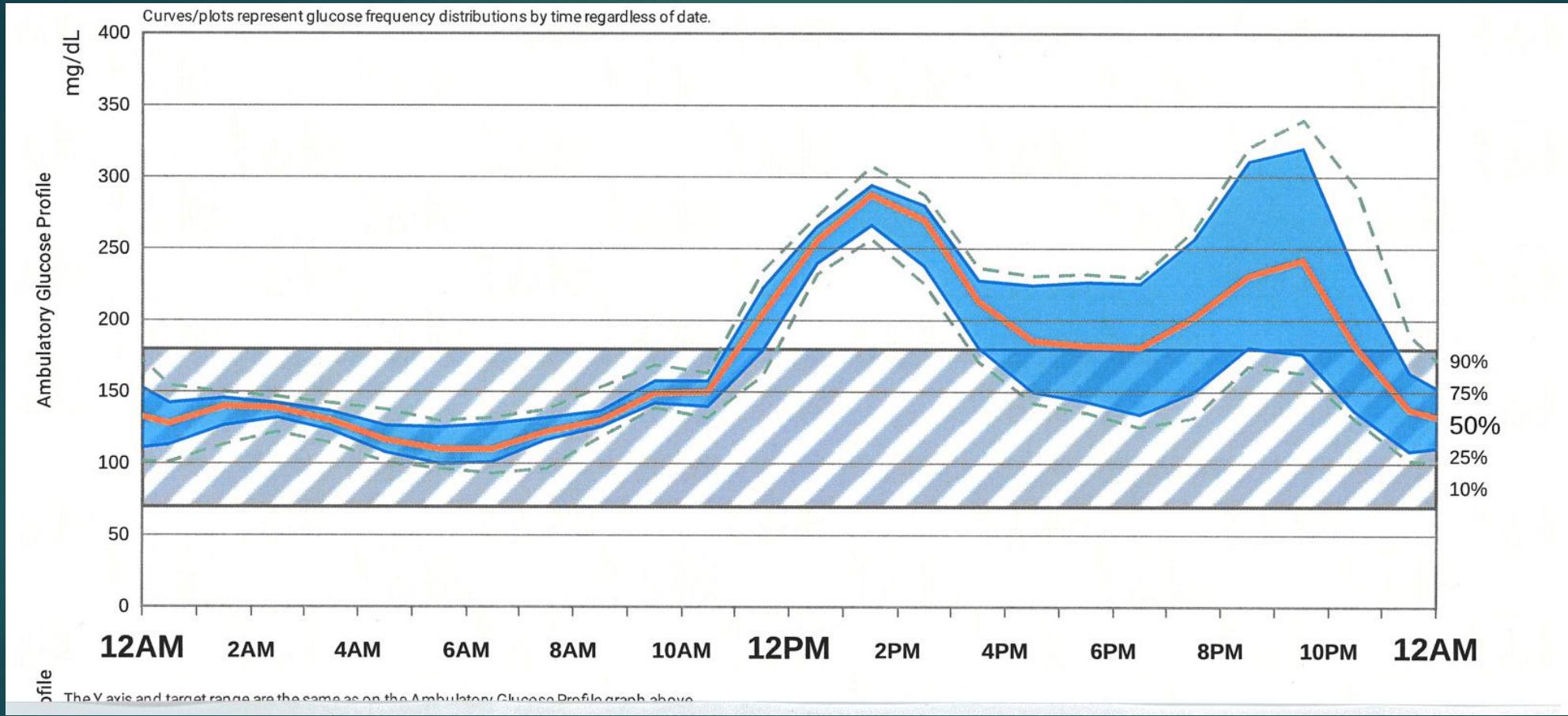
# Fasting only checks



- "I'm running 80-low 100s"
- A1c is...
- Willing to increase frequency? Vary times?
- CGM – Pro or personal?



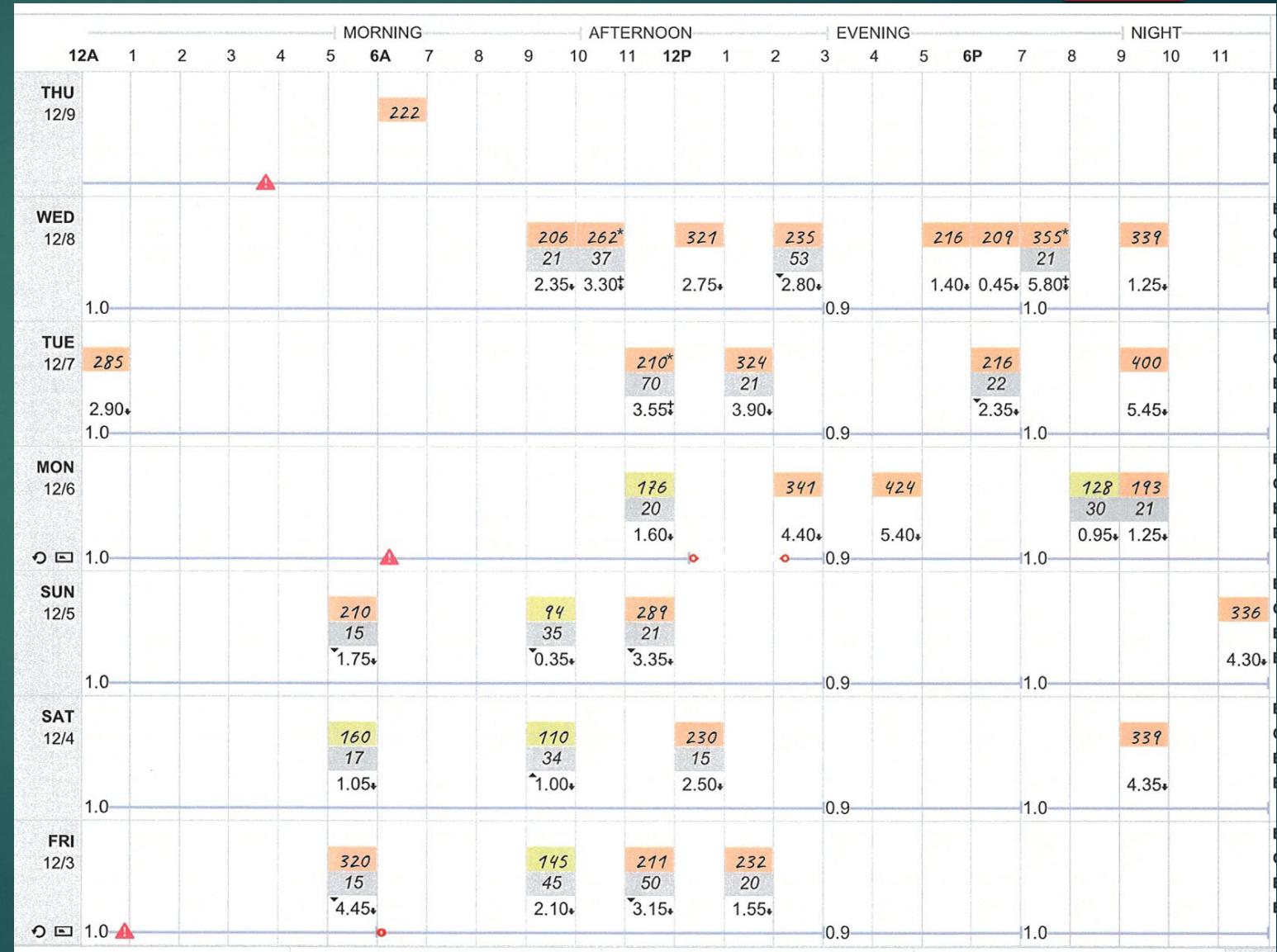
# Uncover the rest of the story...



- Med change/addition
- Insulin titration/addition
- Discuss food choices

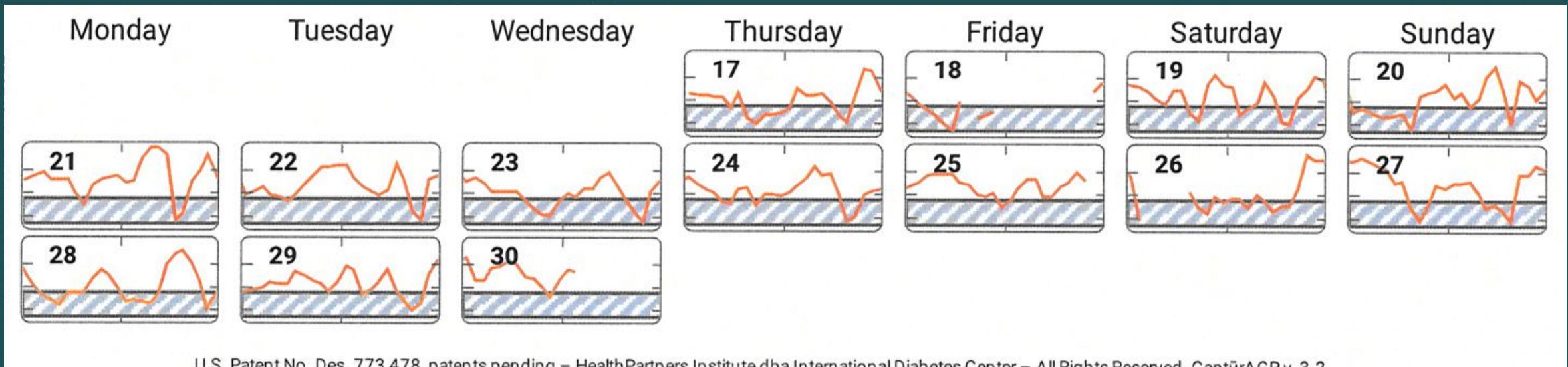
# More times of day being checked

- Appears to be "always high"
  - What would you ask about?

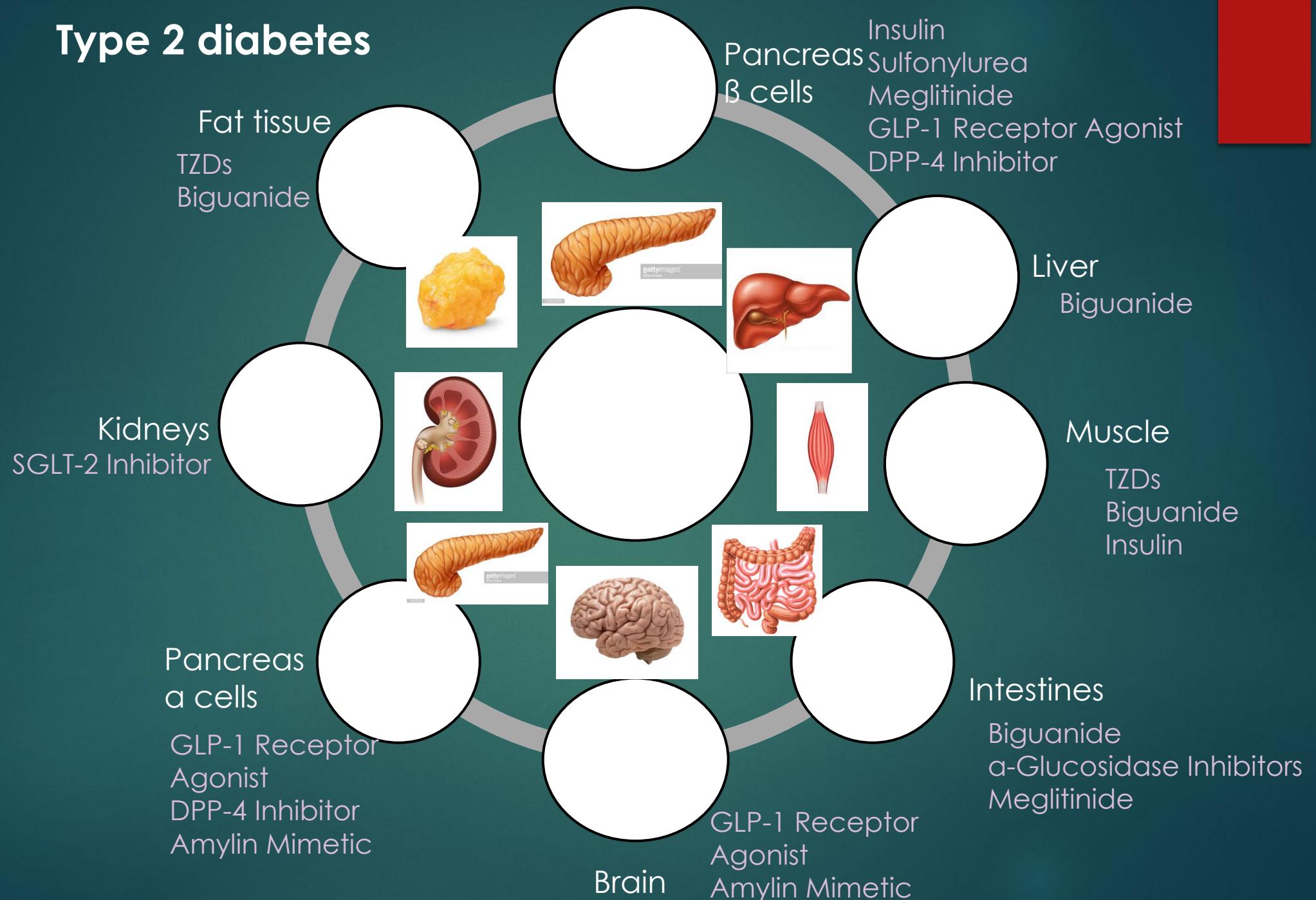


# Connect the dots

- Med change/removal
- Insulin adjustment, basal vs bolus use
- Hypoglycemia treatment, discuss fear of



# Type 2 diabetes



# What is Neuropathy in Diabetes?

- ▶ **Progressive** loss of nerve fiber function
- ▶ Happens throughout the body- recognized based on what nerves are affected.
- ▶ Most common complication of diabetes
- ▶ Prevalence increases with duration of diabetes and hyperglycemia severity
- ▶ Manage with symptom relief and therapies to slow progression
- ▶ Most important treatment- BG management!!

# Peripheral neuropathy

- ▶ 50% of people with diabetes will develop neuropathy
  - ▶ Peripheral neuropathy most common
    - ▶ Amputation and foot ulceration
    - ▶ Diabetes is leading cause of non-traumatic lower limb amputation
- ▶ Stocking-and-glove pattern numbness, pain, tingling, weakness
- ▶ Usually starts in the 1<sup>st</sup> and 3<sup>rd</sup> toes and progresses to the 1<sup>st</sup> and 3<sup>rd</sup> metatarsal heads
- ▶ Goals: avoid infection, complications, loss of sensation, slow progression



# Management

- ▶ Routine visual inspection of feet at each diabetes-related healthcare visit
  - ▶ Detect acute problems
  - ▶ Reinforce importance of preventive strategies and self-care
- ▶ Annual comprehensive foot exam
  - ▶ Visual inspection
  - ▶ Vibratory sensation exam
  - ▶ Pressure sensation
  - ▶ Superficial pain sensation
  - ▶ Assess mobility, gait, balance
- ▶ Patient education
  - ▶ BG management
  - ▶ Daily foot inspections
  - ▶ Proper footwear
  - ▶ Exercise



# Patient education - foot care

- ▶ Look at both feet top, bottom, sides and between toes daily
- ▶ Wash feet daily
- ▶ Dry feet well, especially between the toes
- ▶ Moisturize to keep skin soft, no lotion between toes
- ▶ Inspect daily for cuts, sores, blisters, redness, calluses, thick or ingrown nails
- ▶ Cut toenails straight across, file sharp corners
- ▶ Wear clean, soft socks – watch tightness
- ▶ Wear shoes that fit well
- ▶ No barefoot (or sock-footed) walking
- ▶ Check inside shoes before putting on

**Foot Care for People with Diabetes**

CHANGINGlife WITHDIABETES

People with diabetes have to take special care of their feet. You should have a comprehensive foot exam every year. This page shows some more things you can do to keep your feet healthy.

Ask your diabetes care team how you should care for your toenails.

Wash your feet in warm water every day.

Dry your feet well, especially between the toes.

Keep your feet warm and dry. Always wear shoes that fit well.

Keep the skin soft with a moisturizing lotion, but do not apply it between the toes.

Never walk barefoot indoors or outdoors.

Inspect your feet every day for cuts, bruises, blisters, or swelling. Tell your doctor right away if you find something wrong.

Examine your shoes every day for cracks, pebbles, nails, or anything that could hurt your feet.

**Take good care of your feet – and use them. A brisk walk every day is good for you.**

For more information, call the Novo Nordisk Diabetes Tip Line at 1-800-260-3730, or visit us online at [ChangingDiabetes-us.com](http://ChangingDiabetes-us.com).

# Self foot exam - barriers

- ▶ Vision
  - ▶ Manual palpation substitute for visual inspection
- ▶ Mobility
  - ▶ regular or magnifying mirror to help visualize the feet
- ▶ May require someone else to complete

# Patient education – additional items

- ▶ Mild to moderate exercise can prevent onset
  - ▶ Acute foot ulcer: recommend moderate weight-bearing exercise
  - ▶ Injury/open sore: non-weight-bearing activities
- ▶ Daily range-of-motion exercises
  - ▶ Yoga, tai chi
- ▶ Avoid jogging
- ▶ May use hoop to keep covers off feet at night
- ▶ Quit smoking
- ▶ Eat healthy meals
- ▶ Avoid excessive alcohol
- ▶ Glucose management

# Symptom Treatment

- ▶ Manage the conditions causing neuropathy
- ▶ Pain relievers
  - ▶ NSAID up to possible tramadol, oxycodone
  - ▶ Gabapentin, pregabalin
  - ▶ Topical treatments: capsaicin cream, frankincense and myrrh oil, Lidocaine patch
  - ▶ Antidepressant medications
- ▶ Therapies
  - ▶ TENS: 30 minutes daily x 1 month
  - ▶ Plasma exchange, IVIG
  - ▶ PT
- ▶ Alternative medicine
  - ▶ Acupuncture
  - ▶ ALA
  - ▶ Herbs
  - ▶ Amino acids

