Diabetes Education SERVICES

15 years

Welcome to Diabetes in the 21st Century

Beverly Dyck Thomassian, RN, MPH, BC-ADM, CDE
President, Diabetes Education Services
www.DiabetesEd.net

Diabetes Education SERVICES

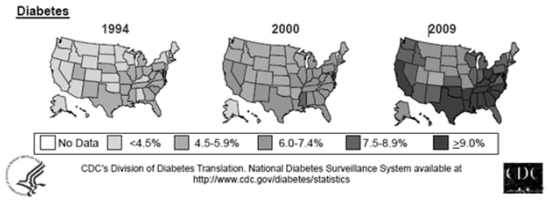
Diabetes in the 21st Century:
A Clinical and Educational Update

1. Describe impact of diabetes
2. Discuss prevention, management strategies
3. Discuss different types of diabetes
4. Describe insulin therapy
5. Review glucose patterns and determine how to adjust therapy to improve glucose.
6. Discuss medical nutrition therapy
7. Gain understanding of Type 2 Meds.
8. Demonstrate successful teaching strategies

Diabetes Education SERVICES

Diabetes in America 2015

- 29 million or > 9.3%
- 27% don't know they have it
- 37% of US adults have pre diabetes (86 mil)



Diabetes Education SERVICES

CDC Announces

35% of Americans will have Diabetes by 2050

Boyle, Thompson, Barker, Williamson
2010, Oct 22:8(1)29
www.pophealthmetrics.com

Diabetes Education SERVICES

Global Epidemic

- Every 10 seconds
  - 1 person dies with diabetes
  - 2 people develop diabetes
- Every year
  - 3 million deaths
  - 6 million new cases
- World Diabetes Day is November 14
- March is ADA Sound the Alert Day "find people w/ undetected diabetes"

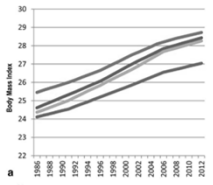
Diabetes Education SERVICES

World Diabetes Day

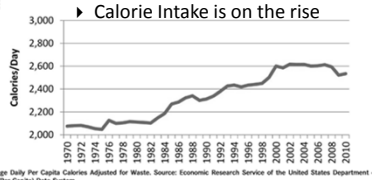
November 14

Diabetes Education SERVICES

U.S. Weight - 68% overweight or obese



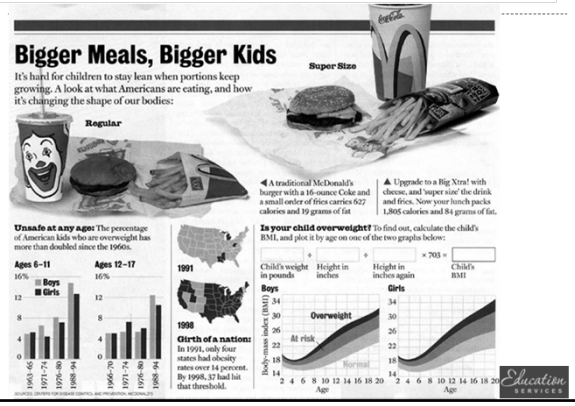
- ~~34% BMI 25-29~~
- 34% BMI 30 +
  - 1/3 of all overwt people don't get diabetes
  - We burn 100 cals less a day at work
  - Overall, food costs ~ 10-15% of income
- Calorie Intake is on the rise



Average Daily Per Capita Calories Adjusted for Waste. Source: Economic Research Service of the United States Department ... ility (Per Capita) Data System.

Diabetes Education SERVICES

Bigger Meals, Bigger Kids



Free Live Webinars and Live Seminars at DiabetesEd.net

- Free Webinars
  - Preparing to take CDE
  - New Frontiers
  - New Medications
  - BC-ADM
- Sign-Up Sheet
  - Provide email and we'll send you free monthly newsletter

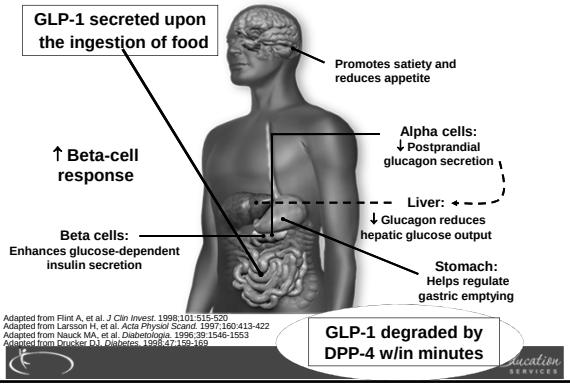
Diabetes Education SERVICES

Hormones Effect on Glucose

Hormone	Effect
Glucagon (pancreas)	↑
Stress hormones (kidney)	↑
Epinephrine (kidney)	↑
Insulin (pancreas)	↓
Amylin (pancreas)	↓
Gut hormones - incretins (GLP-1) released by L cells of intestinal mucosa, beta cell has receptors)	↓

Diabetes Education SERVICES

GLP-1 Effects in Humans
Understanding the Natural Role of Incretins



Adapted from Flint A, et al. *J Clin Invest*. 1998;101:515-520
Adapted from Larsson H, et al. *Acta Physiol Scand*. 1997;160:413-422
Adapted from Nauck MA, et al. *Diabetologia*. 1996;39:1546-1553
Adapted from Puntker DJ. *Diabetes*. 1998;47:159-169

Diabetes Education SERVICES

Incretin Mimetics
Byetta, Bydureon, Trulicity, Tanzeum

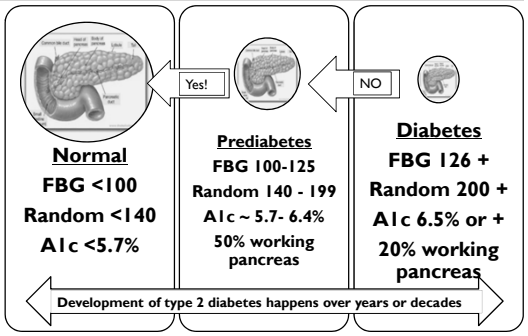
- **Action (synthetic gut hormone)**
  - Insulin release in response to meal
  - Slows gastric emptying
  - Causes Satiety – promotes wt loss
  - Preserves Beta Cells
- **Details:**
  - Daily and long acting version - 1x week injection
  - **Efficacy:** Decreases A1c by 0.5 – 1.6%, wt by 3lbs +
- **Benefits/Issues** – wt loss, no hyp. Expensive, N/V
  - □ Pancreatitis Warning – report signs immediately

Diabetes Education SERVICES

Bariatric Surgery

- Consider on diabetes pts w/ BMI >35, esp with comorbidities
- Remission (BG normalized)
  - rates range from 40 – 95%
  - Better results with newer diabetes (more beta cell mass)
  - Due to increase incretins (gut hormones)
- Still researching long term benefits, cost effectiveness and risk

Natural History of Diabetes



Signs of Diabetes

- Polyuria
- Polydipsia
- Polyphasia
- Weight loss
- Fatigue
- Skin and other infections
- Blurry vision

- Glycosuria, H_2O losses
- Dehydration
- Fuel Depletion
- Loss of body tissue, H_2O
- Poor energy utilization
- Hyperglycemia increases incidence of infection
- Osmotic changes

Diabetes Classifications

- Type 1
- Type 2
- Gestational
- Secondary

Case Study

1. Pt profile: 5'8", 192 lb male
Diabetes 12 years, on insulin 3 yrs
What type of DM and how do you know?

2. Pt profile: 5'6", 108 lb female
On insulin 3u Novolog before meals,
10u Lantus at bedtime
What type of DM and how do you know?

Type 1 Rates Increasing Globally

- 23% rise in type 1 diabetes incidence from 2001-2009
- Why?
  - Autoimmune disease rates increasing over all
  - Changes in environmental exposure and gut bacteria?
  - Hygiene hypothesis
  - Obesity?

Incidence of Type 1 in Youth

- **General Pop 0.3%**
- **Sibling 4%**
- **Mother 2-3%**
- **Father 6-8%**
- Rate doubling every 20 yrs
- Many trials underway to detect and prevent (Trial Net)

Type 1 – 10% of all Diabetes Genetics and Risk Factors

- Auto-immune pancreatic beta cells destruction
- Most commonly expressed at age 10-14
- Insulin sensitive (require 0.5 - 1.0 units/kg/day)

- Combo of genes and environment:
  - Autoimmunity tends to run in families
  - Higher rates in non breastfed infants
  - Viral triggers: congenital rubella, coxsackie virus B, cytomegalovirus, adenovirus and mumps.

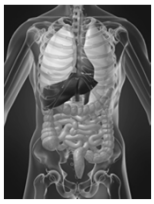
Autoantibodies Assoc w/ Type 1

Panel of autoantibodies –

- GAD65 - Glutamic acid decarboxylase –
- ICA - Islet Cell Cytoplasmic Autoantibodies
- IAA - Insulin Autoantibodies

Type 1 Diabetes Associated with other immune conditions

- Celiac disease (gluten intolerance)
- Thyroid disease
- Addison's Disease
- Rheumatoid arthritis
- Other



Diabetes Education SERVICES

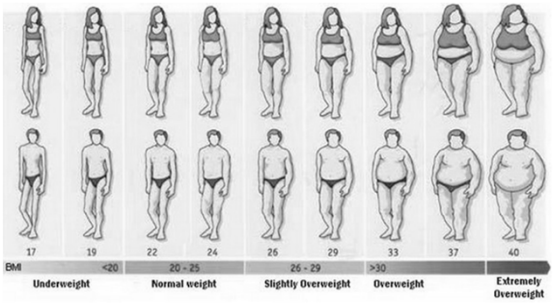
Type 1 in Hospital

- 43 yr old admitted to evaluate angina.
- Morning blood sugar is 92.
- Based on Regular insulin sliding scale, no insulin required.
- Breakfast tray shows up and patient says, I need my insulin shot before I eat.

What do you say?

Diabetes Education SERVICES

BMI Categories



Diabetes Education SERVICES

Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)

1. Testing should be considered in all adults who are overweight (BMI ≥ 25) and have additional **risk factors**:

   - First-degree relative w/ diabetes
   - Member of a high-risk ethnic population
   - Habitual physical inactivity
   - PreDiabetes
   - History of heart disease

Diabetes Education SERVICES

Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)

Risk factors cont'd

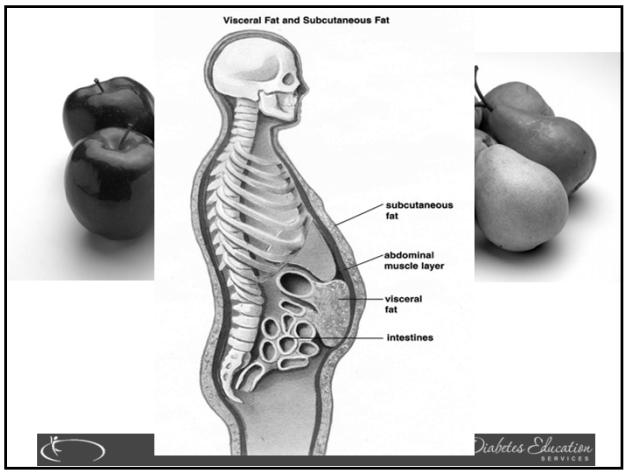
- HTN - BP > 140/90
- HDL < 35 or triglycerides > 250
- baby >9 lb or history of Gestational Diabetes Mellitus (GDM
- Polycystic ovary syndrome (PCOS)
- Other conditions assoc w/ insulin resistance:
  - Severe obesity, acanthosis nigricans (AN)

Diabetes Education SERVICES

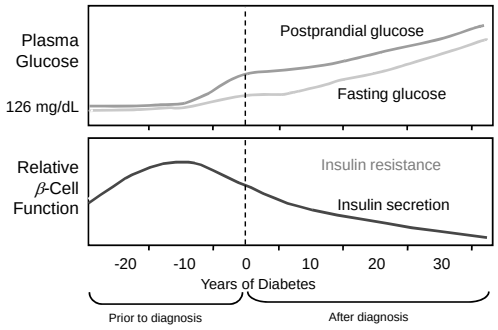
Acanthosis Nigricans (AN)

- Signals high insulin levels in bloodstream
- Patches of darkened skin over parts of body that bend or rub against each other
  - Neck, underarm, waistline, groin, knuckles, elbows, toes
  - Skin tags on neck and darkened areas around eyes, nose and cheeks.
- No cure, lesions regress with treatment of insulin resistance

Diabetes Education SERVICES



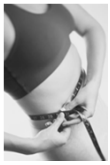
Natural Progression of Type 2 Diabetes



Adapted from Bergenstal et al. 2000; International Diabetes Center.

Diabetes Education SERVICES

Cardio Metabolic Risk - 5 Hypers -



- Hyperinsulinemia (resistance)
- Hyperglycemia
- Hyperlipidemia
- Hypertension
- Hyper"waistline"emia (35" women, 40" men)

Manifestations of Insulin Resistance

Diabetes Education SERVICES

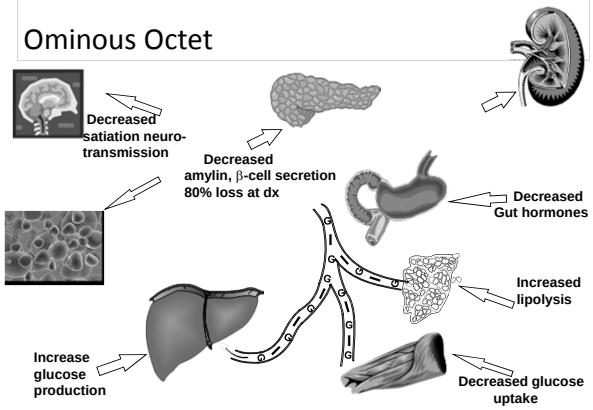
Metformin – 1st agent of choice

- **Action:** decrease hepatic glucose (glycogen)
- Metformin (Glucophage)
  - Starting dose: 500 BID, max 2500mg daily
  - Metformin XR - extended release – less GI upset
  - **Efficacy:**
    - Decrease fasting plasma glucose 60-70 mg/dl
    - Reduce A1C 1.0-2.0%
  - Benefits / Issues
    - Cheap, no weight gain; some lose weight, lowers LDL, no hypo
    - Not indicated if creat > 1.4-1.5 or GFR < 60 (cleared by kidney)

Diabetes Detectives Needed

- On average – takes 6.5 years to diagnose diabetes
- 1/4 of all people with diabetes don't know they have it

Ominous Octet



SGLT2 Inhibitors- "Glucoretics"

- **Action**: "Glucoretic" decreases renal reabsorption in the proximal tubule of the kidneys (reset renal threshold and increase glycosuria)

SGLT2 Inhibitors • Decrease glucose reabsorption in kidneys • "glucoretic."	Canagliflozin (Invokana) Dapagliflozin (Farxiga) Empagliflozin (Jardiance)	100–300 mg once daily 5–10 mg once daily 10–25 mg once daily

- Benefits: Lowers A1c 0.7 – 1.5%, lowers wt 1-3 lbs, no hypo
- Issues: Can initially lower GFR, monitor kidney function and lytes. Watch for hypotension/ GU infections. Expensive

Comparison of Type 1 and Type 2

	Type 1	Type 2
Obesity	x	xxx
Insulin dependence	xxx	30%
Respond to oral agents	0	xxx
Ketosis	xxx	x
Antibodies present	xxx	0
Typical Age of onset	teens	adult
Insulin Resistance	0	xxx

Other Causes of Hyperglycemia

- Steroids
- Agent Orange
- Tube feedings / TPN
- Transplant medications
- Cystic Fibrosis

Regardless of cause, requires treatment
- Insulin always works
- Sign of pancreatic malfunction

Diabetes is also associated with:

- Fatty liver disease
- Obstructive sleep apnea
- Cancer; pancreas, liver, breast
- Alzheimer's
- Depression

DiaBingo

B Frequent skin and yeast infections
B A BMI of ____ or greater is considered overweight
B To reduce complications, control **A**1c, **B**lood pressure, **C**holesterol
B PreDiabetes – fasting glucose level of ___ to ____
B Erectile dysfunction indicates greater risk for ____
B Diabetes – fasting glucose level____ or greater
B Type 1 diabetes is best described as an _____ disease
B People with diabetes are _____ times more likely to die of heart dx
B Elevated triglycerides, < HDL, smaller dense LDL
B Each percentage point of A1c = _____ mg/dl glucose
B At dx of type 2, about __% of the beta cell function is lost
B Diabetes – random glucose ____ or greater

Life Study – Mrs. Jones

Mrs. Jones is 62 years old, overweight and complaining of feeling tired and urinating several times a night. She is admitted with a urinary tract Infection. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine.

- What are her risk factors, signs of diabetes
- What type of diabetes does she have?
- Does she have insulin resistance?

Strategies – One Step at a Time, Focus on Survival Skills

Look for
"teaching moment"
opportunities

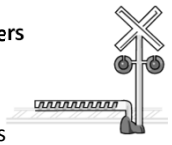
What Do You Say? Mrs. Jones asks you

- What is type 2 diabetes?
- Will this go away?
- Will I get complications?
- Will I need to take diabetes medication for the rest of my life?
- How come I got diabetes?
- Do I have to check my blood sugars?

No one is Unmotivated

…. to lead and long and healthy life

- **These are the 3 usual Critical Barriers**
  - Perceived worthlessness
  - Too many personal obstacles
  - Absence of support and resources



Bill Polonsky, PhD, CDE

Overcoming barriers

- Confront the key misbelief. Ask the question, does dm cause complications?
- Offer pts evidence based hope message –
- Frequent contact
- Paired glucose testing

- Ask pt, "Tell me 1 thing that is driving you crazy about your diabetes"
- Discuss medication beliefs
- To improve outcomes, see pts more often

Bill Polonsky, PhD, CDE

Diabetes Education SERVICES

How Often Should I Check?

- Be realistic!!
- Type 2 on orals – Medicare covers 100 strips for 3 months
- Based on individual - Consider:
  - Types and timing of meds
  - Goals
  - Ability (physical and emotional)
  - Finances / Insurance

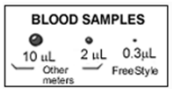
Diabetes Education SERVICES

How will it help me?

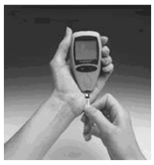
- See if your treatment plan is working
- Make decisions regarding food and/or med adjustment when exercising
- Find out how that pizza affected your BG
- Avoid unwanted weight gain
- Enhanced athletic performance
- Find patterns
- Manage illness

Diabetes Education SERVICES

New Meters – a little goes a long way



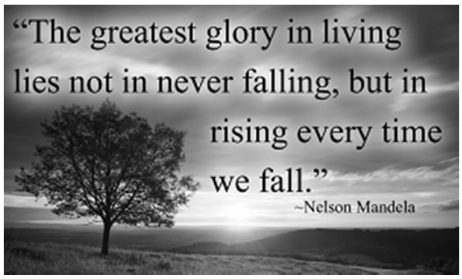
- 0.3 microliters of blood
- minimal pain



Customer Service (toll-free): Look for 800 number

Diabetes Education SERVICES

Diabetes Vacations



Diabetes Education SERVICES

Complications - Why?

- Degree of hyperglycemia "glucose toxicity"
- Duration of hyperglycemia
- Genes
- Multiple risk factors: smoking, vascular disease, dyslipidemia, hypertension, other

Diabetes Education SERVICES

Diabetes Complications

- Heart disease leading cause of death.
- CAD death rates are about 2 -4x's as high as adults without diabetes (it's not getting better)
- Risk of stroke is 2 - 4 times higher
- 60% - 65% of people with DM have HTN.
- DM accounts for 40% of new cases of ESRD
- 60 - 70% have mild - severe forms of neuropathy
- Diabetes is the leading cause of blindness
- Accounts for 50% of lower limb amputations

Control Matters

- **Trials**
- **Practice Recommendations**

Financial Advisor

- Mid 30s, friendly, he smiles to greet you and you notice his gums are inflamed. You'd guess a BMI of 26 or so, with most of the extra weight in the waist area.
- If you could give him some health related suggestions, what would they be?

Can Type 2 be Prevented in Older Adults?

- Physical activity (30 mins a day)
- Dietary score (higher fiber intake, low saturated fat and *trans*-fat , lower mean glycemic index)
- Not Smoking
- Alcohol use (up to 2 drinks a day);
- BMI <25 and waist circumference

Dariush Mozaffarian, MD, *Arch Intern Med.* 2009;169(8):798-807.

Overall, 9 of 10 new cases of diabetes attributable to these 5 lifestyle factors.

89% risk reduction when all at goal.

35% rel risk reduction for each additional

Diabetes Education SERVICES

Can we stop pre diabetes from progressing?

3, 234 people w/ Pre-Diabetes randomized:

- Placebo
- Diet/Exercise or
- Metformin

over a three year period

Diabetes Prevention Program (DPP) 2001

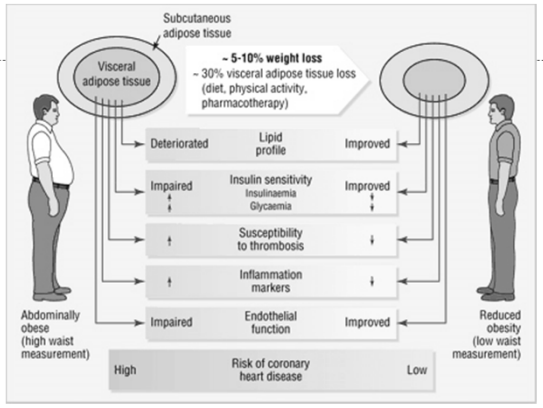
NATIONAL Diabetes PREVENTION PROGRAM

Diabetes Education SERVICES

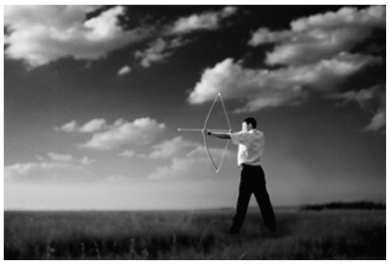
Diabetes Prevention Program

- Standard Group - 29% developed DM
- Lifestyle Results - 14% developed DM
  - 58% (71% for 60yrs +) Risk reduction
    - 30 mins daily activity
    - 5-7% of body wt loss
- Metformin 850 BID - 22% developed DM
  - 31% risk reduction (less effective with elderly and thinner pt's)

Diabetes Education SERVICES



Goals of Care



ABCs of Diabetes –

- A1c less than 7% (avg 3 month BG)
  - Pre-meal BG 80-130
  - Post meal BG <180
- Blood Pressure < 140/90
- Cholesterol
  - DM and 40 yrs, start statin
  - HDL >40
  - Triglyceride < 150
- E xercise, Education
- H ealthy Eating

Glucose and BP Control Matter

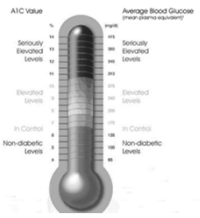
- 1% decrease in A_1c reduces microvascular complications by 35%
- 1% decrease in A_1c reduces diabetes related deaths by 25%
- B/P control (144/82) reduced risk of:
  - Heart failure (56%)
  - Stroke (44%)
  - Death from diabetes (32%)

Lancet 352: 837-865, 1998

Diabetes Education SERVICES

6. Glycemic Targets

- **Adult non pregnant A1c goals**
  - **A1c < 7%** - a reasonable goal for adults.
  - **A1c < 6.5%** - may be appropriate for those without significant risk of hypoglycemia or other adverse effects of treatment.
  - **A1c < 8%** - may be appropriate for patients with history of hypoglycemia, limited life expectancy, or those with longstanding diabetes and vascular complications.



Diabetes Education SERVICES

A1c and Estimated Avg Glucose (eAG) 2008

A1c (%)	eAG
5	97
6	126
7	154
8	183
9	212
10	240
11	269
12	298

Order teaching tool kit free at diabetes.org

eAG = 28.7 x A1c-46.7 ~ 29 pts per 1%

Translating the A1c Assay Into Estimated Average Glucose Values – ADAG Study

Diabetes Care: 31, #8, August 2008

Diabetes Education SERVICES

"Legacy Effect"

- For participants of DCCT and UKPDS
  - long lasting benefit of early intensive BG control prevents
    - microvascular complications
    - Macrovascular complications (15-55% decrease)
  - Even though their BG levels increased over time
  - Message – Catch early and Treat aggressively

Diabetes Education SERVICES

Exercise Recommendations

- **Activity update –Don't sit more than 90 minutes**
- Evidence supports that everyone, including with diabetes should be encouraged to reduce sedentary time, by not sitting for more than 90 minutes at a time.
- It is recommended that people with pre diabetes and diabetes engage in 150 minutes of activity a week and at **least 2 weekly sessions of resistance exercise.**

Diabetes Education SERVICES

Good Exercise Info / Quotes

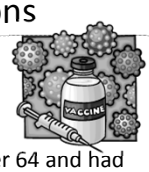
- 20 % of people walk 30 mins a day
- Exercise decrease A1c 0.7%
- No change in body wt, but 48% loss in visceral fat
  - ADA PostGrad 2010

- "If you don't have time for exercise, you better make time for disease."

"I don't have time to exercise, I MAKE time."

Mike Huckabee

Vaccinations- Immunizations



- Flu vaccine
  - every year starting 6 months
- Pneumococcal starting at 2 years.
  - One time Revaccination for those over 64 and had first vaccine >5 years prior
- Hepatitis B Vaccine
  - For diabetes pts age 19 – 59 (not previously vaccinated)
  - Double risk of Hep B due to lancing devices/ glucose meter exposure

Diabetes Education SERVICES

DiaBingo- G

G ADA goal for A1c is less than ____%

G People with DM need to see their provider at least every month

G Blood pressure goal is less than

G People with DM should see eye doctor (ophthalmologist) at least

G The goal for triglyceride level is less than

G Goal for my HDL cholesterol is more than

G The goal for blood sugars 1-2 hours after a meal is less than:

G People with DM should get this shot every year

G People with DM need to get urine tested yearly for _____

G Periodontal disease indicates increased risk for heart disease

G The goal for blood sugar levels before meals is:

G The activity goal is to do ___ minutes on most days

Diabetes Education SERVICES

Mr. Jones - What are Your Recommendations?

Patient Profile

64 yr old with type 2 for 11 yrs. Hx of CVD.

Labs:

- A1c 9.3%
- HDL 37 mg/dl
- Triglyceride 260mg/dl
- Proteinuria - neg
- B/P 152/94

Self-Care Skills

- Walks dog around block 3 x's a week
- Bowls every Friday
- 3 beers daily
- *What meds?*
- *What referrals?*
- *My foot hurts*
- *Admitted to hospital*

Diabetes Education SERVICES

Glucose Management and Hospitalized Patients

In hospitalized patients with critical illness, hyperglycemia is a signal that warrants our attention.

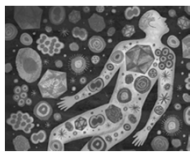
Hospitals and Hyperglycemia What's the Big Deal?

- Hyperglycemia is associated with increased morbidity and mortality in hospital settings.
  - Acute Myocardial Infarction
  - Stroke
  - Cardiac Surgery
  - Infection
  - Longer lengths of stay

Diabetes Education SERVICES

Stress response and hyperglycemia

- Decreased WBC's
- Catabolism
- Abnormal inflammatory response
- Endothelial cell dysfunction
- Increased clotting, blood viscosity
- Tissue breakdown
- Inflammatory changes
- Increased blood pressure, pulse



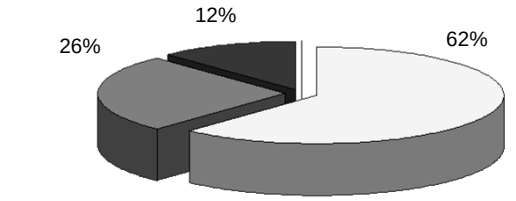
Leads to: Longer lengths of stay, complications, death

- Inflammation, "the body on fire"

Diabetes Care, v. 27, #2, Feb 2004

Diabetes Education SERVICES

Hyperglycemia*: A Common Comorbidity in Medical-Surgical Patients in a Community Hospital



- ☐ Normoglycemia
- ☐ Known Diabetes
- ☐ New Hyperglycemia

n = 2,020

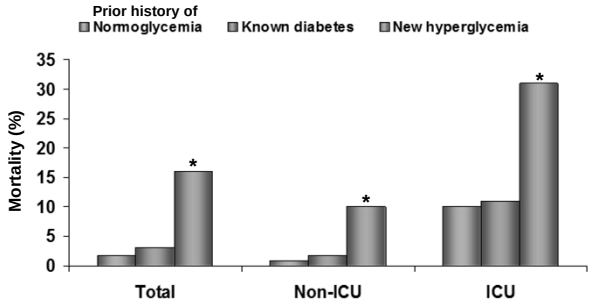
* Hyperglycemia: Fasting BG ≥ 126 mg/dl or Random BG ≥ 200 mg/dl X 2

Umpierrez G et al, J Clin Endocrinol Metabol 87:978, 2002

Umpierrez et al

Diabetes Education SERVICES

Effect of Hyperglycemia on Hospital Mortality



*P<.01 compared with normoglycemia and known diabetes.

Umpierrez GE et al. *J Clin Endocrinol Metab.* 2002;87:978-982.

Diabetes Education SERVICES

BG Above Normal = Trouble

- Pre Diabetes
  - Fasting Glucose = 100-125mg/dl
  - A1c 5.7 – 6.4%
- Diabetes
  - Fasting Glucose = 126 mg/dl +
  - Random Glucose = 200 mg/dl +
  - A1c 6.5% +

Any blood glucose above 140 requires treatment

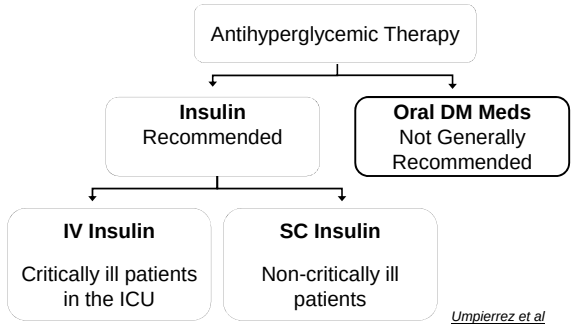
Umpierrez et al

Diabetes Education SERVICES

Diabetes Detectives Needed

- On average – takes 6.5 years to diagnose diabetes
- 1/4 of all people with diabetes don't know they have it

Recommendations for Managing Patients With Diabetes in the Hospital Setting

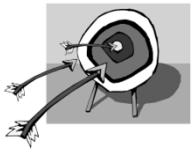


Umpierrez et al

1. ACE/ADA Task Force on Inpatient Diabetes. *Diabetes Care.* 2006 & 2009
2. *Diabetes Care.* 2009;31(suppl 1):S1-S110..

Management of Hyperglycemia and Diabetes

- Non-ICU
  - Basal/bolus therapy (MDI)
    - NPH and Regular insulin
    - Long-acting and rapid-acting insulin
    - Premixed insulin



- ICU and Critical Care
  - Insulin Drips
  - Basal /Bolus

Glucose Goals For Hospitalized Patients

Sub-Q Insulin

- Blood glucose goals:
  - Premeal 100 -140
  - Post meal <180

Insulin Drip Goals

- glucose goal 140-180

UCLA Santa Monica - UCLA Medical Center and Orthopædic Hospital

Patient Name: ____

Date of Birth: ____

Medical Record #: _

Adult Subcutaneous Insulin Orders

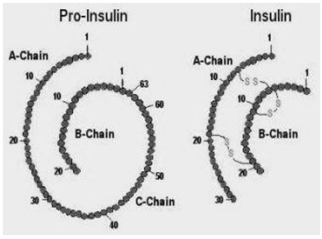
Diabetes Education Services

Insulin – the Ultimate Hormone Replacement Therapy

Objectives:

•Discuss the actions of different insulins

•Describe using pattern management as an insulin adjustment tool.



Diabetes Education Services

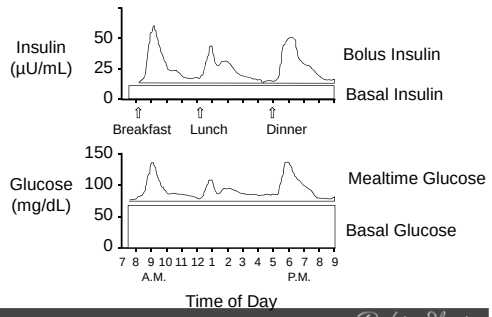
Psychological Insulin Resistance (PIR)

- 50% of providers in study threatened pts "with the needle".
- Less than 50% of providers realized insulins' positive effect on type 2 dm
- Most pts don't believe that insulin would "better help them manage their diabetes".
- Solutions: Find the root of PIR and address it, use more insulin pens

Diabetes Attitudes, Wishes, Needs Study - Rubin

Diabetes Education Services

Physiologic Insulin Secretion: 24-Hour Profile



Life Study – Mrs. Jones

Mrs. Jones is 62 years old, a little heavy and complains of feeling tired and urinating several times a night. She is admitted with a urinary tract Infection. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine.

Life Study – Mrs. Jones

- How would we manage her BG in hospital?

Initiating Insulin in Hospital

Stop oral agents - Obtain patient wt in kg

Calculate total daily dose (TDD) as 0.3-0.7 units per kg/day

Choose the dosing schedule

50% of TDD as basal insulin	50% of TDD as prandial or nutritional insulin

Use Correction Insulin for BG above goal

Adjust according to results of BSGM	Adjust dose for NPO status or changes in clinical status

Diabetes Education SERVICES

Insulin Action Teams

- Bolus: lowers after meal glucose levels
  - Rapid Acting
    - Aspart, Lispro, Glulisine
  - Short Acting
    - Regular

- Basal: controls glucose between meals, hs
  - Intermediate
    - NPH
  - Long Acting
    - Detemir (Levemir)
    - Glargine (Lantus)

Diabetes Education SERVICES

Bolus Insulins
(½ of total daily dose ÷ meals)

Name	Onset	Peak Action
*Aspart (NovoLog)	5-15 min	0.5 -1.5 hrs
Lispro (Humalog)		
Glulisine (Apidra)		

*Aspart is insulin of choice

Short Acting – for gastroparesis patients

Regular	30 -60 min	2 - 3 hrs

Diabetes Education SERVICES

Bolus Insulin Summary

- Aspart, Humalog, Apidra, Regular
- Starts working fast (15-30 mins)
- Gets out fast (3-6 hours)
- Post meal BG reflects effectiveness
- Should comprise about ½ total daily dose
- Covers food and/or hyperglycemia.
  - 1 unit
    - Covers ≈ 10 -20 gms of carb
    - Lowers BG ≈ 30 – 50 points

More than 200 units a day?

Consider u-500 High Potency Insulin

5 x's the concentration of u100

- 500 units per mL vs 100 units per mL
  - How much- When converting from u100?
  - Take total daily dose and divide by 5
    - 200 units a day/5 = 40 units a day of u500
    - 300 units a day/5 = ____ units a day of u500
  - 20 mL a vial. 500 units per mL= 10,000 units/vial
  - Costs ~ ~~$400~~ $1,200 per vial – less expensive unit for unit?
  - Less volume

U-500 Insulin: When More With Less Yields Success: *Diabetes Spectrum March 20, 2009 vol. 22 no. 2 116-122*

Diabetes Education SERVICES

Dosing Strategies u-500

- Consider U-500 (5 x's more potent)
  - 1 unit on U-100 syringe = 5 units insulin
  - Dosing – take total daily needs and split into 2-3 doses
    - 2 doses: 60% am / 40% pm or
    - 3 doses: 40/30/30 or 40/40/20
  - No basal insulin needed, because U-500 has bolus and basal action
  - Safety is number one concern
    - Must have Endocrinology consult
    - TB Syringe must be used in hospital setting

U-500 Insulin: When More With Less Yields Success: *Diabetes Spectrum March 20, 2009 vol. 22 no. 2 116-122*

U-500 Dose

U-100 syringe and TB Syringe

If this is **your dose** of Humulin R U-500	Fill a U-100 **insulin syringe** up to this marking	Fill a **tuberculin syringe** up to this marking
25	5	0.05
50	10	0.1
75	15	0.15
100	20	0.2
125	25	0.25
150	30	0.3
175	35	0.35
200	40	0.4
225	45	0.45
250	50	0.5
275	55	0.55
300	60	0.6
325	65	0.65
350	70	0.7
375	75	0.75
400	80	0.8
425	85	0.85
450	90	0.9
475	95	0.95
500	100	1.0

Bolus Insulin Timing

- How is the effectiveness of bolus insulin determined?
  - Before next meal blood glucose
- Inpt Glucose goals (ADA) – may be modified by provider/pt
  - 1-2 hours post meal <180
  - Before next meal – 100- 140

Insulin Therapy Components

- Prandial or meal insulin – a bolus insulin that covers food, IV dextrose, enteral nutrition
- Correction insulin – bolus insulin dosed to correct for hyperglycemia **in addition** to basal and meal insulin
  - Usually given before meals w/ prandial insulin
- Basal insulin – long acting insulin covers between meals and through night

Diabetes Education SERVICES

Choosing the Right Bolus Insulin Algorithm

Prandial –
- Choose insulin:carb ratio

Correction –
- Choose Algorithm

Diabetes Education SERVICES

SM/RR - UCLA Insulin Order Sets

- Adult Subcutaneous Insulin
- Adult Intravenous Insulin (SM /RR WARD)
- Adult Intravenous Insulin (ICU ONLY)
- Adult Intravenous Insulin - Type 1
- Adult Subcutaneous Insulin Pump
  - Patient Administered
  - **REQUIRES** Endocrine Consult
  - Assess patient – level of ability to self-administer

Diabetes Education SERVICES

How Much Insulin? – Consider the Individual

- It depends, based on:
  - Body weight
    - Overwt, normal wt, or thin
  - Frail, elderly
  - Eating status
    - Normal, poor intake or NPO
  - Renal or hepatic insufficiency
  - Type of Diabetes
  - Current meds; steroids, insulin, oral dm agents
  - Infected or Septic

Mealtime Bolus

- Carbohydrate/ Prandial Coverage
  - Match the insulin to the carbohydrates
  - 1 unit for 8gms
  - 1 unit for 10 gms
  - 1 unit for 15 gms
  - 1 unit for 20 gms

Resistant

⇩

Sensitive

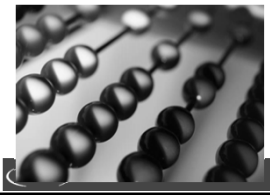
- Adjust ratios depending on

Post meal glucose and patterns

Please calculate the following.

- Ate 45 gms of carb
- How much insulin?
  - 1:8
  - 1:10
  - 1:15

- Ate 75 gms of carb
- How much insulin
  - 1:10
  - 1:20
  - 1:15



- Blood Glucose 84
- Blood Glucose 147

Max Carb Servings per Meal

- Breakfast
  - 45 gms
  - 3 servings carb

- Lunch / Dinner
  - 75 gms or
  - 5 servings carb

Now What?

- Nurse had an emergency and pt already ate lunch?

- Nurse administered insulin and pt only ate a few bites of turkey and drank non sugar tea?
- You just gave 3 units of Aspart and patient needs to go to OR NOW!

Now that we covered food, what about Elevated BG?

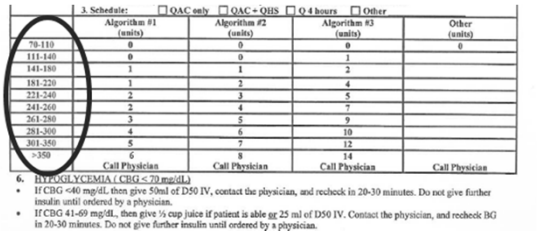
- That's where the Correction Bolus comes into play.

Calculating Correction Bolus

- Algorithm 1
  - Insulin Sensitive - BMI < 20, Type 1, ESRD
- Algorithm 2
  - For avg pt, BMI 20-29, Known Type 2
- Algorithm 3
  - Insulin resistant pt - obese, on steroids

Consider continuing usual home insulin dose

Correction Bolus



3. Schedule: ☐ QAC only ☐ QAC + QHS ☐ Q 4 hours ☐ Other

	Algorithm #1 (units)	Algorithm #2 (units)	Algorithm #3 (units)	Other (units)
70-110	0	0	0	0
111-140	0	0	1	
141-180	1	1	2	
181-220	1	2	4	
221-240	2	3	5	
241-260	2	4	7	
261-280	3	5	9	
281-300	4	6	10	
301-350	5	7	12	
>350	6	8	14	
	Call Physician	Call Physician	Call Physician	Call Physician

6. HYPOGLYCEMIA (CBG < 70 mg/dL)
- If CBG <40 mg/dL then give 50ml of D50 IV, contact the physician, and recheck in 20-30 minutes. Do not give further insulin until ordered by a physician.
- If CBG 41-69 mg/dL, then give ½ cup juice if patient is able or 25 ml of D50 IV. Contact the physician, and recheck BG in 20-30 minutes. Do not give further insulin until ordered by a physician.

For following BG levels- How much corrective insulin?

BG	Alg 1	Alg 2	Alg 3
74			
159			
378			

Basal Insulins
(½ of total daily dose)

Long Acting	Peak Action	Duration
Detemir (Levemir)	No peak	6 - 24 hrs
Glargine (Lantus)	No peak	20- 24 hrs

Intermediate Acting	Peak Action	Duration
NPH	4-10 hrs	10-16

Fasting BG reflects efficacy of basal

Diabetes Education SERVICES

Basal Insulin Summary

- NPH, Levemir, Lantus
- Covers in between meals, through night
- Starts working slow (4 hours)
- Stays in long (12-24 hours)
  - NPH 12 hrs
  - Levemir, Lantus 20-24 hrs
- Fasting blood glucose reflects effectiveness

Combination SQ Insulin

Insulin Type	Onset	Duration
Humalog Mix 75/25: 75% NPL, 25% lispro 50/50: 50% NPL, 50% lispro	5-15 min	10-16 hrs
NovoLog Mix 70/30: 70% NPA, 30% aspart	5-15 min	10-16 hrs
NPH + Reg Combo 70/30: 70%N /30%R 50/50: 50%N /50%R	30 – 60 min	10-16 hrs

Considerations:
- Pre-mixed, difficult to fine tune therapy

Diabetes Education SERVICES

UCLA Santa Monica - UCLA Medical Center and Orthopaedic Hospital

Patient Name: ____
Date of Birth: ____
Medical Record #: _

Adult Subcutaneous Insulin Orders

A. Basal Insulin; choose one type of basal insulin.
Typical starting doses are 0.3 units/kg/day.

Glargine insulin (Lantus®)
- ❑ ____ units subcutaneously at ____ a.m.

and/or
- ❑ ____ units subcutaneously at ____ p.m.

Detemir insulin (Levemir®)
- ❑ ____ units subcutaneously every ____ a.m.

and/or
- ❑ ____ units subcutaneously every ____ p.m.

NPH insulin
- ❑ ____ units subcutaneously q.a.m. and
- ❑ ____ units subcutaneously q.h.s.
- ❑ ____ units subcutaneously q. ____ hours

Diabetes Education SERVICES

Calculate Basal Insulin Needs

- Typical starting dose
  - Body wt in Kg x .3
  - May need more or less based on clinical presentation
  - 10 units common starting dose

Less 0.1 u/kg 0.2u/kg More 0.35 u/kg

Thin, elderly, ↑ creat Heavy, infection, steroids

Diabetes Education SERVICES

Inpt Study – Mrs. Jones

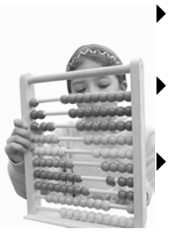
Mrs. Jones is 62 years old, weighs 70kg and complains of feeling tired and urinating several times a night. She is admitted with a urinary tract Infection. Her WBC is 12.3,

- BG 237
- A1c 8.9%
- Creat 1.1
- BMI 25

- What insulin dose would we start Mrs. Jones on?

Diabetes Education SERVICES

Insulin Dose – Mrs. Jones



- Basal
  - 0.3u/ins x 70 kg = 21units
- Insulin/Carb ratio
  - 1:15
- Why?
  - Depends on clinical picture and other oral meds
  - Average weight, good oral intake, type 2

Corrective Insulin – Novolog – Algorithm 2 Rapid/Fast Acting Insulin

Blood Glucose Insulin Dose

70-110	0 unit
111-140	0 unit
141-180	1 unit
181-220	2 unit
221-240	3 units
241-260	4 units
261-280	5 units
281-300	6 units
301-350	7 units
>350	8 units and call MD

Mrs. Jones – Carb 1:15
Alg 2 correction, 21 unit Lantus hs

	Break	Lunch	Dinner	HS
Day 1	admit	219 4 + 2u	243 5 + 4u	219
Day 2	129 3 u	197 5 + 2u	184 5 + 2u	195 - NPO
Day 3	67 Held ins	gone	119 clear liquids 3 units	104
Day 4	73 3 units	81 5 units	109 4 units	d/c

Preparation for Surgery

- Try to schedule surgery in am, resume meds/insulin when eating and stable.
- Basal Insulin: Night before
  - Lantus/Detemir – 100%
  - NPH –
    - Give 100% night before
    - 50% am dose

- Corrective insulin dose: as prescribed
- Have D5 or D10 IV available in case of hypo

BG Running Low?

- Possible Causes
  - Too much insulin
    - Premeal bolus
    - HS basal
  - Glucose toxicity improving
  - Infection improving
  - Stopped/lowered steroids
  - Poor kidney function
  - Skipped meal, poor PO intake
  - Not eating enough carbs

Hypoglycemia Symptoms

- **Autonomic**
  - Anxiety
  - Palpitations
  - Sweating
  - Tingling
  - Trembling
  - Hypoglycemic Unawareness
- Neuroglycopenia
  - Irritability
  - Drowsiness
  - Dizziness
  - Blurred Vision
  - Difficulty with speech
  - Confusion
  - Feeling faint

Hypoglycemia – The Limiting Factor

- Defined as BG of 70mg/dl or below
- 50% of episodes occur during night
- Higher mortality rate with severe hypoglycemia secondary to sulfonylureas
  - Especially (glyburide) Micronase®, Diabeta®
- Blood glucose levels don't describe severity, response is individual

Diabetes Education SERVICES

UCLA Hypo Guidelines

BG 41 – 69 mg/dl

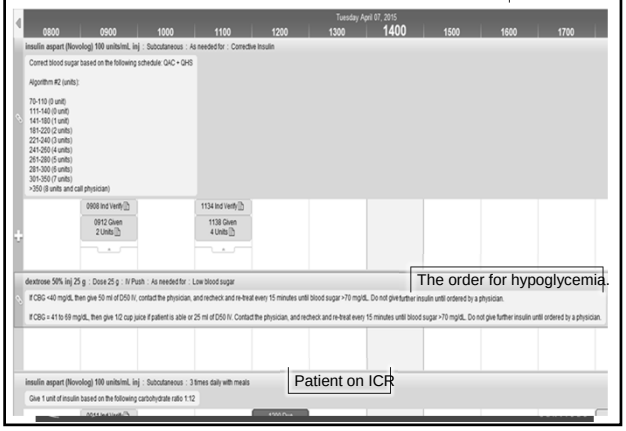
- If eating:
  - ½ cup of juice
- Not eating
  - 25 ml of D50 IV
- Contact MD
- Recheck and retreat every 15 mins until BG > 70
- DO NOT give further insulin until ordered by MD

BG <40 mg/dl

- Give 50 ml D50 IV
- Contact MD
- Recheck and retreat every 15 minutes until BG > 70
- DO NOT give further insulin until ordered by MD

Diabetes Education SERVICES

Adult Subcutaneous insulin order and Hypo Instructions



15 - 20 Gms Carb Sources

- 3 - 4 Glucose Tablets
- 8 - 10 Lifesavers candy
- 2 to 3 peppermints
- 2 Tablespoons Raisins
- 4 - 6 oz's Nondiet soda
- 4 oz's Fruit Juice
- 8 oz Milk (non fat)
- Peds – 15 Skittles

Diabetes Education SERVICES

BG Too Low? Insulin Adjustment Guidelines

- Before meal Blood glucose <70?
  - Implement hypoglycemia protocol
  - Evaluate cause and make needed adjustments
    - Missed meal?
    - Too much insulin?
- Morning blood glucose < 100?
  - Decrease evening Lantus
- Evaluate trends, provide feedback

Diabetes Education SERVICES

Mrs. Jones ready to go home.

- What glucose management strategies for home?
- Her A1c = 8.9%
  - Creat 1.1
  - BMI 25

Diabetes Education SERVICES

Discharge insulin Algorithm

Discharge Treatment

A1C < 7%	A1C 7%-9%	A1C >9%
Re-start outpatient treatment regimen (Orals and/or insulin)	Re-start outpatient oral agents and D/C on glargine once daily at 50-80% of hospital dose	D/C on basal bolus at same hospital dose. Alternative: re-start oral agents and D/C on glargine once daily at 50-80% of hospital dose

Clinical Guidelines for the Managment of Hyperglycemia in Hospitalized Patients in a Non-Critical Care Setting

Diabetes Education SERVICES

Discharge Teaching

- What supplies will she need?
- What top 5 things do we need to teach her?
- What resources can we provide?
- What referrals?

Diabetes Education SERVICES

5 Survival Skills

1. Basics of Diabetes
2. Can patient perform self blood glucose monitoring? Do they need meter?
3. Can pt safely take meds / insulin? Teach side effects.
4. Meal Planning?
5. Self Care

Follow-Up plan - Does pt know who to contact when need help?

SERVICES

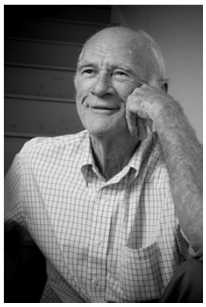
When to Call Provider?*

- Blood glucose <70
- Blood glucose > 250 twice in a day (adults)
- Blood glucose >300 anytime, adults and peds
- *When sick

**Individualize based on pt/provider*

Diabetes Education SERVICES

Mr. R has a foot ulceration How Much Insulin Needed?



- Creatinine 1.6
- 76 years old
- Not very hungry
- BMI 19
- Weighs 80kg
- Glucotrol 5mg at home
- A1c 7.2%

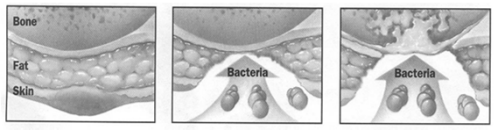
Diabetes Education SERVICES

Foot Care

Lift the sheets and look at the Feets!

Diabetes Education SERVICES

Foot Wounds



Blisters
Calluses

Ulcers

Bone infection

A Quick Foot Assessment

- Ask - What do you do to take care of your feet?
- Look - texture, toenails, structural deformities, lesions, corns
- Assess sensation
- Assess risk factors
- Teach, teach, teach

Calculate Basal Insulin Needs

- Typical starting dose
  - Body wt in Kg x .3
  - May need more or less based on clinical presentation
  - 10 units common starting dose

Less 0.1 u/kg 0.2u/kg More 0.35 u/kg

Thin, elderly, ↑ creat Heavy, infection, steroids

Calculate Insulin Needs
Basal/ insulin carb/ correct

- Body wt in Kg x 0.2
- 80kg x 0.2 = 16 units once daily

- What insulin:carb ratio?
  - 1:20

- What correction alg?
  - Alg 1

Corrective Insulin – Novolog – Algorithm 1

Rapid/Fast Acting Insulin

Blood Glucose	Insulin Dose
70-110	0 unit
111-140	0 unit
141-180	1 unit
181-220	1 unit
221-240	2 units
241-260	2 units
261-280	3 units
281-300	4 units
301-350	5 units
>350	6 units and call MD)

3 days poor intake, pt started on Tube Feeding

- If on continuous tube feeding, how would this change his insulin regimen?
- If on intermittent tube feeding, how would this change his insulin regimen?
- If patients tube feeding is interrupted, what precautions would you take?

Mr. R- Pattern – meal + correction
Algorithm 1 plus 16u Lantus hs

	Break	Lunch	Dinner	HS
Day 1		admit	381 3 + 6 units	198
Day 2	98 3 units	127 3 units	69 ins held	98 RN Held Lantus
Day 3	146 3 +1	67 Ins held	72 tube feeding 4 times a day	207 3 +1 unit
Day 6	142 3 + 1 unit	129 Tube pulled – start D10 IV 3 units	Pt feels funny- BG 63 Ins held	184

Diabetes Education SERVICES

Glycemic Management of the Patient Receiving Enteral Nutrition

Continuous enteral nutrition (EN)
- Basal insulin: NPH Q8 or Q12
- Prandial bolus insulin: to match the feeding

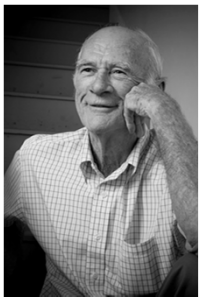
Cycled enteral nutrition
- Based on situation: possibilities include:
- Basal insulin
- Bolus insulin administered q4 to 6 hours
- Correctional insulin given for BG above goal

Bolus enteral nutrition
- Rapid acting analog or short acting insulin given prior to each bolus

If tube pulled out, hang D10% at 40cc/hr

Diabetes Education SERVICES

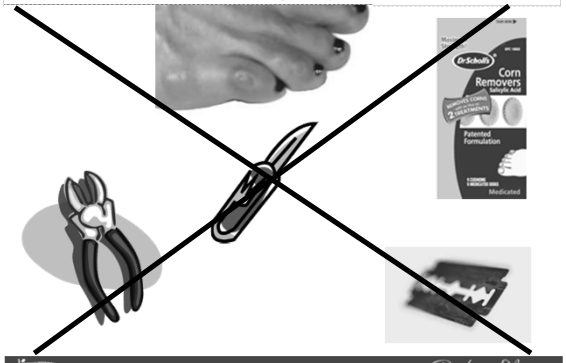
Mr. R after 9 days feeling better, non wt bearing R. Foot. Eating again, regaining strength. DC today.



- What supplies will he need?
- What top 3 things do we need to teach him?
- What resources and referrals?

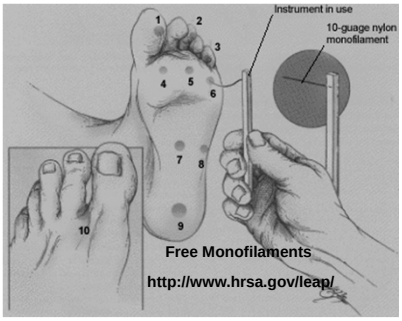
Diabetes Education SERVICES

No Bathroom Surgery



Diabetes Education SERVICES

5.07 monofilament = 10gms linear pressure
If pt can't feel pressure = neuropathy



Free Monofilaments

http://www.hrsa.gov/leap/

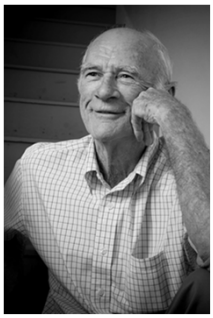
Diabetes Education SERVICES

3 Most Important Foot Care Tips

- Inspect and apply lotion to your feet every night before you go to bed.
- Do NOT go barefoot, even in your house. Always wear shoes!
- Every time you see your doctor, take off your shoes and show your feet.

Diabetes Education SERVICES

Glucose Management for DC?



- Creatinine 1.6
- 76 years old
- Not very hungry
- BMI 19
- Weighs 80kg
- Glucotrol 5mg at home
- A1c 7.2%

Diabetes Education SERVICES

Discharge insulin Algorithm

Discharge Treatment

A1C < 7%	A1C 7%-9%	A1C >9%
Re-start outpatient treatment regimen (Orals and/or insulin)	Re-start outpatient oral agents and D/C on glargine once daily at 50-80% of hospital dose	D/C on basal bolus at same hospital dose. Alternative: re-start oral agents and D/C on glargine once daily at 50-80% of hospital dose

Clinical Guidelines for the Management of Hyperglycemia in Hospitalized Patients in a Non-Critical Care Setting

Diabetes Education SERVICES

5 Survival Skills

1. Basics of Diabetes
2. Can patient perform self blood glucose monitoring? Do they need meter?
3. Can pt safely take meds / insulin? Teach side effects.
4. Meal Planning?
5. Self Care

Follow-Up plan - Does pt know who to contact when need help?

Diabetes Education SERVICES

How Much Insulin Needed?
Mr. K

- Wt 120kg – BMI 31
- Creat 0.9
- Infected Foot Ulcer
- Asthma
- Meds
  - Metformin
  - Exenatide (ran out)
  - Actos (worried about ankles swelling)
- A1c 10.8%

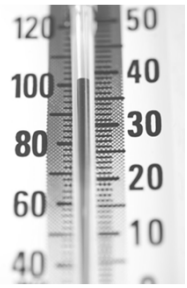
Diabetes Education SERVICES

Started on Prednisone 60mg qd for Asthma

- Blood glucose levels running 300-500.

Diabetes Education SERVICES

BG Running High?



- Possible Causes
  - Glucose Toxic
  - Infection
  - Started on steroids
  - Physical stress
  - Insulin dose too low

Diabetes Education SERVICES

BG Too High? Insulin Adjustment Guidelines

- Morning BG > 140?
  - Consider:
    - Could pt be having nocturnal hypo?
    - Increasing evening Lantus by 10%
- Pre Lunch/Dinner BG > 140?
- Post meal BG > 180?
  - Consider:
    - Increasing mealtime coverage
    - Increasing insulin correction scale

Diabetes Education SERVICES

Calculate Insulin Needs
Basal/ insulin carb/ correct

- Body wt in Kg x 0.3
- 120kg x 0.3 = 36 units once daily

- What insulin:carb ratio?
  - 1:10
- What correction alg?
  - Alg 3

Diabetes Education SERVICES

Corrective Novolog Insulin Resistant - Algorithm 3

Insulin Resistant, BMI >30, Steroids

Blood Glucose	Insulin Dose
70-110	0 unit
111-140	1 unit
141-180	2 unit
181-220	4 unit
221-240	5 units
241-260	7 units
261-280	9 units
281-300	10 units
301-350	12 units
>350	14 units and call MD)

Diabetes Education SERVICES

Mr. K- Pattern (1:10 carb ratio, Algorithm 3 and 36 Lantus am

	Break	Lunch	Dinner	HS
Day 1		admit	432 8 + 14	182
Day 2	292 4 + 10	417 8 + 14	391 8 + 14	234 5
Day 3	318 5 + 12	497 8 + 14	408 8 + 14	367 14
Day 4	423 4 + 14	429 insulin drip started		

Diabetes Education SERVICES

Mr. K BG Levels Too High Insulin Drip Started

- 100 units insulin in 100 cc NS Bag
- 1 cc = 1unit of insulin

Diabetes Education SERVICES

IV Insulin Infusion

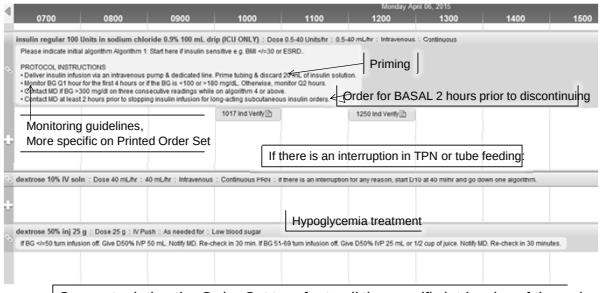
Give extra IV Push insulin x 1 if initial:

- BG 200 -300 – 5units
- BG >300 10 units

- Monitor BG Q 1 hour for first 4 hours or if BG <100 or >200. Otherwise, monitor Q 2 hours.

Diabetes Education SERVICES

IV insulin Order Set
Please read entire order carefully:



Priming

Order for BASAL 2 hours prior to discontinuing

Monitoring guidelines,
More specific on Printed Order Set

If there is an interruption in TPN or tube feeding:

Hypoglycemia treatment

Suggest printing the Order Set to refer to all the specific intricacies of the order

Diabetes Education SERVICES

Initial Infusion Rate

- 3 algorithms:
  - A = insulin sensitive BMI ≤25
  - B = insulin resistant BMI ≥ 30
  - C = Special order only
  - Custom
- If patient eating, also needs novolog at meals

Diabetes Education SERVICES

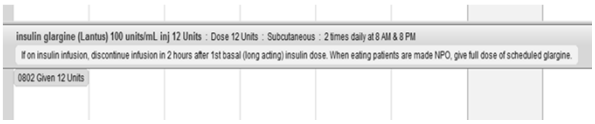
Don't Stop Insulin Infusion…

- Before giving Sub Q Basal insulin!
- Give SubQ 2 hours before stopping drip
- Otherwise, can lead to hyperglycemic crises – DKA or HHS

Diabetes Education SERVICES

Stopping Insulin Infusion

If on insulin infusion, discontinue infusion 2 hours after 1st BASAL insulin dose



When eating patients are made NPO, give full dose of scheduled glargine

Diabetes KetoAcidosis

- 135,000 Hospitalizations a year
- $2.4 billion U.S. dollars spent on treatment
- Often a cry for help

ADA article on Hyperglycemic Crises

DKA Precipitating Factors

- 25 -30% of time, illness and infection
  - increases stress hormone release
- 50% inadequate insulin dosage
- initial manifestation of type 1
- emotional stress - especially teens, neglect or mismanagement

Extreme Hyperglycemia – Diabetes KetoAcidosis (DKA)

- DKA - profound insulin deficiency
- Excess stress hormones such as glucagon, epinephrine, and cortisol render insulin less effective
- Excess glucose production by liver
- Lipolysis leads to FFA's and ketones
- Osmotic diuresis, dehydration, lyte imbalances, acidosis

Diabetes Education SERVICES

DKA Signs and Symptoms

- hyperglycemia- leads to weakness, lethargy, malaise, headache
- GI symptoms - N/V, abd pain
- Kussmaul's deep, rapid breathing
- hypothermia, acetone breath
- hyperpnea - to rid acidosis
- changes in mentation, hyporeflexia/tonia
- dehydration, ortho hypo

Diabetes Education SERVICES

Extreme Hyperglycemia – Hyperosmolar Hyperglycemic State (HHS)

- occurs in elderly pt's w/ type 2 - esp if not closely monitored
- often precipitated by illness or stress
- symptoms may go unrecognized for wks
- massive fluid loss from osmotic diuresis
  - burns, hyperglycemia, diarrhea, hemodialysis, diuretics, steroids
- MI, infections, hypertonic feedings

Diabetes Education SERVICES

DKA vs HHS

- Usually < 40 yrs old
- < 2 days symptoms
- Glucose >250
- Serum Ketones: +++
- pH low (<7.3)
- Anion Gap > 12
- Usually Type 1
- 3 – 10% mortality

- Usually >60 yrs old
- > 5 days symptoms
- Glucose >600
- Ketones: none to +
- pH normal (>7.3)
- Usually Type 2
- 10 - 20% mortality

Diabetes Education SERVICES

DKA - HHS Presentation and Action

- Labs
  - NA - low to high
  - K+ - moves into vascular space
  - Hct and Hgb ↑ dehydration
  - BUN / Creatinine ↑
  - WBC ↑
  - pH low to normal
- Action
  - maintain insulin drip until anion gap closed, ketones negative
  - glucose < 200
  - maintain hydration
  - check BG q1 hour
  - assess lytes, K+
  - give sub-Q insulin before d/c IV insulin
  - teach, teach, teach

Diabetes Education SERVICES

Anion Gap Calculation

- Na+ value – (Bicarb +Cl) = anion gap
- Goal is to be close to 10 as possible.
- Normal is 10 to 12
- Bicarb is from venous blood (not arterial blood)

CHEM 7
Soduim 131
Potassium 4.0
Chloride 89
Total CO2 26
Urea Nitrogen 30
Creatinine 1.7
Glucose 546

131 – (89 +26) =
131 – 115 = 16
Gap = 16

Diabetes Education SERVICES

Tx of DKA

1. Fluids-rehydrate
2. Replace insulin to correct glucose, pH, ketosis
3. Correct electrolyte imbalances
4. Provide Glucose
5. Treat underlying medical condition
6. Prevent complications
7. Pt and family ed

Tx of HHS

1. Fluids-rehydrate
2. Replace insulin to correct glucose
3. Correct electrolyte imbalances
4. Treat underlying medical condition
5. Prevent complications
6. Pt and family ed

DKA and HHS

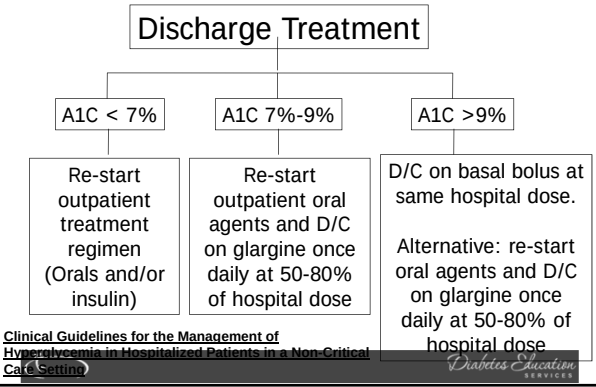
5 most important interventions

- Fluids (NS, →0.45 NS, →D51/2 NS once glucose 200 – 250 mg/dl)
- Insulin (.05 - 0.1unit/kg per hour)
- Potassium / lyte replacement
  - (K^+, Mg, Ca, Phos)
- Determine, treat precipitating cause
- Education to prevent future episodes

What Glucose Managment Strategy for Discharge?

- Waistline 46”
- Infected Foot Ulcer
- A1c 10.8%
- Creat 1.3
- Asthma (on pred)
- Meds?
  - Basal/Bolus Insulin
  - Metformin

Discharge insulin Algorithm



Clinical Guidelines for the Management of Hyperglycemia in Hospitalized Patients in a Non-Critical Care Setting

Diabetes Education SERVICES

MR K. Stable, ready for discharge.

- What is your biggest concern?
- What supplies will he need?
- What top 3 things do we need to teach him?
- What resources and referrals?

Diabetes Education SERVICES

Insulin Teaching Keys

- Bolus insulin with meals
- Basal 1-2xs daily
- Can't mix Glargine or Detemir with other insulins
- Abdomen preferred injection site
- Stay 1" away from previous site
- Can re-use syringes if patient at low risk for infection
- Keep unopened insulin in refrigerator
- Toss opened insulin vial after 28 days
- Proper disposal
- Review patients ability to withdraw and inject.
- Side effects include hypoglycemia/wt gain

Diabetes Education SERVICES

5 Survival Skills

1. Basics of Diabetes
2. Can patient perform self blood glucose monitoring? Do they need meter?
3. Can pt safely take meds / insulin? Teach side effects.
4. Meal Planning?
5. Self Care

Follow-Up plan - Does pt know who to contact when need help?

DiaBingo - I

- I Inhaled insulin
- I Glargine, Detemir, NPH are types of
- I Breakdown of glycogen into glucose
- I Anabolic hormone
- I Insulin is released when glucose levels are low
- I Once opened, insulin vials are good for one _____
- I Elevated post-prandial glucose indicate need for pre-meal
- I Epinephrine increases insulin resistance
- I Creation of glucose from amino acids and lactate
- I Decreasing renal function for people on insulin can cause
- I Bolus insulins
- I A hormone that increases blood glucose levels

Medical Nutrition Therapy – ADA 2014 Updates

- No ideal percentage of calories from protein, carbohydrate and fat for people with diabetes.
- Macronutrient distribution should be based on an *individualized assessment* of eating patterns, preferences and metabolic goals.

Medical Nutrition Therapy – ADA

- Focus on the Individual
- Maintain pleasure of eating
- Provide positive messages about food
- Limit food choices only when backed by science
- Provide practical tools
- Refer to a RD and Diabetes Education – Lowers A1c by 1-2%

Approach Depends on Patient

- New Type 2
  - Portion Control
  - Plate Method
  - Record Keeping
  - Education
- On Insulin?
  - Carb counting
  - Post prandial checks

What are next steps?

- 72 yr old, thin, lives alone, A1c 7.3%. History of MI, stroke. DM for 12 yrs, "diet controlled". Creat 1.4
- Limited income.
- Good insurance

DPP-4 Inhibitors – "Incretin Enhancers"

Januvia (sitagliptin) – Tradjenta (linagliptin)
Onglyza (saxagliptin) Nesina (alogliptin)

- **Action:**
  - Increase insulin release w/ meals
  - Suppress glucagon
- **Dosing**: Januvia – 100mg a day
  Onglyza – up to 5mg a day
  Tradjenta – 5mg a day
  Nesina – up to 25 mg a day
- **Efficacy:** Decreases A1c by 0.6 -0.8%
- **Benefits/ Issues**: weight neutral, no hypo, few side effects. Expensive

Losing 2-8kg Early in diagnosis Type 2 Helpful

ADA 2014

- Weight Loss –
  - *The optimal macronutrient intake to lose weight not known*
  - *The literature does not support one particular nutrition therapy to reduce weight, but rather a spectrum of eating patterns that result in reduced energy intake*.

  - To lose one pound – avoid 3,500 cals
    - Decrease intake 250-500 cals daily + exercise

Successful weight loss strategies include

- Weekly self-weighing
- Eat breakfast
- Reduce fast food intake.
- Decrease portion size
- Increase physical activity
- Use meal replacements
- Eat healthy foods

Diabetes Prevention Program
Focus on fat = wt loss success

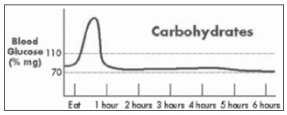
To help you lose weight and improve your health, stay as close as possible to your fat and calorie goals.
Find your starting weight below. Your fat and calorie goals are in the same row. Circle your fat and calorie goals.

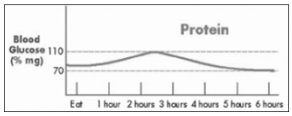
Weight (lb)	Fat Goal (grams)	Calorie Goal
120-174	33	1,200
175-219	42	1,500
220-249	50	1,800
>250	55	2,000

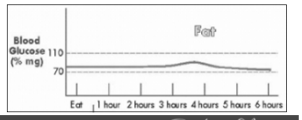
http://www.cdc.gov/diabetes/prevention/recognition/curriculum.htm

Diabetes Education SERVICES

How nutrients affect blood sugar

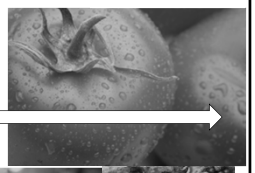






Diabetes Education SERVICES

Move toward the Tomato



ADA recommendation
Eat Less Junk Food & Sugary Drinks –

- Less Processed Foods
- Less Sugary Beverages
  - increase visceral adiposity
  - 12 teaspoons sugar in one soda
  - High fructose corn syrup
- Avg American eat 25 teaspoons of sugar a day.
- Soda Tax?
- Junk Food Tax?

Diabetes Education SERVICES

10 Superfoods

- Beans
- Dark Green Leafy Vegs
- Citrus Fruit
- Sweet Potatoes
- Berries

- Tomatoes
- Fish High in Omega-3 Fatty Acids
- Whole Grains
- Nuts
- Fat-Free Milk and Yogurt

Diabetes Education SERVICES

USDA Plate Method
www.myplate.gov

Balancing Calories

- Enjoy your food, but eat less.
- Avoid oversized portions.

Foods to Increase

- Make half your plate fruits and vegetables.
- Make at least half your grains whole grains.
- Switch to fat-free or low-fat (1%) milk.

Foods to Reduce

- Compare sodium in foods like soup, bread, and frozen meals — and choose the foods with lower numbers.
- Drink water instead of sugary drinks.

Diabetes Education SERVICES

Another plate example

Diabetes Education SERVICES

Nutrition Facts

Serving Size 1/2 cup (114 g)
Servings Per Container 4

Amount Per Serving	
Calories 90	Calories from Fat 30
	% Daily Value*
Total Fat 3g	5%
Saturated Fat 0g	0%
Cholesterol 0g	0%
Sodium 300mg	13%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugars 3g	
Protein 3g	
Vitamin A 80% * **Vitamin C** 60%	
Calcium 4% * **Iron** 4%	

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2000	2500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

Calories per gram: Fat 9 Carbohydrates 4 Protein 4

1 tsp sugar ⟹ =4 gms

Fooducate App – gives grade and nutrition info.

Fooducate
eat a bit better™

Diabetes Education SERVICES

Carbs affect Post meal Blood Glucose

- Starch
- Fruit
- Milk
- Desserts

Diabetes Education SERVICES

Carbohydrate Needs for Most Adults

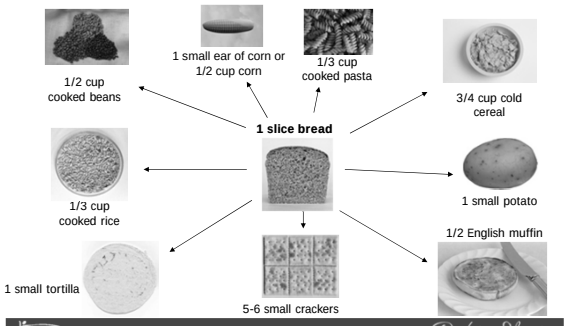
	Grams	Servings
Each Meal	45-60 gm	3 - 4
Snacks	15-30 gm	1- 2

Carbs affect Post Meal Blood Glucose

Diabetes Education SERVICES

Carb Counting - Starch

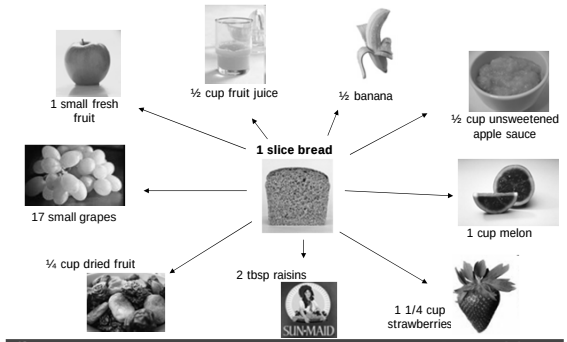
Each Food has:
80 Calories
15 grams carb



Diabetes Education SERVICES

Carb counting- fruit

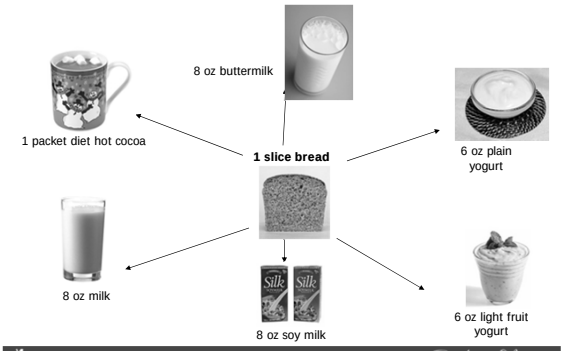
Each Food has:
60 Calories
15 grams carb



Diabetes Education SERVICES

Carb Counting - Milk

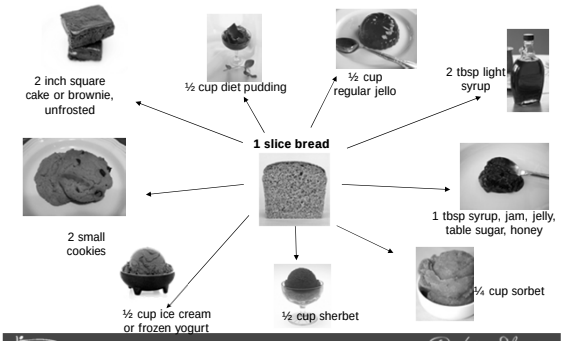
Each Food has:
90-150 calories
12-15 grams carb



Diabetes Education SERVICES

Carb Counting - Sweets

Each Food has:
Calories vary
15 grams carb



Diabetes Education SERVICES

Using Alcohol Safely

- Women- 1 or fewer alcoholic drinks a day
- Men 2 or fewer alcoholic drinks a day
  - 1 alcoholic drink equals
    - 12 oz beer, 5 oz glass of wine, or 1.5 oz distilled spirits (vodka, gin etc)
- If drink, limit amount and drink w/ food.
- Ask HCP if safe for you to drink. Tell them your usual quantity and frequency.
- Can cause hypo and worsen neuropathy

Diabetes Education SERVICES

Ms. Gonzales' Daily Meal plan

Break	Lunch	Dinner	Night
5 corn tortillas, 1/2 c. beans, salsa, peppers, egg beaters	Sandwich, low fat potato chips, 1c. juice, 2-4 lowfat cookies	Lg bowl low salt soup, 1c. rice, BBQ meat, salad & cooked vegs 1 glass wine	1 bowl of cereal
Avg BG 120's	**Avg BG 200's**	**Avg BG 200's**	**Avg BG 180's**

Diabetes Education SERVICES

DiaBingo - N

N DPP demonstrated that exercise and diet reduced risk of DM by ___%
N An _____a day can help prevent heart attack and stroke
N Rebound hyperglycemia
N Scare tactics are effective at motivating patients to change behavior
N Losing ___ % of body weight, can improve blood glucose, BP, lipids
N Drugs that can cause hyperglycemia
N 2/3 cups of rice equals _____ serving carbohydrate
N A1c of 7% equals glucose of
N One % drop in A1c reduces risk of complications by ___ %
N 1 gm of fat equal _____kilo/calories

N Metabolic syndrome = hyperglycemia, hyperlipidemia, hypertension

N Average American consumes 25 teaspoons of sugar a day.

Diabetes Education SERVICES

Thank You

- Questions?
- Email bev@diabetesed.net
- Web www.DiabetesEd.net

Diabetes Education SERVICES

Diabetes Education SERVICES