Getting to the Heart (& Brain) of the Matter…. 

- An informed and involved patient is the key to success of any diabetic program
- In addition to glucose control, if you can touch on these topics, you will have done more than most!
- MI and CVA are common causes of death in diabetes

“Diabetes is a serious disease and deserves the best effort of doctor and patient from beginning to end. Sixty years of experience with diabetics convinces me that aggressive and continuous treatment with strict control of the disease pays.”

HOW AGGRESSIVE SHOULD WE BE OR HOW LOW SHOULD WE GO?

Intensive Glycemic Control and the Prevention of Cardiovascular Events: Implications of the ACCORD, ADVANCE, and VA Diabetes Trials

- BG control (<6% vs 7 – 7.9%) lowered the incidence of DR, but not vision loss
- Tight lipid control reduced the incidence of DR, but not vision loss
- Tight BP control (<120 vs <140), did not lower the incidence of DR or vision loss

ACCORD EYE Summary

- HbA1c of 6% cannot be recommended to prevent progressive retinopathy because it resulted in a higher mortality (study halted early)
- Earlier recommendations for a SBP for diabetics of 120 – 130 mm Hg does not seem to be of benefit and has many potential drawbacks
Tight Blood Pressure Control and Cardiovascular Outcomes Among Hypertensive Patients With Diabetes and Coronary Artery Disease

- 6400 patients with DM, HTN, and known CAD
- Tight (<130) vs usual (130 – 139) vs uncontrolled (>139)
- After 5 yrs, mortality was higher in the tight control group than in the usual control group – no benefit for lowering BP <130 / 80 mm Hg

JAMA 7 / 10

Level of Systolic Blood Pressure Within the Normal Range and Risk of Recurrent Stroke

- 20,330 patients with recent ischemic stroke
- Compared with a mean SBP of 130-139 mmHg, a SBP < 120 mm Hg and > 140 mm Hg were associated with an increased risk of recurrent stroke.

JAMA

DIABETIC MANAGEMENT GOALS

- HbA1c ≤ 7%
- BP < 140/80 mmHg (~130/80 mm Hg)
- Cholesterol < 200
- Triglycerides < 150
- LDL < 100
- HDL > 45 men > 55 women
- Smoking cessation
- BMI of 19 – 24.9 kg/m²

WATCH²

A study of 1700 adults with DM:

- 37% achieved target HbA1c < 7%
- 35.8% achieved target BP of < 130/80 mmHg
- 49.2% had a total cholesterol < 200 mg/dl
- Only 7.3% of adults with DM achieved all 3 target levels

JAMA 2004

SHOULD DIABETICS EAT DIFFERENTLY THAN EVERYONE ELSE?

Doctors should take the Hippocratic “Oats”

“Let your food be your medicine and your medicine be your food”
"Tight" White Coat Syndrome:
Doctor Heal Thyself

Only 3% of adult Americans:
Don’t smoke
Have a BMI of 19-25
Eat healthy
Exercise

Steps to a Healthier You
or
How Do You Like Them Apples?

Recommend
Fewer calories
Wiser food choices
More activity

Comparison of Weight Loss Diets With Different Compositions of Fat, Protein, and Carbohydrates (n=811)

Effect of a Free Prepared Meal and Incentivized Weight Loss Program on Weight Loss and Weight Loss Maintenance in Obese and Overweight Women
A Randomized Controlled Trial

- 442 overweight or obese women assigned to usual care or commercial wt loss program.

- While the program participants lost a bit more wt, the estimated 2 yr cost was $14,000, or about $920 / average pound lost.
**Diet**

- High in vegetables, fruits, beans, cereals, fish, unsaturated oils; moderate dairy & wine; low in red meat

**Lyon Diet Heart Study**

Compared the AHA diet with the MedD in 605 patients having suffered a MI and followed for 27 months:
- Coronary events ↓ 73%
- Mortality ↓ 70%

**White Rice, Brown Rice, and Risk of Type 2 Diabetes in US Men and Women**

- 200,000 adults, followed for 14 – 22 yrs
- DM was 17% greater in the group with the highest intake of white rice; 11% lower in the group with the highest intake of brown rice.

**Nut Consumption and Blood Lipid Levels**

- Nut consumption improved blood lipid levels -- ↓ TC, LDL, & TG by 5% - 8%
- Consumption was not associated with wt gain at 2.4 oz. per day

**Good Reasons to be Nuts About Walnuts**

- Brazil nuts
- Pistachios
- Pecans
- Peanuts
- Almonds
- Macadamia nuts
- Cashews
- Hazelnuts

**Polyphenol - resveratrol**

<table>
<thead>
<tr>
<th>Monthly</th>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>Beans, legumes, and nuts</td>
</tr>
<tr>
<td>Olive oil</td>
<td>Whole grains, and potatoes</td>
</tr>
<tr>
<td>Bread, pasta, rice, couscous, polenta, other whole grains, and potatoes</td>
<td></td>
</tr>
<tr>
<td>Daily Physical Activity</td>
<td></td>
</tr>
</tbody>
</table>

Food Pyramid Reflecting the Traditional Healthy Mediterranean Diet.

**Nut and vegetable intake and incidence of type 2 diabetes mellitus: systematic review and meta-analysis.**

- 6 studies, 220,000 people ages 30-74, followed for a mean of 13.4 yrs
- Intake of green leafy vegetables (~1.4 servings / d) had a 14% lower risk for T2D
- Diabetics who ate an avg of 9 oz. of fruit a day had half the risk of developing DR compared to those who ate < 1 oz / D

**Good Reasons to be Nuts About Walnuts**

- Brazil nuts
- Pistachios
- Pecans
- Peanuts
- Almonds
- Macadamia nuts
- Cashews
- Hazelnuts

Food and Function 2 / 2012
Inverse Relationship of Fiber and Diabetes

- 286,125 patients, of which 10,944 developed diabetes during a 12-18 yr follow-up
- Two whole grain servings per day decreased the risk of developing diabetes by 21%

PLoS (Harvard) 8 / 07

Diets high in fiber were associated with a reduction in BP (and also resulted in a 1kg weight loss).
- Systolic BP decreased by 6.7 mm Hg
- Diastolic BP decreased by 3.7 mm Hg

J Am Diet Assoc 9 / 06

• CHD and mortality were lower w/ 1-2 drinks daily by favorably affecting biomarkers associated with CHD

BMJ / Feb 2011

• Compared with low fat & low carb diets, the MedDiet delayed the need for diabetic drug therapy in overweight patients with newly diagnosed Type 2 DM

Ann Int Med 2005

Adherence to the Med diet resulted in:
- Overall mortality ↓ 9%
- Mortality due to CVD ↓ 9%
- Mortality from cancer ↓ 6%
- Incidence of Parkinson's & Alzheimer's ↓ 13%

BMJ / 11/ 2008
• MedD improved BMI, HDL, triglycerides, BP, and glucose metabolism

• Adhering to a MedD lowered the risk of metabolic syndrome >31%  
  J Am Coll Cardiol Mar 2011

• DASH diet compared to control diet of equal calories for 8 weeks:
  Wt loss: 5 kg vs 2 kg
  A1c: -1.7% vs -0.5%
  BP: -13.6 / -9.5 mm Hg vs -9.5 / 0.7 mm Hg
  LDL: -17.2 mg/dl vs -2.7 mg/dl
  HDL: +4.3 mg/dl vs +1.3 mg/dl  
  Diabetes Care Jan 2011

• Over 400,000 healthy people (ages 50-71) followed for >10 years

• Men and women who drank 6 or more cups of coffee daily (caffeinated or decaf) had a 10 yr mortality rate 10%-15% lower than people who did not drink coffee

• Antioxidants may explain benefits  
  NEJM 5 / 2012

Dietary Integration with Grana Padano Cheese Effectively Reduces Blood Pressure in Hypertensive Patients

<table>
<thead>
<tr>
<th></th>
<th>Office BP</th>
<th>BPTRU</th>
<th>Daytime ABP</th>
<th>Nighttime ABP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EBP before</td>
<td>145/90 ± 4/5</td>
<td>136/86 ± 9/4</td>
<td>135/76 ± 8/11</td>
</tr>
<tr>
<td></td>
<td>EBP end-merig</td>
<td>135/62 ± 4/5</td>
<td>132/78 ± 11/8</td>
<td>127/74 ± 9/11</td>
</tr>
<tr>
<td></td>
<td>Control subjects</td>
<td>EBP before</td>
<td>137/70 ± 5/5</td>
<td>137/65 ± 11/0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EBP end-merig</td>
<td>129/63 ± 4/5</td>
<td>132/75 ± 9/11</td>
</tr>
</tbody>
</table>

Patients who received Grana Padano cheese presented a statistically significant reduction in systolic and diastolic BP (Student’s t test; p < 0.005) irrespective of the type of BP measurement used. No changes in BMI, total and HDL cholesterol, triglycerides, blood glucose, serum sodium and potassium levels, and urinary sodium excretion were found after the dietary integration.  

European Society of Hypertension 5 / 2012

The Elixir of Life?
  ↓ CAD & HF
  ↓ Stroke risk
  ↓ Risk of DM
  ↓ Promote wt loss
  ↓ Cancers
  ↓ Slow dementia
  ↓ Parkinson’s
  ↓ Cirrhosis
  ↓ Dry eye
  ↓ Gout
  ↓ MRSA carriage

Consumption of fried foods and risk of coronary heart disease: Spanish cohort of the European Prospective Investigation into Cancer and Nutrition study

• In Spain, a Mediterranean country where olive oil is used for frying, the consumptions of fried foods was not associated with CHD or with all cause mortality  
  BMJ 1 / 2012
THE JOSLIN CENTER / (DASH) / MED-DIET

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>RECOMMENDED INTAKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SATURATED FAT</td>
<td>&lt; 7% of total calories</td>
</tr>
<tr>
<td>POLYUNSATURATED FAT</td>
<td>10% - 20% of total calories</td>
</tr>
<tr>
<td>MONOUNSATURATED FAT</td>
<td>20% - 30% of total calories</td>
</tr>
<tr>
<td>TOTAL FAT</td>
<td>20% - 30% of total calories</td>
</tr>
<tr>
<td>CARBOHYDRATE</td>
<td>45% - 55% of total calories</td>
</tr>
<tr>
<td>FIBER</td>
<td>21-38 g/D (minimum)</td>
</tr>
<tr>
<td>LEAN PROTEIN</td>
<td>15% - 35% of total calories</td>
</tr>
<tr>
<td>CHOLESTEROL</td>
<td>&lt; 200 mg/D</td>
</tr>
<tr>
<td>SODIUM</td>
<td>&lt; 2,300 mg of Na (= 1 tsp of salt) /D</td>
</tr>
<tr>
<td>TOTAL CALORIES</td>
<td>BALANCE ENERGY INTAKE AND EXPENDITURE; MINIMUM OF 150-175 MINUTES / WK OF AEROBIC, STRETCHING &amp; RESISTANCE EXERCISE</td>
</tr>
</tbody>
</table>

Not all carbs are created equal

‘Bad’ or ‘simple’ carbs create a sensation of hunger and can lead to overeating

‘Good’ or ‘complex’ carbs keep your blood glucose levels more even and help in weight loss

AHA Scientific Statement

Diet and Lifestyle Recommendations Revision 2006
A Scientific Statement From the American Heart Association Nutrition Committee

For wt control only, the equation is simple: Calories in – Calories out
(Portion control and energy expenditure)

78% of overweight Americans still believe the myth that what you eat makes diets succeed or fail. Reality: The key is how much you eat. Supersizing means more calories, more pounds.
Varying the dietary contents (fats, carbs, and proteins) is not what really matters. Excess food consumption is a driver of obesity and calories alone account for the increase in fat.

To keep wt off, you have to eat this many fewer calories, increase physical activities, or both.

- Reducing 250 cal / d will lead to a 25 lb wt loss, but it will take 3 yrs for most obese adults. About ½ the wt will be lost the first yr, with wt loss slowing after this time.
- Don’t focus on wt loss, focus on change and long term behaviors.
- People who stick with their diets will continue to lose wt for long periods – expectations must be realistic.

WHAT IF YOU DON’T HAVE A DECK OF CARDS OR A HOCKEY PUCK IN YOUR POCKET?

- Palm of hand – serving of protein
- Clenched fist – serving of carbohydrates
- Thumb – serving of fats
- 2 clenched fists – vegetables / fruits

WHEN IT COMES TO FOOD, SIZE DOES MATTER
FOOD COURT – Judge Cinna Bon
Presiding

THE CRIME

1,588
• Calories in an order of 10 buffalo wings (not counting the beer or the main entree)

THE PUNISHMENT

4.8
• Number of hrs treading water to burn 1,588 cals

Cardinal Behaviors of Successful Weight Losers and Maintainers

• 78% eat breakfast every day and consume a healthy, low calorie, low fat diet
• 75% weigh themselves at least once per week & monitor and record food intake daily
• 62% watch less than 10 hrs of TV / wk
• 90% exercise, on average, about 1 hr / D

YOU TALK A LOT ABOUT CALORIES -- HOW DO I KNOW HOW MANY CALORIES I CAN HAVE?

DASH
daily recording sheet for food intake and exercise

Maximum Body Weight

<table>
<thead>
<tr>
<th>Frame</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Med build</td>
<td>Allow 100 lbs for 5 ft, plus 5 lbs for each additional inch</td>
<td>Allow 106 lbs for 5 ft plus 6 lbs for each additional inch (6'1&quot; = 184 lb)</td>
</tr>
<tr>
<td>Large build</td>
<td>Add 10%</td>
<td>Add 10%</td>
</tr>
<tr>
<td>Small build</td>
<td>Subtract 10%</td>
<td>Subtract 10%</td>
</tr>
</tbody>
</table>

Do I Have “Big Bones”?

• A big or heavier skeleton does not make one overweight or appear that way
• To tell if you have ‘big bones” or a large build, measure your wrist
  - man > 5’5”, wrist size > 7.5”
  - woman > 5’5”, wrist size > 6.5”
  - women 5’2” to 5’5”, wrist size > 6.25”
  - women < 5’2”, wrist size > 5.75”
Daily Caloric Needs

- **Basal calories**: 10 calories / lb of MBW
- **Activity calories**: 3 calories / lb of MBW – sedentary
  5 calories / lb of MBW – moderate
  10 calories / lb of MBW – strenuous
- To lose weight safely, subtract 500 calories / day, which theoretically translates into about 1 lb / week – in actual practice, weight loss is typically much slower and requires realistic expectations

I don’t eat any more than I used to, but I’m still gaining weight – what’s the dang deal?
2500 calorie intake per day
\* 365 days per year (no cheating)
912,500 calories per year
5% of 912,500 calories = 45,625 calories
3500 calories in a pound
\[
\frac{45,625}{3500} = 13.03 \text{ lbs per yr} \quad \text{(or } \approx 1 \text{ lb per mo)}
\]

Factors Contributing to Obesity

- **Biology**
  - desire to eat; no drive to be active
  - your biology says ‘eat and rest’
  - we’re not hungry; it’s a habit
- **Appetite Influences**
  - large plates and glasses
- **Economics**
  - Americans love more for less
- **Social Systems**
  - people like to eat; we don’t do physical labor; food is inexpensive, energy dense, large portions, and is always accessible

Accuracy of Stated Energy Contents of Restaurant Foods

- Restaurant food accounts for ≈ 35% of daily energy intake for the average American
- A review of 42 restaurants and 209 food items found that overall, the restaurant stated calories was very similar to measured values. However, there were substantial understated inaccuracies for certain foods.

Fast Food Meals or Haste Makes Waist

<table>
<thead>
<tr>
<th>Food Item</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 oz SOFT DRINK</td>
<td>250 CALORIES</td>
</tr>
<tr>
<td>SUPERSIZE FRIES</td>
<td>610 CALORIES</td>
</tr>
<tr>
<td>BACON</td>
<td>250 CALORIES</td>
</tr>
<tr>
<td>CHEESEBURGER</td>
<td>800 CALORIES</td>
</tr>
<tr>
<td>16 oz ICE CREAM CONE</td>
<td>450 CALORIES</td>
</tr>
</tbody>
</table>

http://www.bcm.tmc.edu/cnrc
EXERCISE AND BODY MASS INDEX

Trends in Quality-Adjusted Life-Years Lost Contributed by Smoking and Obesity

- The prevalence of smoking in the US declined 18.5% from 1993-2008, while the proportion of obese people rose 85%
- Using QALY’s, obesity has surpassed smoking as the greater health threat

Am J Prev Med 2010

Overweight vs Obese

- Study involved only non-smokers – reference BMI was between 23.5 – 24.9
- The risk of death, even among nonsmokers, begins to rise at a BMI of 25 – 1.4X for overweight persons and 1.9X for obese persons
- $1275 MORE/yr for health costs of smokers vs non-smokers
- $1850 MORE/yr for obese people vs those of normal wt

J of Occupational and Environmental Medicine 3/2012

Effects of Aerobic and Resistance Training on Hemoglobin A_1c Levels in Patients With Type 2 Diabetes
A Randomized Controlled Trial

- 262 sedentary diabetic patients assigned to various exercise routines – aerobic & resistance
- Exercise time and calories burned were equal among groups
- All groups lowered their HbA1c levels, but the combination group had the best outcome
- Stretching is also important and flexibility may correlate with elasticity of major arteries.

JAMA 11/2010

Leading actual causes of death in the United States

<table>
<thead>
<tr>
<th>Actual cause</th>
<th>Percent</th>
<th>Number</th>
<th>Percent</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>18.1</td>
<td>435,000</td>
<td>19</td>
<td>400,000</td>
</tr>
<tr>
<td>Poor diet and physical inactivity (overweight, 385,000)</td>
<td>16.6</td>
<td>400,000</td>
<td>14</td>
<td>300,000</td>
</tr>
<tr>
<td>Alcohol</td>
<td>3.5</td>
<td>85,000</td>
<td>5</td>
<td>100,000</td>
</tr>
<tr>
<td>Microbial agents</td>
<td>3.1</td>
<td>75,000</td>
<td>4</td>
<td>90,000</td>
</tr>
<tr>
<td>Toxic agents</td>
<td>2.3</td>
<td>56,000</td>
<td>4</td>
<td>80,000</td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>1.8</td>
<td>43,000</td>
<td>1</td>
<td>25,000</td>
</tr>
<tr>
<td>Firearms</td>
<td>1.2</td>
<td>29,000</td>
<td>2</td>
<td>35,000</td>
</tr>
<tr>
<td>Sexual behavior</td>
<td>0.8</td>
<td>20,000</td>
<td>1</td>
<td>30,000</td>
</tr>
<tr>
<td>Illicit drug use</td>
<td>0.7</td>
<td>17,000</td>
<td>&lt;1</td>
<td>20,000</td>
</tr>
<tr>
<td>Total</td>
<td>48.2</td>
<td>1,159,000</td>
<td>50</td>
<td>1,000,000</td>
</tr>
</tbody>
</table>


BMI should be the 5th vital sign
BMI > 40 went from 1 / 200 to 1 / 50

BMI > 50 went from 1 / 2000 to 1 / 400

Will increased levels of exercise reduce the health risk of being overweight?

Can you be Fit and Fat?

If you had to make the choice, is it better to be:

A) Obese and active
B) Lean and inactive
C) Obese and inactive
D) All the above are equal

Changes in Fitness and Fatness on the Development of Cardiovascular Disease Risk Factors

Hypertension, Metabolic Syndrome, and Hypertriglyceridemia

Duck-dal Lee, MD*, Nam-hi You, MD, Timothy S. Church, MD, Joel J. Levin, MD*
Author(s): Joel J. Levin, PhD, James V. Hides, PhD*
Columbia, South Carolina, Baton Rouge and New Orleans, Louisiana and Houston, Texas

- 3148 adults followed for 27 years
- Improvements in fitness attenuated the effects of increased fatness (BMI) and reduction in fatness reduced the detrimental effects of loss of fitness
- Must improve both parameters, not just one or the other

CALCULATING & CLASSIFYING BODY MASS INDEX (BMI)

1. MULTIPLY BODY WEIGHT IN POUNDS BY 703
2. (HEIGHT IN INCHES) X (HEIGHT IN INCHES)
3. DIVIDE #1 BY #2

<table>
<thead>
<tr>
<th>BMI</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 19</td>
<td>UNDERWEIGHT</td>
</tr>
<tr>
<td>19 – 25</td>
<td>HEALTHY WEIGHT</td>
</tr>
<tr>
<td>26 – 30</td>
<td>OVERWEIGHT</td>
</tr>
<tr>
<td>31 - 39</td>
<td>VERY OVERWEIGHT *</td>
</tr>
<tr>
<td>&gt; 40</td>
<td>EXTREMELY OVERWEIGHT</td>
</tr>
</tbody>
</table>

* BMI > 30 is considered “obese”
100 lbs above the IBW (BMI > 40) is “morbid obesity”
2X the IBW (or BMI > 50) is considered “super morbidly obese”
**IS THERE A BETTER CARDIAC (and PULMONARY) PREDICTOR THAN BMI?**

- Recent studies suggest that the CV burden of obesity may be underestimated by the BMI – the abdominally obese (large WHR) have 3X the risk of heart attack & aortic plaques

*Waist measurement – smallest part of waist*

*Hip measurement – widest area of buttocks*

- Women 0.8 or less
- Men 0.9 or less

**Lancet** 11 / 05

**Circulation** 12 / 07

**Hip measurement – widest area of buttocks**

- Women 0.8 or less
- Men 0.9 or less

**Lancet** 11 / 05

**Circulation** 12 / 07

---

**Take-Home Pearl:** Diabetic individuls with a higher body mass index and larger neck circumference are more likely to have diabetic retinopathy, and to have it at a more advanced stage.


---

**I’M NOT TOO SURPRISED THAT MY PERSONAL BMI IS A LITTLE HIGH, BUT MY KID (or grandkid) IS A BIT CHUBBY TOO!**

**WILL THEY GROW OUT OF IT?**

---

**Percent of Overweight Children Ages 6-19**

**BMI > 95th Percentile**

- Age 6-11
- Age 12-19

---

**Waist Circumference and All-Cause Mortality in a Large US Cohort**

- 105,000 white adults age ≥50 followed for 9 yrs.
- Mortality adjusted for BMI and other risk factors

- Mortality was 102% higher in men with a WC >47.2” vs WC’s <35.4”
- Women the risk was 136% higher for a WC >43.3” vs <29.5”

**Arch Int Med** 8 / 10
1,740 eighth grade students

- 49% were overweight
- 41% had "pre-diabetes with high levels of insulin"
- 25% had high blood pressure
- 38% had abnormal lipid profiles

**Diabetes Care** 3 / 06

**PREVENTION AND MANAGEMENT OF TYPE 2 DIABETES MELLITUS**

- >80% of Americans with T2D are obese
- Abdominal obesity and gynecoid obesity are both linked to CVD, but apples may have a higher risk for DM

**TexasMedicine**

- Avg child spends 7.5 hrs/d in sedentary activities
- Kids are exposed to 40,000 food ads / yr, 72% of which are for candy, cereal, and fast food

**The New England Journal of Medicine**

- PREVENTION OF TYPE 2 DIABETES MELLITUS BY CHANGES IN LIFESTYLE AMONG SUBJECTS WITH IMPAIRED GLUCOSE TOLERANCE

**TREATMENT OF TYPE 2 DIABETES**

- DIET AND EXERCISE IS OF GREAT IMPORTANCE AS MOST TYPE 2 PATIENTS ARE OVERWEIGHT
- IF THE PATIENT CANNOT OBTAIN A NORMAL BMI, OR REMAINS HYPERGLYCEMIC (Hb A1c > 7%) DESPITE REACHING THEIR IDEAL BODY WEIGHT, ANTI-DIABETIC AGENTS SHOULD BE INITIATED
ORAL ANTI-DIABETIC AGENTS

- SULFONYLUREAS
  - 1st AND 2nd GENERATION - tolbutamide (Orinase)
  - glyburide (DiaBeta)
- MEGLITINIDES - repaglinide (Prandin)
- BIGUANIDES - metformin (Glucophage)
- THIAZOLIDINEDIONES (TZD’s) - pioglitazone (Actos)
- α GLUCOSIDASE INHIBITORS - acarbose (Precose)

(Despite many antidiabetic agents, ~60% of diabetics do not achieve target HbA1c levels)

Abnormalities of Glucose Regulation in Type 2 Diabetes

- Relatively deficient insulin secretion → poor uptake of glucose by tissues
- Paradoxical rise of glucagon in response to meals, resulting in increased hepatic glucose production
- Accelerated gastric emptying → rapid appearance of glucose into the blood

Oral Drugs Commonly Used for Type 2 Diabetes

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Mechanism of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfonylureas</td>
<td>Stimulate insulin secretion</td>
</tr>
<tr>
<td>Meglitinides &amp; analogs</td>
<td>Stimulate insulin secretion</td>
</tr>
<tr>
<td>α-glucosidase inhibitors</td>
<td>Delay digestion of carbs</td>
</tr>
<tr>
<td>Biguanides</td>
<td>Decrease liver glucose</td>
</tr>
<tr>
<td>Thiazolidinediones</td>
<td>Enhance insulin sensitivity</td>
</tr>
</tbody>
</table>

Oral Antidiabetes Medication Monotherapy: Maximum Therapeutic Effect on A1C

- Nataglinide
- Acarbose
- Repaglinide
- Rosiglitazone
- Pioglitazone
- Glimipiride
- Glipizide GlT3
- Metformin

Reduction in A1C (%)

Risk of Acute Myocardial Infarction, Stroke, Heart Failure, and Death in Elderly Medicare Patients Treated With Rosiglitazone or Pioglitazone

- 227, 521 Medicare patients
- Compared to pioglitazone, rosiglitazone was associated with an increased risk of CVA, HF, MI and all cause mortality.
- FDA voted 20 / 12 to keep Avandia with added warnings, JAMA July, 2010
In Actuality, It’s Dyslipidemia, Not Hypercholesterolemia

- Regardless of the LDL levels, higher HDL levels predicted lower rates of CV events at 5 years
- HDL levels are inversely correlated with CV risk
For healthy patients receiving potent statins, who attain very low levels of LDL (54 mg/dL), lower levels of HDL was not predictive of residual vascular risks.

**Lancet** 7 / 10

**WHAT’S CURRENTLY THE BEST TEST TO FOLLOW EITHER TYPE 1 OR TYPE 2 DIabetics OVER TIME?**

**HbA1c**

**Glycosylated Hemoglobin (HbA1c)**

- Reflects the state of glycemia for the preceding 8–12 weeks
- Should be obtained 2–4 times / yr, depending on stability of control

**Joslin Formula for Average Blood Glucose**

Average glucose = \((A1c \times 20) + 10\)

More accurate for lower vs higher levels of blood glucose
Values that appear to represent a threshold for increased risk of DR over 10 yrs include:
- FPG > 108 mg/dl
- HbA1c > 6%

Knowing levels of glycemic control can help guide counseling and frequency of F/U.

MICROVASCULAR DISEASE INCREASES RAPIDLY WITH AN A1c > 7%

NINE YEARS EXPOSURE TO A HbA1c OF 8% YIELDS THE SAME RISK OF RETINOPATHY AS 2.5 YEARS EXPOSURE TO A HbA1c OF 11%

IN T2D, FOR EVERY 1 POINT DECREASE IN HbA1c, THERE IS ≈30% - 35% REDUCTION IN RISK OF ALL MICROVASCULAR COMPLICATIONS & A 25% REDUCTION IN MACROVASCULAR COMPLICATIONS

METRICA INC PRODUCES AN "A1cNOW" MONITOR FOR HOME (AND OFFICE) USE.

92 patients with persistent CSDME and 32 with resolved CSDME

HbA1c levels were 9.1% vs 6.9%

Long term glycemic control decreases the risk of poor response to therapy for DME.
If you can't remember WATCH2, then KEEP YOUR DIABETICS ON TRACK

• **TAKE YOUR MEDICATIONS**
• **REACH AND MAINTAIN A HEALTHY WEIGHT**
• **ADD EXERCISE TO YOUR DAILY ROUTINE**
• **CONTROL YOUR BLOOD GLUCOSE, BLOOD PRESSURE, AND BLOOD LIPIDS**
• **KICK THE SMOKING HABIT**