Office Based Nutrition: Obesity Background Review

- ACE Education Module

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OBJECTIVES

- **Background review**
  - Epidemiology
  - Obesity prevalence and co-morbid disease states
  - General management principles
- **Review specific strategies for successful wt. loss**
  - Diet plans
  - Activity and exercise
  - Behavioral support for lifestyle changes
  - Weight loss medication
  - Bariatric surgery
The Obesity Epidemic

USA NHANES* Database

- 61% of population overweight (BMI ≥ 25 kg/m²)
  - More than 30% are obese (BMI ≥ 30 kg/m²)
    - Flegal K et al. *Int J Obes Relat Metab Disord* 1998;22:39
    - Ogden CL et al. *JAMA* 2006;295:1549

- Type 2 diabetes prevalence increased by 33% in the 1990’s (4.9% to 6.5%), and mirrored increases in weight
  - Mokdad A et al. *Diabetes Care* 2000;23:1278
  - Wild S et al. *Diabetes Care* 2004;27:1047

*NHANES: National Health and Nutrition Examination Surveys*
USA Adults Overweight and Obese

Prevalence (%)

- Obese
- Overweight

Worldwide Obesity

Rates Projected to Double Over the Next 30 Yrs

BMI ≥ 30 (%)

- USA
- England
- Australia
- Brazil

Excess Weight (BMI) and Disease Risk

Willet WC. NEJM 1999;341:427

Calle EE. NEJM 2003;348:1625
# Obesity-Related Diseases

<table>
<thead>
<tr>
<th>Disease</th>
<th>Estimated Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep apnea</td>
<td>88 – 95%</td>
</tr>
<tr>
<td>Pre-diabetes &amp; type 2 diabetes</td>
<td>83 – 91%</td>
</tr>
<tr>
<td>Asthma</td>
<td>25 – 40%</td>
</tr>
<tr>
<td>Gallbladder disease</td>
<td>~ 30%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>15 – 25%</td>
</tr>
<tr>
<td>Coronary heart disease (CHD)</td>
<td>&gt; 10%</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>&gt; 10%</td>
</tr>
<tr>
<td>Cancer (breast, uterine, colon)</td>
<td>&gt; 10%</td>
</tr>
</tbody>
</table>

DeMaria EJ. *NEJM* 2007;356:2176.  
Steps to Obesity Management

- **Recognition**
  - BMI, waist circumference, obesity-related complications

- **Commitment**
  - Patient, and nutrition team (MD, NP-PA, RD, PhD)

- **Realistic expectations**
  - Reduction in health risks, 5% to 10% initial weight loss

- **A multi-disciplined treatment approach**
  - Behavior modification
  - Physical activity
  - Diet
  - Pharmacotherapy
Management of Obesity

● Initial Office Visit

✓ Waiting room with oversized chairs
✓ Step stools where needed, i.e. next to exam tables
✓ Large gowns and blood pressure cuffs
✓ Scale in a private area, appropriate for obese patients
✓ Obesity educational materials, and treatment protocols
✓ Empathetic, respectful, and supportive office staff
Management of Obesity

**Initial Office Visit**

- Evaluation of potential obesity related diseases by appropriate history, examination, and laboratory tests
- Review weight history, dietary patterns, and daily behaviors
- Measure weight and height, and calculate body mass index
- Categorize obesity and record associated health risks
- Determine patient readiness to lose weight
- Discuss the treatment plan and health goals, and provide realistic expectations (involve other professionals if needed)
- Provide support and arrange necessary follow-up visits

Obesity Management: The History

- Obtain diet history and document medication use
  - Stressors, triggers and ‘emotional’ eating behaviors
  - Skipped meals, ‘restrained’ and ‘dis-inhibited’ eating
  - Past weight loss programs and weight loss medications
    - What worked, or didn’t, and why
  - Daytime work, activities, and exercise

- Assess potential obesity-related disease
  - CVD, PVD, HTN, pre-diabetes or diabetes, dyslipidemia, obstructive sleep apnea, GERD, weight-bearing joint pain
  - Document medication use

- Family history for obesity and related diseases
Obesity Management: The Examination

- Calculate body mass index (BMI = kg/m²)¹
  - BMI has replaced ideal body weight (IBW) as the primary criterion for assessing obesity²
  - Correlates with body fat, morbidity, and mortality²
- Measure waist circumference²⁴
  - Correlates with visceral fat and increased health risk
  - High risk: Women > 35 inches, men > 40 inches
- Assess for secondary causes of obesity

### Classification of Obesity by BMI, Waist Circumference and Disease Risk

<table>
<thead>
<tr>
<th>Category</th>
<th>BMI</th>
<th>Disease Risk Relative to Body Weight and Waist Circumference</th>
<th>Men ≤ 40 in</th>
<th>Men &gt; 40 in</th>
<th>Women ≤ 35 in</th>
<th>Women &gt; 35 in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt; 18.5</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Normal</td>
<td>18.5-24.9</td>
<td>—</td>
<td>—</td>
<td>Increased</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0-29.9</td>
<td>Increased</td>
<td>High</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Obese: Class 1</td>
<td>30.0-34.9</td>
<td>High</td>
<td>Very high</td>
<td>Very high</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Class 2</td>
<td>35.0-39.9</td>
<td>Very high</td>
<td>Very high</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Class 3</td>
<td>≥ 40</td>
<td>Extremely high</td>
<td>Extremely high</td>
<td>Extremely high</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Increased waist circumference denotes disease risk in non-obese persons**

Management of Obesity

Multiple causes
- Genetic
- Behavioral
- Cultural

Treatment options
- Behavior change, attitude toward a healthy lifestyle
- Reduced-calorie diet
- Increased activity, exercise
- Pharmacotherapy
- Bariatric Surgery

Chronic obesity
- Disease recognition
- Assess related health risks
- Commitment to therapy

References:
3. Anderson D. Arch Fam Med 1999;8:156.
Management of Obesity

- Lifestyle Modification
  - Diet planning – not dieting!
  - Daily activity – with aerobic exercise
  - Behavior modification – w/ professional support

- Weight loss medication
  - Orlistat (Xenical)
  - Sibutramine (Meridia)

- Bariatric surgery
### Management of Obesity

**Guide for Selecting Weight Loss Therapy**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>BMI (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25–26.9</td>
</tr>
<tr>
<td>Diet, exercise, behavior therapy</td>
<td>+</td>
</tr>
<tr>
<td>Pharmacotherapy</td>
<td></td>
</tr>
<tr>
<td>Bariatric surgery</td>
<td></td>
</tr>
</tbody>
</table>

Management of Obesity

Treatment Goals

**Principal goal**
- Reduce obesity-related morbidity and mortality

**Secondary goal**
- Weight loss and weight maintenance
- Set specific and realistic goals
  - Reduce body weight by 5% to 10% from baseline
  - Attempt further weight loss as indicated for health
  - Maintain lower body weight long-term
Management of Obesity

Treatment Goals

“The initial goal of weight loss therapy for overweight patients is a reduction in total body weight of about 10% … Moderate weight loss of this magnitude can significantly decrease the severity of obesity-associated risk factors”

However, most patients have unrealistic weight loss goals, which often leads to patient frustration and treatment non-compliance.
Unrealistic Treatment Goals
Obese Patients

Obese women, (n= 60, BMI 36.3 ± 4.3 kg/m² at study onset) lost 16 kg wt. over 48 wks, reaching only their “disappointed” goal wt. Foster GD et al. *J Consult Clin Psychol* 1997;65:79

<table>
<thead>
<tr>
<th>Initial weight</th>
<th>Weight (lb)</th>
<th>% Wt Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>218</td>
<td>0 %</td>
<td></td>
</tr>
</tbody>
</table>

Pre-study weight goals:

<table>
<thead>
<tr>
<th></th>
<th>Weight (lb)</th>
<th>% Wt Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Disappointed”</td>
<td>180</td>
<td>17 %</td>
</tr>
<tr>
<td>“Acceptable”</td>
<td>163</td>
<td>25 %</td>
</tr>
<tr>
<td>“Happy”</td>
<td>150</td>
<td>31 %</td>
</tr>
<tr>
<td>“Goal”</td>
<td>146</td>
<td>33 %</td>
</tr>
<tr>
<td>“Dream”</td>
<td>135</td>
<td>38 %</td>
</tr>
</tbody>
</table>
Management of Obesity

“Rules To Live By”

1. *Life is not fair!*
   - Individual metabolism is variable, and measurement of basal metabolism (REE) may help set realistic goals and improve compliance with lifestyle changes.

2. *Exercise is key to long-term weight loss*

3. *Most weight loss occurs through how we eat*

4. *Weight regain (relapse) is almost inevitable*
   - Weight should be used *primarily* as a monitor for energy balance, with monthly weight as a guide to reassess daily diet and exercise goals.

Management of Obesity

- **Lifestyle Modification**
  - Diet planning – not dieting!
  - Daily activity – with aerobic exercise
  - Behavior modification – w/ professional support

- **Weight loss medication**
  - Orlistat (Xenical)
  - Sibutramine (Meridia)

- **Bariatric surgery**
The Causes of Overweight

Fuel Intake

Fuel Burned

1 lb fat = 3,500 calories
Energy Metabolism in Lean vs Obese


**Energy Expenditure (k/cal/d)**

- **Lean (BMI=21 kg/m²)**
- **Obese (BMI=38 kg/m²)**

*Resting Energy Expenditure*

- Lean: ~1500 k/cal/d
- Obese: ~1800 k/cal/d

*Total Energy Expenditure*

- Lean: ~2500 k/cal/d
- Obese: ~2800 k/cal/d

*p < 0.05 vs lean subjects*
Energy Intake and Energy Expenditure

Reported (patient history) vs Actual (measured) Results

* $p < 0.05$ vs reported

Lichtman et al. NEJM 1992;327:1893
Tissue Mass and Energy Expenditure

REE = Resting energy expenditure

Energy Expenditure (% REE)

Tissue energy expenditure

Tissue weight

Tissue mass and energy expenditure in different tissues:
- Liver, Brain, Kidneys, Gut, Heart
- Skeletal Muscle
- Adipose Tissue, Lean Person
- Adipose Tissue, Obese Person

REE = Resting energy expenditure
Body Energy Stores of Lean 70-kg Man

Adipose tissue triglyceride = 120,000 kcal
Liver triglyceride = 450 kcal
Liver glycogen = 400 kcal
Muscle triglyceride = 3000 kcal
Muscle glycogen = 2500 kcal
Adipose tissue triglyceride = 120,000 kcal
Components of Daily Energy Expenditure

- Thermic effect of eating
- Energy expenditure of activity
- Resting energy expenditure

Sedentary Person (1800 kcal/day):
- 75% Thermic effect of eating
- 17% Energy expenditure of activity
- 8% Resting energy expenditure

Physically Active Person (2200 kcal/day):
- 60% Thermic effect of eating
- 32% Energy expenditure of activity
- 8% Resting energy expenditure

Relationship of REE* and Fat-free Mass

![Graph showing the relationship between Resting Energy Expenditure (REE) and Fat-Free Mass (kg) for Lean females, Obese females, Lean males, and Obese males.](image)

*REE = Resting energy expenditure

Guidelines on Healthy Nutrition and Exercise

- Reduce calories to maintain a healthy weight
  - Meal replacements may be helpful in some patients
- Eat a variety of healthful foods, with an emphasis on plant based foods
  - Eat > 5 servings of a variety of vegetables and fruits daily
  - Eat whole grain starches (bread, pasta, cereals, brown rice) and lentils/beans in preference to processed (refined) grains
  - Limit consumption of simple sugars (juices, sweets, candies)
  - Limit consumption of high fat meats and dairy, and processed food (pastries, snacks, “fast food” items)
Nutrition and Optimum Diet

- **Emphasize** (in healthy portions)
  - Fresh or frozen fruits and vegetables (≥ 5 servings/day)
  - Whole grain starches (bread, pasta, cereals, brown rice)
  - Legumes (any type bean; navy beans highest in fiber)
  - Olive oil (olives), canola oil
  - Nuts (almonds, English walnuts)
  - Fish (salmon, tuna, white fish ≥ 3 servings/week)

- **Limit** (infrequent use and in small portions)
  - Marbled or processed meat
  - Processed and “fast” foods
  - High fat dairy products
  - Refined carbohydrates
  - Eggs (yolk)
  - Pastries
  - Sweets and desserts
  - Sodium/salt
Healthy Meal Plan Diets

The Food Guide Pyramid (1992)
- Whole grains, fruits & vegetables are foundation
- Fats/oils/sweets to be used “sparingly”

MyPyramid (2005)
- “One size doesn’t fit all”
- Number of servings from each group determined by age, gender & activity level

US Department of Agriculture. www.mypyramid.gov
Dietary Population Compliance

- Only 16% of the USA population are meeting the NCEP-ATP Step-II dietary guidelines for ≤ 30% fat and ≥ 5 fruits and vegetables daily

  - 51% not meeting either daily recommendation
    - Women more likely to meet both goals (22% vs 8%)

  - Average USA consumption:
    - Whole grains only 1.0 per day
    - Refined grain products 5.7 per day
What About Food Makes Us Eat Too Much?

↑ Fat, sugar, salt = ↑ palatability
↑ Energy density = ↑ calories/bite
↑ Variety = ↑ intake
↑ Packaging = ↑ portion size
## Energy Density and Energy Intake

20 subjects randomized to diet; crossover study design

<table>
<thead>
<tr>
<th></th>
<th>LED diet*</th>
<th>HED diet*</th>
<th>(p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy intake (kcal/day)</td>
<td>1570</td>
<td>3000</td>
<td>0.0001</td>
</tr>
<tr>
<td>Eating time (min/day)</td>
<td>69</td>
<td>52</td>
<td>0.0001</td>
</tr>
<tr>
<td>Rate of energy intake (kcal/min)</td>
<td>23</td>
<td>59</td>
<td>0.0001</td>
</tr>
<tr>
<td>Diet acceptance (1=high, 4=low)</td>
<td>1.5</td>
<td>1.5</td>
<td>0.90</td>
</tr>
</tbody>
</table>

*HED vs LED: high energy vs low energy diet*
Energy Density and Energy Intake

Food Volume Required to Consume a Fixed Kcal Meal

Energy Density of Selected Foods

<table>
<thead>
<tr>
<th>Energy Density (kcal/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lettuce</td>
</tr>
<tr>
<td>Vegetable soup</td>
</tr>
<tr>
<td>Skim milk</td>
</tr>
<tr>
<td>Apple</td>
</tr>
<tr>
<td>Black beans</td>
</tr>
<tr>
<td>White fish</td>
</tr>
<tr>
<td>Yogurt</td>
</tr>
<tr>
<td>Vegetable lasagna</td>
</tr>
<tr>
<td>Roast chicken</td>
</tr>
<tr>
<td>White bread</td>
</tr>
<tr>
<td>Pretzels</td>
</tr>
<tr>
<td>Cheddar cheese</td>
</tr>
<tr>
<td>Salad dressing</td>
</tr>
<tr>
<td>Potato chips</td>
</tr>
<tr>
<td>Bacon</td>
</tr>
<tr>
<td>Butter</td>
</tr>
</tbody>
</table>

Energy Density of Different Foods

Effects of Fat and Water Content in Food

A. Fat Content (g/100 g) vs. Energy Density (kcal/g)

B. Water Content (g/100 g) vs. Energy Density (kcal/g)

Diet Energy Density
Influence on Short-term Body Weight

Energy Density:
- High
- Medium
- Low

Weight Change (kg)

Days
1 2 3 4 5 6 7 8 9 10 11 12 13 14

*p< 0.038, treatment effect

Food Volume and Energy Intake

Portion size affects energy intake in older vs younger children

Younger Children
(Mean age = 3.6 years)

Portion Size

Amount Consumed (g)

Older Children
(Mean Age = 5.0 years)

Portion Size

Amount Consumed (g)

[Graph showing data for younger and older children with different portion sizes and amounts consumed.]
Food Volume and Energy Intake

Large Portions of Food Increase Energy Intake

*Bars on the same graph with different letters are significantly different (p<0.0001)*

Management of Obesity
Put Your Registered Dietitian to Work!

- **Teach new habits of food purchasing & cooking**
  - Plan a grocery list before shopping
  - Read and understand nutrition labels
  - Limit saturated fats and use healthy fats in cooking

- **Teach monitoring of food consumption**
  - Portion size, exchange system, food diary

- **Review the energy value of different foods**
  - “Energy density” is a major determinant of caloric intake
  - Food volume consumed less variable than caloric intake

Meal Choices: Home & Restaurants

- Check the menu (label) before choosing
- Keep it simple, never assume
- Order a salad, then share a main entrée
- Request a salad plate, and use it to serve from the main entrée
- Eat slowly, and stop eating when satisfied
- Beware of fat content in foods
  - Salad dressings (ask for “low fat”)
  - Red meat, high fat dairy foods, desserts
Management of Obesity
Summary

- Obesity is not a benign disease
  - Associated with CVD, diabetes, sleep apnea, arthritis, etc.
- The cause of obesity is multi-faceted, but social and environmental factors (the ubiquity of food) dominate
- Lifestyle modification with diet, exercise, and behavior therapy is the foundation for therapy
  - Weight loss of 5% to 10% weight loss is significant
  - Weight control requires long-term treatment, and a multi-disciplined team approach is best
  - Medication works best in combination w/ lifestyle change
Management of Obesity

References


American Obesity Association (AOA). www.obesity.org

American Society for Bariatric Surgery (ASBS). www.asbs.org


Centers for Disease Control (CDC): Obesity and Overweight. www.cdc.gov/nccdphp/dnpla/obesity/index.htm