Obesity as a Clinical Diagnosis

Anthropometric and Clinical Components to the Diagnosis:
Measurement of adiposity and impact on patient health

“What are we treating?”
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Disclosures

• Stock/ownership
  • Vivus
  • Arena
  • Orexigen
  • LeanerLiving
Objectives

1. Appreciate obesity as a clinical diagnosis

2. Utilize anthropometric measurements to screen and guide the diagnosis

3. Utilize clinical components beyond anthropometric measurements to diagnose and stage obesity

Definition of Obesity

AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS’ POSITION STATEMENT ON OBESITY AND OBESITY MEDICINE

Jeffrey I. Mechanick, MD, FACP, FACE, FACN, ECNU; Alan J. Garber, MD, PhD, FACE; Yehuda Handelsman, MD, FACE; W. Timothy Garvey, MD

• Obesity is a complex, multifactorial condition characterized by excess body fat (1998)

• AACE views obesity as a disease with multiple pathophysiological aspects, including genetic, environmental, physiological, and psychological factors

1. Impairment of normal functioning
2. Characteristic signs or symptoms
3. Harm or morbidity

Endocr Pract 2012;19(5):643-648
The *Anthropometric* Component of the Diagnosis of Obesity

- **Q2.** How should the degree of adiposity be measured in the clinical setting?
- **Q2.1.** What is the best way to optimally screen or aggressively case-find for overweight and obesity?
- **Q2.2.** What are the best anthropomorphic criteria for defining excess adiposity in the diagnosis of overweight and obesity in the clinical setting?
- **Q2.3.** Does waist circumference provide information in addition to BMI to indicate adiposity risk?
- **Q2.4.** Do BMI and waist circumference accurately capture adiposity risk at all levels of BMI, ethnicities, gender, and age?

**Case 1**

- 32 y/o Caucasian m; former college athlete
- PMHx includes Hashimoto’s hypothyroidism
  - Levothyroxin 175mcg + liothyronine 5mcg
  - Fish oil, D3, +/- creatine
- Unremarkable family hx
- 6’ 2”
- 233lbs
- BMI 30 kg/m²
- BP 116/70
- WC 90cm
- Exam otherwise unremarkable
- Labs
  - FBG 90
  - A1c 5.3
  - Triglycerides 60
  - HDLc 59
  - OGTT – not performed
Case 2

- 40 y/o Asian m; sedentary
- + family history of T2DM and CAD
- 5' 8"
- 165lbs
- BMI 25 kg/m²
- BP 140/90
- WC 94cm
- Exam remarkable for slight acanthosis
- Labs
  - FBG 110
  - A1c 6.1
  - Triglycerides 160
  - HDLc 39
  - OGTT 155

Diagnosis???

Normal?
Overweight?
Obesity?
**Anthropometric Component**

- **R3**
  - All adults should be screened annually
    - BMI ≥ 25 kg/m²
  - Generally correlates with adiposity at population level
  - DM2
  - CAD
  - Mortality

- **R4**
  - BMI used to confirm/classify *clinical excess adiposity* as “overweight” or “obesity”
  - Clinical evaluation & judgement
    - Individual adiposity is variable
    - Under/over-estimates adiposity and risk
      - Athletes, elderly/sarcopenia

<table>
<thead>
<tr>
<th>BMI kg/m²</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18.5</td>
<td>“underweight”</td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>“normal” weight</td>
</tr>
<tr>
<td>25-29.9</td>
<td>Overweight*</td>
</tr>
<tr>
<td>30-34.9</td>
<td>Class I obesity</td>
</tr>
<tr>
<td>35-39.9</td>
<td>Class II obesity</td>
</tr>
<tr>
<td>≥40</td>
<td>Class III obesity</td>
</tr>
</tbody>
</table>

*BMI ≥ 23 kg/m² East, Southeast, South Asian (R7)

“According to this chart, I’m too short.”

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**Association of All-Cause Mortality With Overweight and Obesity Using Standard Body Mass Index Categories**

A Systematic Review and Meta-analysis

- Measured & Self Reported data
- 97 observational studies
  - Most from US, Europe, & Australia
  - Some from China, Japan, India
  - 2.88 million participants
    - 270,000 deaths
- Relative to “normal” weight:
  - class 2 and 3 obesity were associated with higher mortality
    - HR 1.29 overall
  - Class 1 obesity was not
  - Overweight was associated with lower all-cause mortality
    - HR 0.94 overall

*JAMA 2013;309(1):71-82*
**R6 - Measure WC in all patients when screening for obesity and related comorbidities**

- Especially when BMI < 35 kg/m²
- Ethnic-specific cutoffs per 2009 Joint Interim Statement of the IDF Task Force on Epidemiology and Prevention; NHLBI; AHA; World Heart Federation; IAS; and IASO
Q2.4. Do BMI and waist circumference accurately capture adiposity risk at all levels of BMI, ethnicities, gender, and age?

**R7.** A BMI cut-point value of $\geq 23 \text{ kg/m}^2$ should be used in the screening and confirmation of excess adiposity in South Asian, Southeast Asian, and East Asian adults.

**R8.** Region- and ethnic-specific cut-point values for waist circumference should be used as measures of abdominal adiposity and disease risk:

- South Asian, Southeast Asian, and East Asian adults
- men with values $\geq 85 \text{ cm}$ and women $\geq 74$ to $80 \text{ cm}$ should be considered at risk and consistent with abdominal obesity

Recent AHA/NHLBI guidelines for metabolic syndrome recognize an increased risk for CVD and diabetes at waist-circumference thresholds of $\geq 94 \text{ cm}$ in men and $\geq 80 \text{ cm}$ in women and identify these as optional cut points for individuals or populations with increased insulin resistance.
Normal BMI but central obesity per WHR & Mortality

Body fat % per DXA predicts mortality independent of BMI
Combining Body Mass Index With Measures of Central Obesity in the Assessment of Mortality in Subjects With Coronary Disease

Role of “Normal Weight Central Obesity”

Normal-Weight Central Obesity and Mortality Risk in Older Adults With Coronary Artery Disease

1. “normal” BMI/low WC
2. “normal” BMI/high WC
3. Overweight BMI/low WC
4. Overweight BMI/high WC
5. Obese BMI/low WC
6. Obese BMI/high WC


J Am Coll Cardiol 2013;61:553-60
Q4. Do BMI or other measures of adiposity convey full information regarding the impact of excess body weight on the patient’s health?

R29

• All patients with overweight or obesity should be clinically evaluated for weight-related complications because BMI alone is not sufficient to indicate the impact of excess adiposity on health status;

• therefore, the diagnostic evaluation of patients with obesity should include an anthropometric assessment of adiposity and a clinical assessment of weight-related complications
The Clinical Component of the Diagnosis of Obesity

• **Q3. What are the weight-related complications that are either caused or exacerbated by excess adiposity?**

  • **Q3.1-15**
    • metS, preDM2/T2DM, dyslipidemia, HTN, NAFLD, PCOS
    • CVD & CV mortality
    • Female infertility & Male hypogonadism
    • OSA & asthma/RAD
    • OA
    • Stress incontinence
    • GERD
    • Depression
CMDS

Table 1: The Cardiometabolic Disease Staging (CMDS) system

<table>
<thead>
<tr>
<th>Stage</th>
<th>Descriptor</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Metabolically healthy</td>
<td>No risk factors</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Metabolic syndrome or prediabetes</td>
<td>Have one or two of the following risk factors:</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Metabolic syndrome + prediabetes</td>
<td>Have any two of the following three conditions in addition:</td>
</tr>
<tr>
<td>Stage 4</td>
<td>T2DM and/or CVD</td>
<td>Have type 2 diabetes mellitus (T2DM) and/or cardiovascular disease (CVD):</td>
</tr>
</tbody>
</table>

CMAJ 2011;183(14):E1059-1066

“Metabolically Healthy Obesity”

• Meta-analysis
  • MetS predicts CV events & mortality
  • MetS components increase with BMI

• No protection from incident T2DM
  • Young Adults Cohort
    • MHO = BMI ≥ 30
    • Nml glucose, BP, lipids
  • Incidence T2DM increased with BMI

• Metabolic stability despite BMI
  • ARIC & CARDIA

• Metabolic instability per WC
  • Tehran Lipid & Glucose Study

Ann Intern Med 2013;159:758-769
Diabetes Care 2014;37:2989-2995
Guo, Garvey, et al. Obesity 2015
Int J Obesity 2015;39:514-519

“Adiposopathy” and “fat mass disease”

Courtesy Nadolinsky, S
Male Obesity-Associated Secondary Hypogonadism

- **BMI ≥ 30 kg/m²**
- **Signs/Symptoms**
  - Sexual/physical/mental, gynecomastia, sleep dysfunction, dysglycemia, low BMD, unexplained anemia
  - TT < lower limit healthy young men x 2
    - fT < lower limit if abnormal SHBG
- **Low or inappropriately nml FSH/LH while other causes excluded**
- **Low T in 40% nml glycemic obesity & 50% in obesity + DM2 > 45 y/o**

Clinical Endocrinology 2013;78:330-337
Diabetes Care 2010;33:1186-1192

Curr Opin Endocrinol Diabetes Obes 2013;20:132-139
Fat Mass Disease & Mental Health

<table>
<thead>
<tr>
<th>R21</th>
<th>Obstructive Sleep Apnea</th>
<th>Physical Exam; neck circumference; ROS</th>
<th>Polysomnography needed to complete diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>R22</td>
<td>Asthma / Respiratory Disease</td>
<td>Physical Exam; ROS</td>
<td>Chest X-ray and spirometry study may be needed to complete diagnosis</td>
</tr>
<tr>
<td>R23</td>
<td>Osteoarthritis</td>
<td>Physical Exam; RCS</td>
<td>Radiographic imaging may be needed to complete diagnosis</td>
</tr>
<tr>
<td>R24</td>
<td>Urinary stress incontinence</td>
<td>Physical Exam; RCS</td>
<td>Urine culture, urodynamic testing may be needed to complete diagnosis</td>
</tr>
<tr>
<td>R25</td>
<td>GERD</td>
<td>Physical Exam; RCS</td>
<td>Endoscopy, esophageal motility study may be needed to complete diagnosis</td>
</tr>
<tr>
<td>R28</td>
<td>Depression, Anxiety, Binge Eating Disorder, Stigmatization</td>
<td>History; ROS</td>
<td>Screening/diagnostic evaluation or questionnaires based on criteria in Diagnostic and Statistical Manual of Mental Disorders; referral to clinical psychologist or psychiatrist</td>
</tr>
</tbody>
</table>

Disability | Physical Exam; ROS | Functional testing may be helpful

Obstructive Sleep Apnea Among Obese Patients With Type 2 Diabetes

Sleep Ahead

- Ancillary study of Look Ahead
- 306 participants
  - BMI 36
  - WC 121/111cm men/women
- 86% with AHI ≥ 5 events/hr
  - Men 20.5
  - 30.5% with AHI 15-30
  - 23% with AHI ≥ 30 c/w severe
- WC significantly related
  - BMI predicted severe

Overall Survival among Patients with the OSA Syndrome and Controls

- Meta-analyses
  - Severe OSA increases CV death, CVA & mortality
  - CPAP may decrease CV death in mod-severe OSA

Diabetes Care 2009;32:1017-1019

Int J Card 2013;69:207-24
Int J Card 2015;191:128-131
### Staging

- **BMI ≥ 25 clinically confirmed to represent excess adiposity**
  - BMI ≥ 23 for South, Southeast, & East Asian adults

- **Overweight or obesity stage 0**
  - BMI dependent classification

- **Obesity stage 1 or stage 2**
  - Criteria specific to each obesity-related complication

#### Checklist of Obesity-Related Complications

<table>
<thead>
<tr>
<th>None</th>
<th>One or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild to Moderate</td>
<td>Severe</td>
</tr>
<tr>
<td>One or more complications mild to moderate in severity and/or may be treated effectively with a moderate degree of weight loss</td>
<td>At least one complication that is severe and/or requires more aggressive weight loss therapy for effective treatment</td>
</tr>
</tbody>
</table>

#### Disease Stage

- **Stage 0**
  - Normal Weight (no obesity)
- **Stage 1**
  - Overweight Stage 0 (no complications)
  - Obesity Stage 0 (no complications)
- **Stage 2**
  - Obesity Stage 1 (1 or more mild-moderate complications)
  - Obesity Stage 2 (at least 1 severe complication)

#### Criteria Specific to Each Obesity-Related Complication

- **MetS, PreDM2, T2DM**
  1. 1 or 2 risk factors
     - CMDS 1
     - BP ≥ 130/85
     - TG 150-399 or HDLc < 40/50
  2. PreDM2/MetS/T2DM
     - CMDS 2-4
     - BP ≥ 130/85 on rx
     - TG ≥ 400

- **Obstructive Sleep Apnea**
  1. AHI 5-29 & mild symptoms
  2. AHI > 29 or severe

- **NAFLD**
  1. Steatosis
  2. Steatohepatitis (NASH)

- **PCOS**
  1. CMDS 1
  2. Oligomenorrhea

- **Osteoarthritis**
  1. Mod function or anatomic
  2. Severe or s/p replacement

*Endocr Pract 2014;20(9):977-989*
Cases

- 32 y/o m
  - BMI 30
  - WC < 94cm
  - CMDS 0
  - asymptomatic
  - No Obesity

- 40 y/o m
  - BMI 25
  - WC 94cm
  - A1c 6.1
  - FBG 110
  - OGGT 155
  - TG 160
  - BP 140/90
  - CMDS 3
  - Obesity Stage 2

Summary

- Obesity is a clinical diagnosis

- BMI does not necessarily define or diagnose per se

- Staging the severity of the disease depicts clinical relevance

Thank You!