Prevalence of Obesity (BMI $\geq 30$ kg/m$^2$)

Trends in Obesity 1999-2014

Ogden, NCHS, 2015
Overweight Trajectories

Past and projected future overweight rates in selected OECD countries

Roadmap
1. Definitions and Outcomes
2. Clinical management
   a. The Clinic Visit
   b. Diet
   c. Exercise
   d. Mobile technology, Apps, wearables
   e. Medications
   f. Bariatric Surgery

Question #1
The same BMI categories should be used for determining overweight and obesity in all populations?

A. True
B. False
Defining Obesity

- "An increase in fat accumulation, to the extent that health may be adversely affected"
- BMI (kg/m²)
- 1995: BMI < 18.5 Underweight
- 18.5 – 24.9 Healthy Weight
- 25 - 29.9 Overweight
- ≥ 30 Obese

WHO, 1995
Intl Obesity Task Force, 1997

Body Shape and Size

All 6 people Are 5'9"
172 lbs
BMI 25.4 kg/m²

Body Labs, NY Times, 9/3/2015

Ectopic Fat Depots

Systemic LOCAL
Intra-muscular Fat Perivascular Fat
Pericardial fat Myocardial Steatosis
Fatty Liver Renal Sinus Fat
Visceral Adipose Tissue

Overweight & Obesity Definitions

<table>
<thead>
<tr>
<th></th>
<th>WHO-general</th>
<th>WHO-Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.5</td>
<td>&lt;18.5</td>
</tr>
<tr>
<td>Normal weight</td>
<td>18.5 – 24.9</td>
<td>18.5 – 22.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0 – 29.9</td>
<td>23.0 – 27.5</td>
</tr>
<tr>
<td>Obese</td>
<td>≥ 30.0</td>
<td>≥ 27.5</td>
</tr>
</tbody>
</table>

Lancet, WHO expert panel, 2004
**CHD and Stroke Outcomes**

- Coronary Heart Disease (4 studies, 260,993 participants, 4,496 cases)
  - Adjusted for age, sex, and smoking status
  - Table shows risk factors

- Ischemic stroke (21 studies, 31,043 participants, 2,583 cases)
  - Table shows risk factors

**Metabolically Healthy Obesity?**

- CVD Mortality
  - 14 studies; 299,000 participants
  - RR 1.47 > 15 years f/u

**Policies and Recommendations**

- **HEDIS**: adults 18-74 years, receive BMI assessment annually at PCP visits
- **USPSTF**: screen all adults for obesity
  - If BMI $\geq 30$ kg/m$^2$, offer or refer for counseling and behavioral interventions to promote weight loss
- **ACA**: provides coverage, without cost sharing, for obesity screening and counseling on healthy eating and weight loss

**Guidelines**

**AACE, ACC/AHA/TOS, Endocrine Society:**

1. Obesity is a chronic disease and needs long-term management.
2. Goal is to improve health.
3. Cornerstone is comprehensive lifestyle change.
4. Initial goal is weight loss of 5-10%
5. Consider use of weight loss medication or possible bariatric surgery as addition to lifestyle therapy to promote greater weight loss and maintain weight loss.
The Clinic Visit

- Measure BMI: the fifth vital sign.
- Document obesity as a problem.
- Talk to patient about their weight, “your BMI is above a healthy range”.
- Ask about eating habits, physical activity.
- What are their goals regarding weight?
- What changes are they willing to start making?
- Willing to work with a team including the PCP?

Question #2

45 y.o. African American woman, no other comorbidities, BMI = 33 kg/m²
She wants to start making dietary changes to lose weight.
What type of diet would you recommend?
A. Low-fat diet
B. Low-carbohydrate diet
C. Weight Watcher’s diet
D. Any diet that she wants to try

Low Fat vs. Other Diets in weight loss trials

- Favors low carb -1.2 kg mean difference
- Favors low fat -5.4 kg mean difference
- Favors low carb -1.2 kg mean difference
Low Fat vs. Other Diets in weight loss trials

- Low-fat Vs. Low carb
  - Favors low carb
  - -1.2 kg mean difference

- Low-fat Vs. Higher fat
  - No difference

- Low-fat Vs. Usual diets
  - Favors low fat
  - -5.4 kg mean difference

Which Named Diet is Better?

- 48 RCTs of named diets evaluated
- Low carb: -7.3 kg at 12 mo vs. no diet
- Low-fat: -7.3 kg at 12 mo vs. no diet
- Weight loss differences between individual diets were minimal
- Supports recommending any diet that a patient can adhere to for weight loss.

My Dietary Tips

- Track what you eat (self-monitor)
- Be conscious of portion sizes (plate method)
- Beware of liquid calories (choose water)
- More fiber (whole grains, fresh fruit/veggies)
- Eat protein at each meal (legume, beans, nuts, fish, poultry...)
- Small snacks between meals (nuts, fruit)
- Take time to eat your meals (mindfulness)
**Question #3**

45 y.o. African American woman, no other comorbidities, BMI = 33 kg/m²
She doesn’t have time to add exercise to her day. She asks whether diet or exercise is more effective for weight loss?

A. Diet is more effective  
B. Exercise is more effective  
C. Both diet + exercise are most effective

---

**Diet vs. Exercise for Weight Loss**

Meta-analysis of 21 trials

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Weight loss, kg</th>
<th>Fat Mass, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diet vs. Exercise</td>
<td>-2.9 (-4.2 to -1.7)</td>
<td>-2.2 (-3.7 to -0.7)</td>
</tr>
<tr>
<td>D+E vs. Diet alone</td>
<td>-1.4 (-2.0 to -0.8)</td>
<td>-1.6 (-2.8 to -0.5)</td>
</tr>
<tr>
<td>D+E vs. Exercise</td>
<td>-4.1 (-5.6 to -2.6)</td>
<td>-3.6 (-6.1 to -1.0)</td>
</tr>
</tbody>
</table>

- Moderate quality evidence that D+E is effective for long-term obesity management
- Moderate superiority of Diet over Exercise for weight loss outcomes
Exercise is Key after Weight Loss

- Weight loss leads to decreases in EE (activity-related, nonexercise activity thermogenesis, and PA index)
- RCT of 140 post-menopausal women who had lost 25 lbs with diet (800 kcal/day)
- Group 1: aerobic trained 3/week, 40 min/day
- Group 2: resistance trained 3/week
- Group 3: no exercise


My Exercise Tips

- Set exercise goals:
  - Be specific: walk 30 minutes per day
  - Attainable (doable): start with 3 days/week
  - Forgiving: Ok if I miss a day
- Find a fitness buddy
- Mix up your routine—walk, bike, swim, dance, step
- Add strength training
- Monitor your steps
- Reward yourself (but not with food)
- Bottom line: “You cannot outrun a bad diet”
Existing (free) Apps

- 7-minute work-out
- My Fitness Pal: calorie counter and diet tracker
- Lose It!
- Noom Coach
- Fooducate
- Amwell
- Calorie counter PRO MyNetDiary ($ Ip/ free Android)
- Diet Assistance
- Endomondo

Mobile Technologies

- Mobile health interventions:
  - Short message service (SMS) – majority of trials
  - Multimedia message service (MMS)
- Meta-analysis of randomized trials of mobile phone interventions with weight change outcomes
  - 14 trials, total of 1,337 participants (trial n=30-250)

Physical Activity trackers

<table>
<thead>
<tr>
<th>Device</th>
<th>No. of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galaxy S4 Moves App</td>
<td>28</td>
</tr>
<tr>
<td>iPhone 5s Moves App</td>
<td>28</td>
</tr>
<tr>
<td>iPhone 5s Health Mate App</td>
<td>27</td>
</tr>
<tr>
<td>iPhone 5s Fitbit App</td>
<td>27</td>
</tr>
<tr>
<td>Nike Fuelband</td>
<td>28</td>
</tr>
<tr>
<td>Jawbone UP24</td>
<td>28</td>
</tr>
<tr>
<td>Fitbit Rex</td>
<td>28</td>
</tr>
<tr>
<td>Fitbit One</td>
<td>26</td>
</tr>
<tr>
<td>Fitbit Zip</td>
<td>27</td>
</tr>
<tr>
<td>Digi-Walker SW-200</td>
<td>28</td>
</tr>
</tbody>
</table>

Meta-analysis of mHealth

Net Change in Weight: -1.4 kg (-2.1 to -0.8)

Liu, Am J Epidemiology, 2015
### Apps + Program

- Omada health Prevent: diabetes prevention
  - App + health coach + tools
  - 16 week program ($120/month or $480 total cost)
  - Single arm longitudinal study (pre- and post-study)
    - 220 people, 187 started and 155 completed

<table>
<thead>
<tr>
<th></th>
<th>Starters (4+ sessions)</th>
<th>Completers (9+ sessions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight loss %</td>
<td>P</td>
</tr>
<tr>
<td>16 week</td>
<td>5.0 &lt;0.001 0.03 0.55</td>
<td>5.2 &lt;0.001 0.03 0.62</td>
</tr>
<tr>
<td>1 year</td>
<td>4.7 &lt;0.001 -0.38 &lt;0.001</td>
<td>4.9 &lt;0.001 -0.40 &lt;0.001</td>
</tr>
<tr>
<td>2 years</td>
<td>4.2 &lt;0.001 -0.43 &lt;0.001</td>
<td>4.3 &lt;0.001 -0.46 &lt;0.001</td>
</tr>
</tbody>
</table>

Sepah, J Med Internet Res, 2015

### Currently Available Meds

<table>
<thead>
<tr>
<th>Drug</th>
<th>Mechanism of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phentermine</td>
<td>Noradrenergic sympathomimetic (IV)</td>
</tr>
<tr>
<td>Orlistat</td>
<td>Triacylglycerol lipase inhibitor</td>
</tr>
<tr>
<td>Lorcaserin</td>
<td>Selective serotonin 2c rec agonist (IV)</td>
</tr>
<tr>
<td>Phentermine/topiramate</td>
<td>NA sympathomimetic/GABA receptor (IV)</td>
</tr>
<tr>
<td>Naltrexone/bupropion SR</td>
<td>NA and dopamine reuptake inhibitor/opioid receptor antagonist</td>
</tr>
<tr>
<td>Liraglutide</td>
<td>GLP-1 receptor agonist</td>
</tr>
</tbody>
</table>

### Currently Available Meds

<table>
<thead>
<tr>
<th>Drug</th>
<th>Weight loss in trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phentermine</td>
<td>No long-term data; 8% short-term efficacy</td>
</tr>
<tr>
<td>Orlistat</td>
<td>-5.8 kg vs. -3.0 kg Po (4 years);</td>
</tr>
<tr>
<td>Lorcaserin</td>
<td>-4.5% to -5.8% vs. -1.5% to -2.5% Po (1 yr)</td>
</tr>
<tr>
<td>Phentermine/topiramate</td>
<td>-10.9% vs. 1.6% Po (56 wks)</td>
</tr>
<tr>
<td>Naltrexone/bupropion SR</td>
<td>-5.0% to -9.3% vs. 1.2% to 5.1% Po (56 wks)</td>
</tr>
<tr>
<td>Liraglutide</td>
<td>-6.2 to -8.0% vs. -0.2 to -2.6% Po (56 wks)</td>
</tr>
</tbody>
</table>
### Currently Available Meds

<table>
<thead>
<tr>
<th>Drug</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phentermine</td>
<td>&gt;10%: Dry mouth, insomnia, stimulant effects CVD risk?</td>
</tr>
<tr>
<td>Orlistat</td>
<td>&gt;10%: GI symptoms, fatty stools, urgency &lt;10%: fecal incontinence</td>
</tr>
<tr>
<td>Lorcaserin</td>
<td>&gt;10%: headache &lt;10%: Nausea, dizzy, fatigue, dry mouth, hypoglycemia FDA: Carcinogenicity, valvulopathy, CVD risk?</td>
</tr>
<tr>
<td>Phentermine/topiramate</td>
<td>&gt;10%: paresthesias, dry mouth, constipation &lt;10%: dizzy, insomnia, nausea, depression, glaucoma FDA: Neurocognitive, tachycardia, birth defects?</td>
</tr>
<tr>
<td>Naltrexone/bupropion SR</td>
<td>&gt;10%: nausea, headache, constipation &lt;10%: dizzy, insomnia, dry mouth FDA: CVD risk by ↑BP and ↑heart rate</td>
</tr>
<tr>
<td>Liraglutide</td>
<td>&gt;10%: N/V/D, constipation, hypoglycemia, URI &lt;10%: GI, infections, site effects, fatigue, cough FDA: CVD risk, medullary thyroid, breast cancer?</td>
</tr>
</tbody>
</table>

### Pharmacological Treatments for Obesity: A Systematic Review and Meta-analysis

**Emerging Therapies**

- Pure CB1 receptor antagonists (different from rimonabant)
- Tesofensine: monoamine reuptake inhibitor
- Velneperit: Y5 receptor antagonist
- Beloranib: MetAP2 inhibitor
- Mirabegron: B3-adrenergic receptor agonist (OAB therapy)

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**Khera, JAMA, 2016**

**Sweeting, 2015**
Principles of Drug Therapy

- NIH: BMI $\geq 30$ kg/m$^2$ or 27 kg/m$^2$ with co-morbidity (but almost never in practice)
- Motivated to begin structured exercise and low calorie diet
- Begin medications at completion of one month successful diet and exercise
- Continue medications only if additional weight loss achieved in first 3 months with meds

Bariatric Surgery

- Refer if BMI $\geq 40$ or BMI 35-40 with a comorbidity, AND
- Must have tried and failed other medically managed weight-loss programs

Contraindications to Surgery:

- High risk surgical pt: severe CHD, coag., anesthesia risk
- Poor post-op adherence: untreated depression or psychosis; binge-eating, drug/alcohol abuse, post-op diet compliance
Long-term weight loss results

![Graph showing weight change over time for different surgical procedures](image)

- Control
- Banding
- VBG
- GBP

Sjostrom, Jama, 2012

Other Outcomes from SOS

![Graph showing cumulative mortality](image)

- Control (Y2 baseline)
- Surgery (Y1 baseline)
- Unadjusted HR = 2.36 (95% CI: 1.00 - 5.50)
- Adjusted HR = 0.71 (95% CI: 0.34 - 1.52)

Sjostrom, NEJM, 2007; Jama 2012; Jama 2004

Quality of Life after Bariatric Surgery

- Meta-analysis of 15 controlled trials
- 7 compared surgery vs. non-surgical intervention
- 6 compared different types of surgery
- Bariatric surgery: > QOL improvements than other obesity treatments
  - Few differences between the procedures
- QOL improved in first 2 years after surgery, more physical QOL than mental QOL

Hachem, Obes Surg, 2015

The Down-sides to Surgery

- Risk of death within 30 days post-op: 0.13%
  - PE most common cause (30-50% of deaths)
- Hospital readmission: 5.8% RYGB, 1.2% LAGB
  - Risk factors: prolonged LOS, open surgery, DVT/PE history, asthma and OSA
- Risk Factors for increased complications:
  - T2DM, BMI>55, cardiomyopathy
- Lifelong supplementation: MVI, Ca, Vit D, iron, B12, and more monitoring
Take-home points

1. Ask about weight, design a plan together, monitor.
2. Monitor your weight, track diet and exercise.
3. Diet + exercise is best lifestyle intervention.
4. Choose a diet that works for the patient.
5. Exercise is important after weight loss too.
6. PA trackers can be helpful. Apps=wearables
7. Medications can be helpful, but each has side effects.
8. Bariatric surgery may have best outcomes, but need a very motivated patient who will have close monitoring.