MORBID OBESITY:
The Role of Bariatric Surgery

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DISCLOSURES

Medical Director, Salem Hospital Bariatric Surgery Center

(...regrettably, I have no other relevant financial disclosures ...but am always open to them... )
SUMMARY OF TALK—pt. 1

- FIRST HALF OF TALK
  - Obesity: definitions and classifications
  - The prevalence of obesity and MORBID obesity
  - Societal implications of obesity (bias)
  - Clinical implications of obesity: morbidity and mortality
  - Impact of obesity on health care economics
  - Treatment options: diets, exercise, and surgery
SUMMARY OF TALK—pt. 2

• SECOND HALF OF TALK
  • Classification of types of bariatric surgery
  • Laparoscopic adjustable banding
  • Laparoscopic and Open Gastric bypass
  • Laparoscopic sleeve gastrectomy
  • Results of bariatric surgery: weight loss
  • Results of bariatric surgery: improvement of medical illnesses
  • Complications of bariatric surgery
  • Conclusions
Definition of “Morbid Obesity”

- **What is the Body Mass Index (BMI)?**
  - \[ \text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2} \]
  - …or \[ \text{BMI} = \frac{\text{(weight (lbs)}}{\text{[height (inches)]}^2} \times 704 \]
  - Me: height = 5’ 10” and weight 155 lbs:
    - \[ \text{BMI} = \frac{155}{[70 \times 70]} \times 704 = 22 \]

- **Classification of Obesity based on BMI:**
  - BMI < 20: Underweight
  - BMI 20 – 25: Normal weight
  - BMI 26 – 30: Overweight
  - **BMI 31 – 35: Class I obesity**
  - BMI 36 – 40: Class II obesity (“Morbid obesity”)
  - **BMI 41 – 50: Class III obesity (“Morbid obesity”)**
  - BMI > 50: Super-morbid obesity
OBESITY IN AMERICA & THE WORLD
"Overweight" in the Anglosphere

Prevalence of overweight people in the Anglosphere

PREVALENCE OF OBESITY

- DEMOGRAPHICS OF OBESITY
  - Flegal et al, JAMA 2010:
    - 68% of US adults are overweight or obese
    - 5.7% have BMI > 40 (Class III/Morbid Obesity)

Figure. Overweight and Obesity, by Age: United States, 1971–2006.

SOURCES: CDC/NCHS, Health United States, 2008, Figure 7. Data from the National Health and Nutrition Examination Survey.
Put another way, we are…
Shifting the “Weight of the Nation”

Normal weight: BMI 21-25
Overweight: BMI 26-30
Obese: BMI > 31
Obesity Trends* Among U.S. Adults
BRFSS, 1985
(*BMI ≥30, or ~30 lbs. overweight for 5’4” person)
Obesity Trends* Among U.S. Adults
BRFSS, 1986

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1987
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults

BRFSS, 1988

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1989
(*BMI $\geq$ 30, or $\sim$ 30 lbs. overweight for 5’ 4” person)

No Data           <10%          10%–14%

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1990

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1991

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1992
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1993
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1994
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1995
(*BMI ≥30, or ~30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 1996
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Outcome: No Data, <10%, 10%–14%, 15%–19%

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
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Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 2000
(*BMI ≥30, or ~30 lbs. overweight for 5’4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults

BRFSS, 2001

(*BMI $\geq 30$, or ~30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 2002
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 2003
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: CDC Behavioral Risk Factor Surveillance System.
Obesity Trends* Among U.S. Adults
BRFSS, 2004
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: Behavioral Risk Factor Surveillance System, CDC.
Obesity Trends* Among U.S. Adults
BRFSS, 2005
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: Behavioral Risk Factor Surveillance System, CDC.
Obesity Trends* Among U.S. Adults
BRFSS, 2006
(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

Source: Behavioral Risk Factor Surveillance System, CDC.
Shifting the BMI curve to the right

<table>
<thead>
<tr>
<th>Year</th>
<th>Overweight</th>
<th>Obese</th>
<th>Extremely Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976-1980</td>
<td>32.1 ± 0.6</td>
<td>15.0 ± 0.4</td>
<td>1.4 ± 0.1</td>
</tr>
<tr>
<td>2003-2004</td>
<td>33.4 ± 1.2</td>
<td>32.9 ± 1.3</td>
<td>5.1 ± 0.6</td>
</tr>
</tbody>
</table>
Rising rates of obesity in **Children**

Prevalence of Obesity* Among U.S. Children and Adolescents (Aged 2-19 Years)
National Health and Nutrition Examination Surveys

* Sex - and age - specific BMI ≥ 95th percentile based on the CDC growth charts.

OBESITY AND SOCIETAL BIAS

“The assumption that weight is dependent on will power leads to the common belief that obesity is the result of character defects within the individual who is obese…”

“…studies have shown that individuals with obesity are perceived as lazy, slow, dirty, stupid, ugly, sloppy, and as having poor willpower.”

“…these studies show that these negative stereotypes are prevalent in children as young as 6 years old.”

Adapted from Bariatric Surgery: A Primer for Your Medical Practice; ed. FA Farraye, RA Forse (2006)
WHAT CAUSES OBESITY?

- COMPLEX MULTI-FACTORIAL ETIOLOGY FOR OBESITY
- Lee Kaplan (GI, Mass Gen Hosp): mouse model → defending a pre-defined *Body Fat “Set Point”*
  - Ad lib fed mice gain weight throughout their lives
  - “Overfed” and “Underfed” (calorie restricted) mice reach new respective set points
  - Resumption of ad lib diet causes animals to return to their age-appropriate weight (NOT their starting weight)
  - RYGBP appears to mimic drop from “overfed” state
- Mech of action for Bariatric Surgery
  - Probably not simply “restrictive” or “malabsorptive”
  - Probably a “hormonal” manipulation
## Obesity is killing us...slowly!

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Cause of Disease</th>
<th># Deaths</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Smoking</td>
<td>435,000</td>
<td>18%</td>
</tr>
<tr>
<td>2</td>
<td>Obesity/Poor diet</td>
<td>400,000</td>
<td>16%</td>
</tr>
</tbody>
</table>

Source: CDC (Centers for Disease Control), 2000 data
Morbid obesity kills even faster!

Obesity and mortality risk

How does Morbid Obesity kill?

Other significant illnesses caused by obesity

- Diabetes Type 2
- Hypertension
- Lipid disorders
- Heart disease
- Asthma
- Sleep apnea
- Gallstones
- NASH (non-alcoholic steatohepatitis)
- Urinary incontinence
- Gastroesophageal reflux
- Osteoarthritis and gout
- Infertility and menstrual problems
- Obstetric complications
- Low back pain
- DVT & thromboembolism
- Depression
- Immobility
- Cancer (breast, colorectal, prostate, endometrial, etc.)
- Venous/stasis ulcers
- Skin infections
## Morbid obesity

### Lifetime risk of obesity related co-morbidity

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>LIFETIME RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>14-20%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>25-55%</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>35-53%</td>
</tr>
<tr>
<td>Cardiac Disease</td>
<td>10-15%</td>
</tr>
<tr>
<td>Sleep Apnea</td>
<td>10-20%</td>
</tr>
<tr>
<td>Arthritis</td>
<td>20-25%</td>
</tr>
<tr>
<td>Depression</td>
<td>70-90%</td>
</tr>
<tr>
<td>Stress Incontinence</td>
<td>50%</td>
</tr>
</tbody>
</table>
THE ECONOMIC COSTS OF OBESITY

- Obesity accounts for 12% of the US health care budget!!
- Costs related to obesity are now TWICE the costs related to tobacco-related illnesses!!

Estimated increased spending associated with obesity in the United States\(^1\)

\(\text{\$ billion} \)

<table>
<thead>
<tr>
<th>Cost to individuals</th>
<th>Incremental food expenses(^2)</th>
<th>Direct medical costs = &lt;$160 billion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Plus-size clothing(^3)</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Weight-loss programs</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Out-of-pocket health care costs</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost to payors</th>
<th>Medicare/Medicaid</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial payors</td>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost to employers</th>
<th>Absenteeism</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased productivity</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Short-term disability</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Other (fuel, funeral, electricity, etc.)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>450</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Rounded estimates.
\(^2\) Based on estimated cost of incremental calorie intake to maintain obese weight.
\(^3\) Based on incremental costs of plus-size clothing.

Source: McKinsey analysis; Centers for Disease Control and Prevention; 2006 National Health Expenditure Accounts; Euromonitor
WELL, WHY DIDN’T YOU SAY SO?

I WANT YOU

TO LOSE

SOME

WEIGHT
Success rates of various treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Average weight loss (percent total)</th>
<th>Percent weight loss maintained at 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>4-6%</td>
<td>0</td>
</tr>
<tr>
<td>Diet/behavior</td>
<td>8-12%</td>
<td>0</td>
</tr>
<tr>
<td>Drug therapy</td>
<td>≤10%</td>
<td>10%</td>
</tr>
<tr>
<td>Bariatric surgery</td>
<td>&gt;50%</td>
<td>85%</td>
</tr>
</tbody>
</table>

Sources: Eliosoff, 1997; Sjostrom, 2000
INTERMISSION AND QUESTIONS
BARIATRIC OPERATIONS AND THEIR BENEFITS
Surgical options

Restrictive procedures

• Goal: **Decrease size of the stomach** to cause early “fullness”
  ▶ *Laparoscopic adjustable gastric banding (LAPBAND)*
  ▶ Vertical banded gastroplasty (no longer favored)
  ▶ *Sleeve gastrectomy*

Malabsorptive procedures

• Goal: **Bypass a segment of the intestine** to decrease the amount of ingested calories that are absorbed by the body
  ▶ Jejuno-ileal bypass (discouraged!)

Combination procedures

• Goal: **Combines advantages of both** of the above
  ▶ *Open Roux-en-Y gastric bypass*
  ▶ *Laparoscopic Roux-en-Y gastric bypass*
  ▶ Biliopancreatic diversion with duodenal switch
How the LAP-BAND system works

- Restrictive procedure
- FDA approved in 6/2001
- Silicone band placed around upper part of the stomach
  - Small pouch is created
  - Stomach holds less food
  - Feel full faster and longer
LAP BAND
Roux-en Y gastric bypass

(Pre-op anatomy)
What is a Roux-en Y gastric bypass? (Postop anatomy)

- Some patients will have simultaneous cholecystectomy (gallbladder removal)
- Gastric pouch (1 ounce!)
- Gastrojejunostomy (stomach – intestine connection) only 1 cm
- Bilio-pancreatic limb (for “bile, gastric, and pancreatic juices”)
- Roux (or alimentary) limb (usually 75 – 150 cm long; for “food only”)
- Jejunojejunostomy (intestine-intestine connection)
- Common channel (for “mixing food and digestive juices”)
Roux-en-Y gastric-bypass
Stomach size before bariatric surgery
Stomach size after bariatric surgery
Stomach size – new vs. old
Laparoscopic Sleeve Gastrectomy
Durable long-term weight loss?

100% excess body wt (ie. preop wt)

IBW = 100 lbs
Preop wt = 200 lbs
75% EBWL = 75 lbs!

IBW = 100 lbs
Preop wt = 300 lbs
75% EBWL = 150 lbs!

65-75% excess body wt

Most weight loss happens in the first year and a half.
## Long-term excess weight loss

<table>
<thead>
<tr>
<th>Operation</th>
<th>1 year</th>
<th>2 years</th>
<th>5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lap RYGB(^1)</td>
<td>74%</td>
<td>80%</td>
<td>75%</td>
</tr>
<tr>
<td>Lap Band(^2)</td>
<td>33%</td>
<td>40%</td>
<td>53%</td>
</tr>
<tr>
<td>Lap Sleeve Gastrectomy(^3)</td>
<td>63%</td>
<td>65%</td>
<td>60%</td>
</tr>
</tbody>
</table>

\(^1\) Wittgrove AC and Clark GW. Obesity Surgery. 2000;10:233  
### Improvement after bariatric surgery

#### Table 4. Change in Obesity-Related Comorbidity

<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>Total Patients</th>
<th>Aggravated (%)</th>
<th>Unchanged (%)</th>
<th>Improved (%)</th>
<th>Resolved (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA/DJD</td>
<td>64</td>
<td>2</td>
<td>10</td>
<td>47</td>
<td>41</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>62</td>
<td>0</td>
<td>4</td>
<td>33</td>
<td>63</td>
</tr>
<tr>
<td>GERD</td>
<td>58</td>
<td>0</td>
<td>4</td>
<td>24</td>
<td>72</td>
</tr>
<tr>
<td>Hypertension</td>
<td>57</td>
<td>0</td>
<td>12</td>
<td>18</td>
<td>70</td>
</tr>
<tr>
<td>Sleep apnea</td>
<td>44</td>
<td>2</td>
<td>5</td>
<td>19</td>
<td>74</td>
</tr>
<tr>
<td>Depression</td>
<td>36</td>
<td>8</td>
<td>37</td>
<td>47</td>
<td>8</td>
</tr>
<tr>
<td>Peripheral edema</td>
<td>31</td>
<td>0</td>
<td>4</td>
<td>55</td>
<td>41</td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>18</td>
<td>0</td>
<td>11</td>
<td>39</td>
<td>44</td>
</tr>
<tr>
<td>Asthma</td>
<td>18</td>
<td>6</td>
<td>12</td>
<td>69</td>
<td>13</td>
</tr>
<tr>
<td>Diabetes</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>82</td>
</tr>
<tr>
<td>Anxiety</td>
<td>7</td>
<td>0</td>
<td>50</td>
<td>17</td>
<td>33</td>
</tr>
<tr>
<td>Venous insufficiency</td>
<td>7</td>
<td>0</td>
<td>71</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>Gout</td>
<td>7</td>
<td>0</td>
<td>14</td>
<td>14</td>
<td>72</td>
</tr>
</tbody>
</table>

Adapted from Ref. 32. DJD, degenerative joint disease; GERD, gastro-esophageal reflux disease; OA, osteoarthritis.
“It’s just like riding a bike …

I used to love to ride. But I’d gained so much weight I just couldn’t. After years of trying to lose weight, I decided surgery was the answer. Weight-loss surgery at Salem Hospital helped me lose 120 lbs. and I feel terrific. My husband surprised me with a new bicycle. Now we go riding together all the time. I just completed a thirty mile ride and felt like I could have ridden thirty more.”

–Mary Grobe
RISKS
Risks of surgery—all patients:

- Risks of anesthesia in any morbidly obese patient
  - Deep venous thrombosis (DVT): clot in leg veins (1 – 2 %)
  - Pulmonary embolus: clot breaks off & goes to the lung (0.5 %)
  - Pneumonia: need for the ventilator
Risks of surgery—Gastric Bypass:

- **Risks of gastric bypass**
  - Leak (US: 1 – 3 %)
  - Wound infection or seroma (fluid collection)
  - Bowel obstruction (US: 1 – 3 %)
  - Stricture: narrowing at the stomach-small intestine connection (US: 5 – 15%)
  - Bleeding (1 – 5 %)
  - **Death** (US: 0.5 – 2 %)
  - Nutritional deficiencies:
    - Iron-deficiency anemia, low calcium
    - Vitamin deficiencies (thiamine, B12)
Risks of surgery—Lap Band:

Overall, 4—6%

• Band slippage

• Band erosion

• Port site problems
Risks of Surgery--Sleeve gastrectomy:

- Acid reflux (6.8%)
  (contraindication to sleeve; may start after surgery even if not present before surgery)

- Leaks (1 – 7%; average 1.3%; can be VERY difficult to close)

- Stricture (tight narrowing at the midportion of the stomach tube)

- Bleeding (2.0%)
Comparison of lap band vs sleeve vs bypass

<table>
<thead>
<tr>
<th></th>
<th>LAP BAND</th>
<th>GASTRIC SLEEVE</th>
<th>GASTRIC BYPASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Invasive</td>
<td>Less Invasive</td>
<td>Moderately invasive</td>
<td>Significantly invasive</td>
</tr>
<tr>
<td>Reversible</td>
<td>Reversible</td>
<td>Irreversible</td>
<td>Irreversible</td>
</tr>
<tr>
<td>Adjustable</td>
<td>Adjustable</td>
<td>Not Adjustable</td>
<td>Not Adjustable</td>
</tr>
<tr>
<td>Slower weight loss</td>
<td>Slow weight loss (50-60 percent)</td>
<td>Intermediate weight loss (60-70 percent)</td>
<td>Faster weight loss (65-70 percent)</td>
</tr>
<tr>
<td>More Follow up</td>
<td>More Follow up</td>
<td>Less Follow up</td>
<td>Less Follow up</td>
</tr>
<tr>
<td>More Dietary</td>
<td>More Dietary compliance required</td>
<td>Moderate dietary compliance required</td>
<td>Less Dietary compliance required</td>
</tr>
<tr>
<td>compliance required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower risk</td>
<td>Lower risk</td>
<td>Intermediate risk</td>
<td>Higher risk</td>
</tr>
<tr>
<td>No anatomic</td>
<td>No anatomic rearrangement</td>
<td>Some anatomic rearrangement with gastric staple line</td>
<td>Anatomic rearrangement with bypass</td>
</tr>
<tr>
<td>rearrangement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
“There is no such thing as a free lunch!”

**Gastric bypass:**
Best weight loss
Highest risk

**Gastric Sleeve:**
Better Weight loss
Slightly lower risk

**Gastric Band:**
Least weight loss
Lowest risk

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**RISKS**

**BENEFITS**
FINAL THOUGHTS
Evaluation process

If you are NOT a surgical candidate for SHBSC...
- Referral to PCP for further non-operative management (or referral elsewhere) (Note: NOT A FAILURE!)

If you ARE a surgical candidate for SHBSC...
- Information Session
- Evaluation of submitted Patient information forms
- Surgeon evaluation
- Psychology evaluation
- Dietitian evaluation
- Labs, X-ray studies, Psych questionnaires
- Support Group

MULTI-DISCIPLINARY REVIEW

If you ARE a surgical candidate for SHBSC...
- Preop surgeon visit
- Pre-op dietitian visit
- Preop 5% weight loss

If you are NOT a surgical candidate for SHBSC...
- Referral to PCP for further non-operative management (or referral elsewhere) (Note: NOT A FAILURE!)
SUMMARY AND CONCLUSIONS:

- Obesity is a disease caused by multiple factors, including genetics, environment, and physiology.

- Current non-surgical treatments for Morbid Obesity are limited in their success in terms of long-term weight loss maintenance.

- While the exact mechanisms by which each type of Bariatric Surgery seems to work has not yet been fully elucidated, it currently offers the best treatment for this devastating disease.

- Furthermore, Bariatric Surgery gives us a tool by which to explore the mechanisms of weight and metabolic regulation by the body, and thereby discover less invasive methods for treatment of obesity.

- Surgery is NOT a viable population-based treatment option for obesity; PREVENTION will have to be the key.
QUESTIONS?

EXERCISE
Welcome to America.