OB³
Obstetrics, Obesity, Oh Boy

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Project ECHO
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DISCLOSURE

M. Smid has no relevant financial interests to disclose.
Objectives

1. Oh boy
   (how big is this problem)

2. Obesity
   (let’s talk about fat, baby)

3. Obstetrics & obesity
   (what we think we know aka best practices for obese women)

4. Cubed
   (what I think of all of this)
Obesity epidemiology

• Prevalence of obesity increased dramatically in the last 25 years
  – More than 33% of women are obese.
  – More than 50% pregnant women obese or overweight.
  – 8% reproductive age women extremely obese

• Revised IOM pregnancy weight gain recommendations (2009)
  – Overweight = BMI 25-29.9
  – Obese = BMI 30 or greater.
  – Does not differentiate class I (30-34.9), class II (35-39.9) and class III (≥40)

• Highest rate in black (50%), then Mexican-American (45%), then white (33%)
Percent of Obese (BMI > 30) in U.S. Adults

1985

CDC

No Data <10% 10%-14% 15%-19% 20%-24% 25%-29% ≥30%
Obesity 2008
Obesity 2010
Projected Obesity 2030

[Map of the United States showing projected obesity rates in 2030 with different color codes for various percentage ranges.]
Childhood obesity 2011
Globesity (actual WHO term)

• Worldwide obesity has more than **doubled** since 1985.
• Surpassed smoking as #1 preventable cause of death.
• In 2014, >**1.9 billion** adults were overweight and 600 million were obese.
• **42 million children** under the age of 5 were overweight or obese in 2013.

World Health Organization
http://www.who.int/mediacentre/factsheets/fs311/en/
Worldwide globesity

Fig. 7.1 Age-standardized prevalence of obesity in men aged 18 years and over (BMI ≥30 kg/m²), 2014

Prevalence of obesity (%)*

- <5
- 5–14.9
- Data not available
- 15–24.9
- ≥25
- Not applicable

* BMI ≥ 30 kg/m²
Worldwide globesity

Fig. 7.2 Age-standardized prevalence of obesity in women aged 18 years and over (BMI $\geq 30 \text{ kg/m}^2$), 2014

Prevalence of obesity (%)*

- <5
- 5–14.9
- Data not available
- 15–24.9
- ≥25
- Not applicable

* BMI $\geq 30 \text{ kg/m}^2$

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Obesity stigma

- Negative attitudes
- Discrimination
- Blame
- Social & psychological impact
  - Mental health
    - Depression and lower self esteem
  - Education
    - Teachers
    - Parents
  - Employment
    - Obese women make $6000 less than non-obese women
    - Non-obese men no difference but less represented in managerial positions.

Puhl and Brownell, 2001
Obesity stigma in health care

- **Physicians (n=400)**
  - Discomfort, reluctance or dislike
  - Drug addiction, alcoholism, mental illness, obesity

- **Nurses (n=586)**
  - 24% say touching an obese patient “repulses them.”
  - Dissatisfaction with own weight positively correlated with negative stereotypes

- **Medical students (n=130)**
  - Uniformly negative attitude toward morbid obesity

Klein et al, 1982; Bagley et al 1987; Blumberg & Mellis 1980
I'M ALL ABOUT THAT BASS PANNUS

NO TREBLE
Defining obesity

- **Adverse medical condition** in which excess adipose tissue accumulation to the extent adversely affects health
- Since 1998, **BMI categories** are used in the US & worldwide
Guessing the Patient’s Weight

- Physicians: 59 - 66%
- RNs: 66 - 78%
- Paramedics: 74%
- Patients: 95 - 97%
Guessing that BMI

- 206 health care practitioners in Ireland and Canada

Ahern et al, 2012

<table>
<thead>
<tr>
<th>Actual BMI (kg/m²)</th>
<th>Endos (n = 21)</th>
<th>GPs (n = 96)</th>
<th>Dietitians (n = 50)</th>
<th>Physios (n = 39)</th>
<th>All (n = 206)</th>
<th>p Value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>p Value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>31 (29 - 34)</td>
<td>29 (28 - 31)</td>
<td>29 (27 - 31)</td>
<td>28 (26 - 28)</td>
<td>29 (27 - 31)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>40</td>
<td>32 (30 - 35)</td>
<td>30 (30 - 33)</td>
<td>30 (29 - 32)</td>
<td>30 (27 - 32)</td>
<td>30 (29 - 33)</td>
<td>0.002</td>
<td>&lt;0.001</td>
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<tr>
<td>51</td>
<td>40 (38 - 49)</td>
<td>40 (35 - 42)</td>
<td>40 (37 - 45)</td>
<td>38 (34 - 40)</td>
<td>40 (35 - 42)</td>
<td>0.044</td>
<td>&lt;0.001</td>
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<tr>
<td>52</td>
<td>42 (40 - 45)</td>
<td>38 (35 - 40)</td>
<td>40 (35 - 45)</td>
<td>39 (33 - 42)</td>
<td>39 (35 - 43)</td>
<td>0.003</td>
<td>&lt;0.001</td>
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<tr>
<td>72</td>
<td>50 (45 - 58)</td>
<td>42 (38 - 45)</td>
<td>47 (40 - 50)</td>
<td>42 (37 - 46)</td>
<td>44 (39 - 49)</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
What is BMI?

- BMI = Weight/height$^2$
- Developed in 19$^{th}$ century by Lambert Adolphe Jacques Quetelet

Reprints and Reflections

**Indices of relative weight and obesity**

Ancel Keys$^1$, Flaminio Fidanza$^2$, Martti J Karvonen$^3$, Noburu Kimura$^4$ and Henry L. Taylor$^5$

$^1$Director, Laboratory of Physiological Hygiene, University of Minnesota School of Public Health, $^2$Professor, Institute of Food and Nutrition Science, University of Perugia, Italy, $^3$Director, Institute of Occupational Health, Helsinki, Finland, $^4$Director, Institute of Cardiovascular Research, University of Kurume, Japan and $^5$Professor, Laboratory of Physiological Hygiene, University of Minnesota School of Public Health

Keys et al 1972
• 21% of men and 31% of women were obese according to BMI
• 50% of men and 62% of women were obese according to body fat defined obesity
• BMI was found to underestimate the number of obese subjects.

Romero et al 2008 *Accuracy of Body Mass Index to Diagnose Obesity In the US Adult Population*
Alternatives to BMI

- 11,000 subjects for up to eight years WHR more predictive of heart attack, stroke, kidney failure, diabetes or death than BMI (Schneirder et al. 2010)

- 60,000 patients for 13 years better predictor of ischemic heart disease (HUNT-II) (Morkedal et al. 2011)

Waist to Hip Circumference Ratio Standards for Men and Women

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEN 20-29</td>
<td>&lt;0.83</td>
<td>0.83-0.88</td>
<td>0.89-0.94</td>
<td>&gt;0.94</td>
</tr>
<tr>
<td>30-39</td>
<td>&lt;0.84</td>
<td>0.84-0.91</td>
<td>0.92-0.96</td>
<td>&gt;0.96</td>
</tr>
<tr>
<td>40-49</td>
<td>&lt;0.88</td>
<td>0.88-0.95</td>
<td>0.96-1.00</td>
<td>&gt;1.00</td>
</tr>
<tr>
<td>50-59</td>
<td>&lt;0.90</td>
<td>0.90-0.96</td>
<td>0.97-1.02</td>
<td>&gt;1.02</td>
</tr>
<tr>
<td>60-69</td>
<td>&lt;0.91</td>
<td>0.91-0.98</td>
<td>0.99-1.03</td>
<td>&gt;1.03</td>
</tr>
<tr>
<td>WOMEN 20-29</td>
<td>&lt;0.71</td>
<td>0.71-0.77</td>
<td>0.78-0.82</td>
<td>&gt;0.82</td>
</tr>
<tr>
<td>30-39</td>
<td>&lt;0.72</td>
<td>0.72-0.78</td>
<td>0.79-0.84</td>
<td>&gt;0.84</td>
</tr>
<tr>
<td>40-49</td>
<td>&lt;0.73</td>
<td>0.73-0.79</td>
<td>0.80-0.87</td>
<td>&gt;0.87</td>
</tr>
<tr>
<td>50-59</td>
<td>&lt;0.74</td>
<td>0.74-0.81</td>
<td>0.82-0.88</td>
<td>&gt;0.88</td>
</tr>
<tr>
<td>60-69</td>
<td>&lt;0.76</td>
<td>0.76-0.83</td>
<td>0.84-0.90</td>
<td>&gt;0.90</td>
</tr>
</tbody>
</table>
Fat distribution

- Waist circumference and BMI related to mode of delivery
  (Bentham 2014 Arch Dis Child Fetal Neonatal Ed)

- WHR correlates with pre-eclampsia
  (Yamamoto 2001 J Ob Gyn Research)

- Waist circumference at 16 weeks
  - Pregnancy induced hypertension OR 1.8 (95% CI 1.1-2.9)
  - Pre-eclampsia OR 2.7 (95% CI 1.2-3.4)
    - (Satter et al 2001 Obstetrics & Gynecology)
Obesity & obstetrics

- Definition?
- Pre-pregnancy BMI
- Delivery BMI
  - 44% of women will change BMI categories, 6% will change two categories (Kibiru & Raynor, 2004 AJOG), “Severe” BMI 35-50
- Maternal weight 200-300 lbs

NO standard definition
Fertility & obesity

- Adipose tissue is an active endocrine organ
- Reduced fertility (PCOS)
  - Oligoovulation
  - Anovulation
- Less likely to respond to gonadotropics
- Male obesity decreases sperm quality and fertility

Harder to get pregnant spontaneously & less successful ART
Obesity & pregnancy loss

- 2011 systematic review
  - Total 28,538 women spontaneously conceiving women with ≥1 miscarriage
  - 16.6% obese women
  - 11.8% overweight women
  - 10.7% normal weight women
  
  Boots and Stephenson (2011)

- Meta analysis of 17 trials of women with PCOS - metformin not shown to improve outcomes
  
  Palomba et al (2009)

Harder to stay pregnant
Obesity Pregnancy Complications

**Maternal**
- GDM
- HTN/Preeclampsia
- VTE
- Cesarean
- Postpartum weight retention
- Peripartum/postoperative complications
- Anesthesia complications

**Perinatal**
- Prematurity
- Stillbirth (fetal demise)
- Congenital anomalies
- Macrosomia
  - Traumatic birth injury
- Childhood obesity
Maternal risks of obesity

• Hypertension, gestational HTN & preeclampsia
  – 3 fold increase in preeclampsia or gestational HTN with obesity
    • Risk doubles with each increase of 5 in BMI

• Gestational Diabetes
  – 2.5-4 fold increased risk, increasing with severity of obesity

• Cesarean delivery
  – Rate is 34-47% (class I-II) obesity vs. 20%
  – Most often indicated by labor arrest disorder

• Post-partum hemorrhage
  – 44% increase (Doherty et al 2006)
Maternal risks of obesity

• Intrapartum complications
  – Difficulty fetal monitoring
  – Difficulty assessing fetal weight
  – Protracted labor disorders
  – Shoulder dystocia (?? - conflicting reports)

• Anesthetic complications
  – 2.5-4 fold increased complication rate
  – Difficult intubations & regional anesthesia
  – Initial epidural failure (42 vs 6%)

• Venous thromboembolism
  – 2-5 fold risk increase (absolute risk 3.5-9/1000)
Maternal risks of obesity

• Operative & postpartum complications
  – 3 fold increased rate
  – 20% increase in postpartum hemorrhage
  – Cesarean: increased blood loss, operative time, endometritis, wound infections & breakdown (1.5-2 fold increase)

• VBAC / TOLAC
  – Lower rate of VBAC success
  – Patients weighing >300 lb have <15% success
  – Increased complications with failed TOLAC
    • Operative injury
    • Postoperative infection & wound breakdown
Perinatal risks of obesity

- Fetal demise
  - 20% increase in miscarriage
  - 2-fold increase in fetal demise and even higher risk among morbidly obese
- Prematurity
  - Increase in medically indicated PTD
- Fetal anomalies
  - 2-fold increase in NTDs
  - Increased risk for others: CHD, orofacial clefts, hydrocephalus, omphalocele, limb defects & CDH
- Macrosomia
  - 2-3 fold increase
Obesity & stillbirth

Bodnar 2015 Maternal prepregnancy obesity and cause-specific stillbirth
Obesity & prenatal diagnosis

- **Congenital anomalies**
  - Anencephaly/spina bifida (OR 3.5, 95% CI 1.2-10.3)
    - Folic acid less effective in prevention
    - (OR 0.52 obese vs 0.32 non-obese)
  - Cardiac defects (OR 2.0 95 CI 1.2-3.4)
  - Multiple anomalies (OR 2.0, 95CI 1.1-3.4)

- **Detection rates**
  - Targeted US:
    - Normal 97%, Overweight 91%, Class I 75%, Class II 88%, Class III 75%

Watkins et al 2003
Cedergren and Kallen 2003
Dashe et al 2009

More anomalies and harder to diagnose
Obesity & preterm birth

• Risk of spontaneous preterm birth
  – 2011 systemic review: (84 studies, one million women) no difference by maternal weight *McDonald et al 2010 BMJ*
  – 2009 systemic review: no difference *Tortloni J Matern Fetal Neonatal Med. 2009*
  – *Cnattiingius 2013 JAMA*: possible 1.5-2 fold increase in risk for extreme SPTB for BMI>35
Increased indicated preterm birth – attributed to HTN & DM?

Table 4. Maternal BMI in Early Pregnancy and Risks of Medically Indicated Preterm Delivery

<table>
<thead>
<tr>
<th>BMI Categories</th>
<th>&lt;18.5</th>
<th>18.5-&lt;25</th>
<th>25-&lt;30</th>
<th>30-&lt;35</th>
<th>35-&lt;40</th>
<th>≥40</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All Women</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely preterm delivery</td>
<td>17 (0.07)</td>
<td>395 (0.04)</td>
<td>226 (0.06)</td>
<td>108 (0.09)</td>
<td>35 (0.11)</td>
<td>17 (0.16)</td>
</tr>
<tr>
<td>Adjusted OR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.05 (0.63-1.77)</td>
<td>1.51 (1.27-1.79)</td>
<td>2.48 (1.99-3.1)</td>
<td>2.74 (1.92-3.92)</td>
<td>3.84 (2.32-6.38)</td>
<td></td>
</tr>
<tr>
<td>Very preterm delivery</td>
<td>60 (0.15)</td>
<td>1517 (0.15)</td>
<td>745 (0.19)</td>
<td>324 (0.28)</td>
<td>121 (0.37)</td>
<td>71 (0.66)</td>
</tr>
<tr>
<td>Adjusted OR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.97 (0.74-1.27)</td>
<td>1.29 (1.18-1.41)</td>
<td>1.91 (1.68-2.17)</td>
<td>2.52 (2.08-3.06)</td>
<td>4.16 (3.23-5.36)</td>
<td></td>
</tr>
<tr>
<td>Moderately preterm delivery</td>
<td>448 (1.09)</td>
<td>9006 (0.89)</td>
<td>4310 (1.13)</td>
<td>1725 (1.52)</td>
<td>618 (1.91)</td>
<td>256 (2.40)</td>
</tr>
<tr>
<td>Adjusted OR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.24 (1.12-1.38)</td>
<td>1.22 (1.18-1.27)</td>
<td>1.62 (1.54-1.71)</td>
<td>2.00 (1.84-2.18)</td>
<td>2.45 (2.15-2.79)</td>
<td></td>
</tr>
</tbody>
</table>

**Women Without Hypertensive or Diabetic Diseases**

<table>
<thead>
<tr>
<th>BMI Categories</th>
<th>&lt;18.5</th>
<th>18.5-&lt;25</th>
<th>25-&lt;30</th>
<th>30-&lt;35</th>
<th>35-&lt;40</th>
<th>≥40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely preterm delivery</td>
<td>11 (0.03)</td>
<td>168 (0.02)</td>
<td>84 (0.02)</td>
<td>34 (0.03)</td>
<td>11 (0.04)</td>
<td>4 (0.05)</td>
</tr>
<tr>
<td>Adjusted OR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.51 (0.78-2.96)</td>
<td>1.27 (0.96-1.67)</td>
<td>1.69 (1.15-2.5)</td>
<td>1.91 (1.02-3.56)</td>
<td>2.06 (0.75-5.64)</td>
<td></td>
</tr>
<tr>
<td>Very preterm delivery</td>
<td>38 (0.10)</td>
<td>673 (0.07)</td>
<td>263 (0.07)</td>
<td>97 (0.09)</td>
<td>19 (0.07)</td>
<td>17 (0.19)</td>
</tr>
<tr>
<td>Adjusted OR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.43 (1.02-1.98)</td>
<td>0.98 (0.84-1.13)</td>
<td>1.15 (0.92-1.44)</td>
<td>0.75 (0.47-1.2)</td>
<td>1.94 (1.18-3.19)</td>
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</tr>
<tr>
<td>Moderately preterm delivery</td>
<td>300 (0.76)</td>
<td>5438 (0.56)</td>
<td>2215 (0.61)</td>
<td>745 (0.72)</td>
<td>233 (0.83)</td>
<td>87 (0.98)</td>
</tr>
<tr>
<td>Adjusted OR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.40 (1.24-1.57)</td>
<td>0.99 (0.94-1.04)</td>
<td>1.07 (0.99-1.16)</td>
<td>1.11 (0.97-1.28)</td>
<td>1.23 (0.99-1.53)</td>
<td></td>
</tr>
</tbody>
</table>
Obesity & intrapartum

- Dysfunctional labor
  - Robinson et al 2011 Obstet Gyn
- Induction
- C-section

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Percent of women delivered by cesarean, by BMI category, stratified by parity and prior cesarean delivery status

<table>
<thead>
<tr>
<th>BMI category</th>
<th>Total deliveries</th>
<th>Cesarean, %</th>
<th>Nulliparas</th>
<th>Total deliveries</th>
<th>Cesarean, %</th>
<th>Multiparas and prior cesarean</th>
<th>Total deliveries</th>
<th>Cesarean, %</th>
<th>Multiparas without prior cesarean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>124,389</td>
<td>14.0</td>
<td>57,230</td>
<td>21.8</td>
<td>5288</td>
<td>37.4</td>
<td>61,871</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td>≥40.0</td>
<td>8897</td>
<td>27.3</td>
<td>3845</td>
<td>42.8</td>
<td>540</td>
<td>52.8</td>
<td>4512</td>
<td>11.0</td>
<td></td>
</tr>
</tbody>
</table>

# OB³: intrapartum

- **ZEPRS database** \((n= 51,250)\)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Underweight (&lt;18.5)</th>
<th>Overweight (25-29.9)</th>
<th>Obese (&gt;=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crude RR</td>
<td>Adjusted RR*</td>
<td>Crude RR</td>
</tr>
<tr>
<td></td>
<td>(95 CI)</td>
<td>(95 CI)</td>
<td>(95 CI)</td>
</tr>
<tr>
<td>Composite perinatal outcome</td>
<td>1.31 (1.21,1.42)</td>
<td>1.32 (1.21,1.43)</td>
<td>0.87 (0.75,1.00)</td>
</tr>
<tr>
<td>Maternal death</td>
<td></td>
<td></td>
<td>0.93 (0.74,1.18)</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>0.63 (0.48,0.81)</td>
<td>0.62 (0.47,0.81)</td>
<td>3.26 (2.79,3.81)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.11 (2.39,4.06)</td>
</tr>
<tr>
<td>Stillbirth</td>
<td>0.85 (0.63,1.14)</td>
<td>0.90 (0.67,1.22)</td>
<td>1.77 (1.33,2.36)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.90 (1.19,3.03)</td>
</tr>
</tbody>
</table>

*adjusted for Age, RPR, HIV status, HGB, Hypertension during ANC or delivery, and EGA at first ANC visit

**Globesity in effect**
Obesity & intrapartum

More failed TOLAC and uterine ruptures
# Obesity and Intraoperative Risks

## Table 3

Log-binomial regression models for the risk of any intraoperative complication, by maternal BMI (n = 51,218)

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted RR (95% CI)</th>
<th>Model 1: direct aRR (95%CI)</th>
<th>Model 2: indirect aRR (95%CI)</th>
<th>Percent of intraoperative risk attributable to surgical characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI 18.5 to 29.9 (reference)</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>32</td>
</tr>
<tr>
<td>BMI 30 to 39.9</td>
<td>0.83 (0.75—0.92)</td>
<td>0.87 (0.82—1.00)</td>
<td>0.93 (0.84—1.03)</td>
<td>32</td>
</tr>
<tr>
<td>BMI 40 to 49.9</td>
<td>0.69 (0.58—0.81)</td>
<td>0.66 (0.56—0.79)</td>
<td>0.76 (0.64—0.89)</td>
<td>32</td>
</tr>
<tr>
<td>BMI ≥ 50</td>
<td>1.15 (0.88—1.51)</td>
<td>1.02 (0.78—1.32)</td>
<td>0.98 (0.75—1.27)</td>
<td>51</td>
</tr>
<tr>
<td>Race (ref nonblack)</td>
<td>1.70 (1.55—1.87)</td>
<td>1.67 (1.51—1.83)</td>
<td>1.55 (1.41—1.71)</td>
<td></td>
</tr>
<tr>
<td>PTD &lt; 37 weeks (ref ≥ 37 weeks)</td>
<td>2.44 (2.22—2.69)</td>
<td>2.31 (2.10—2.55)</td>
<td>2.01 (1.82—2.23)</td>
<td></td>
</tr>
<tr>
<td>Skin incision (ref vertical)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pfannenstiel</td>
<td>0.56 (0.50—0.62)</td>
<td>0.56 (0.50—0.62)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>0.46 (0.42—0.54)</td>
<td>0.58 (0.51—0.66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency cesarean delivery (ref: nonemergency cesarean delivery)</td>
<td>2.33 (2.11—2.57)</td>
<td>1.80 (1.62—2.00)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 1 adjusted for race and PTD < 37 weeks.
Model 2 adjusted for race, PTD < 37 weeks, skin incision type, and emergency cesarean delivery.

aRR, adjusted risk ratio; BMI, body mass index; CI, confidence interval; PTD, preterm delivery; RR, risk ratio.

*Statistical significance at P < .05.

Obesity and intraoperative risks

**FIGURE 1**
Predicted probability of intraoperative complication by maternal BMI at delivery (n = 51,218)
Super obesity (BMI >50)

- Macrosomia aRR 1.8 95% CI 1.3-2.5
- Pre-eclampsia aRR 1.7 95% CI 1.4-2.1
- Cesarean aRR 1.8 95% CI 1.5-2.2
- 39% of nulliparous super obese women scheduled C-sections

**ICU Admission**

- aOR 1.69 (CI 1.01-2.87) for ICU admission
- Overall 1 ICU: 153 admissions
- 1 ICU: 77 deliveries of super obese women
- 1 ICU for 144 deliveries for non-obese women
- 1 ICU for 179 every deliveries for Class I or II women
- 1 ICU for 132 every deliveries women with BMI 40s

Marshall et al
Alanis et al
Smid et al
Super obesity & acute neonatal morbidity

- Acute: APGAR < 5, CPR/vent support, TTN, neonatal injury
- Severe: Grade III/IV IVH, nec, seizure, RDS, HIE, meconium aspiration, vent support > 2 day, sepsis, death

<table>
<thead>
<tr>
<th>Maternal and delivery characteristics</th>
<th>Acute neonatal morbidity (n = 41,262)</th>
<th>Severe neonatal morbidity (n = 41,262)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted OR</td>
<td>Adjusted OR</td>
</tr>
<tr>
<td></td>
<td>(95% CI)</td>
<td>(95% CI)</td>
</tr>
<tr>
<td>BMI: 18.5–29.9 kg/m² (ref)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>BMI: 30–39.9 kg/m²</td>
<td>1.19 (1.01–1.41)</td>
<td>1.26 (1.11–1.42)</td>
</tr>
<tr>
<td>BMI: 40–49.9 kg/m²</td>
<td>1.59 (1.40–1.80)</td>
<td>1.63 (1.38–1.92)</td>
</tr>
<tr>
<td>BMI: ≥50 kg/m²</td>
<td>1.81 (1.46–2.25)</td>
<td>2.08 (1.59–2.73)</td>
</tr>
</tbody>
</table>
What’s the best surgical approach?
Obesity and surgical approach

The Problem of the Pannus: Physician Preference Survey and a Review of the Literature on Cesarean Skin Incision in Morbidly Obese Women

Marcela C. Smid, MD, MA, MS¹  Sarah G. Smiley, MD, MPH²  Jay Schulkin, MD³  David M. Stamilio, MD, MSCE¹  Rodney K. Edwards, MD, MS⁴  Alison M. Stuebe, MD, MSc¹,⁵
**Table 3** Effect of surgical techniques among extremely obese women ($N = 2,411$)

<table>
<thead>
<tr>
<th>Skin incision type</th>
<th>Pfannenstiel ($N = 1,742$)</th>
<th>Vertical ($N = 669$)</th>
<th>$p$-Value$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite morbidity</td>
<td>224 (12.9)</td>
<td>113 (16.9)</td>
<td>0.01</td>
</tr>
<tr>
<td>Infectious composite</td>
<td>155 (8.9)</td>
<td>80 (12.0)</td>
<td>0.02</td>
</tr>
<tr>
<td>Infection</td>
<td>29 (1.7)</td>
<td>20 (3.0)</td>
<td>0.04</td>
</tr>
<tr>
<td>Endometritis</td>
<td>133 (7.6)</td>
<td>67 (10.0)</td>
<td>0.06</td>
</tr>
<tr>
<td>Wound opening</td>
<td>10 (0.6)</td>
<td>8 (1.2)</td>
<td>0.11</td>
</tr>
<tr>
<td>Seroma/hematoma</td>
<td>14 (0.8)</td>
<td>13 (1.9)</td>
<td>0.02</td>
</tr>
<tr>
<td>Readmission</td>
<td>62 (3.6)</td>
<td>25 (3.7)</td>
<td>0.83</td>
</tr>
</tbody>
</table>
Obesity and surgical approach

- Nine studies on skin incision for obese patients
  - Five = no difference between vertical & LT
  - Three = vertical higher rates
  - One = vertical lower rate

- Selection bias – heavier women are more likely to get vertical skin incisions
Best Practices for Obese Patients

• Preconception counseling
  – Weight reduction program: diet, exercise, behavior modification
  – **Folate Rx**: Higher dose not shown to reduce risk
  – Infertility treatment: recommend weight loss program prior to ART Rx

• Record maternal height & weight at initial visit
  – Weight gain for obese: 11-20 lb (2009 IOM)

• Nutrition consultation

• Encourage exercise regimen (reduced GWG)

• Increased risk of preeclampsia:
  – Consider urine protein: creatine and/or baseline 24 hr urine protein & LFTs
Best Practices for Obese Patients

- Anesthesiology consult (antenatal or early labor)
- Antenatal testing:
  - Consider obesity as an indication for serial NST or BPP in the 3rd trimester
    - **No evidence for fetal risk reduction**
  - Targeted fetal anatomy ultrasound
  - Growth ultrasound(s) if unable to clinically estimate fetal weight
- VBAC counseling: no optimal delivery mode
  - Estimate success rate and if very low offer cesarean to avoid risks associated with failed TOLAC & emergency cesarean
Best Practices for Obese Patients

- Early GDM / Type 2 DM screening
  - Class III ("severe") obesity – screen at 1st visit
    - ADA recommendation: 2hr GTT, FBG or HgbA1c
  - Class I-II obesity – consider early screen with other risk factors present
    - "Expert opinion"
  - Type 2 DM criteria: HgbA1c > 6.5%, fasting BG >126 mg/dl, or 75g 2hr GTT >200 mg/dl

- Apply standard delivery mode guidelines for macrosomia
  - DM: offer cesarean if EFW >4500g
  - Non-DM: offer cesarean if EFW >5000g
    - "Expert opinion"
Best Practices for Obese Patients

- Higher dose of preoperative antibiotics
- Closure of subcutaneous layer after cesarean
- What’s the best cesarean skin incision...Pfannenstiel? Vertical? High transverse (peri-umbilical)?
  - No good data to guide clinical practice
- Thromboprophylaxis after cesarean with pneumatic compression devise (or LMWH)
- Encourage breast feeding
- Refer to a weight reduction specialist postpartum
Dr. Intern: we have a C-section

BMI 45

Class III Obesity

Class III obesity
OB^3: what I think of all of this

- **Globesity is increasing**
  - Makes keeping women & their babies safe more challenging

- **BMI is easy but maybe not be identifying women at highest risk**
  - Meant for screening; not diagnostic

- **Fat is important** and have very little idea about what fat is doing in pregnancy.

- Because we don’t understand fat, we lack answers to basic questions in obstetrics and obesity.

- Embrace and investigate the pannus!
Questions?

Thank you…

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