Disclosure

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All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.

Learning Objectives

1. Advise pregnant patients on appropriate weight gain based upon pre-pregnant BMI, the benefits of meeting weight management goals, and resources to assist with making lifestyle modifications as needed.
2. Review the Institute of Medicine’s recommendations for weight gain in pregnancy.
3. Discuss labor management issues associated with obesity.

2014 US National Health and Nutrition Exam Survey of Health Statistics for Reproductive Age Women

<table>
<thead>
<tr>
<th>Pre-pregnancy BMI (kg/m²)</th>
<th>Weight Classification</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 18.5</td>
<td>Underweight</td>
<td>3.8%</td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>Normal weight</td>
<td>29.3%</td>
</tr>
<tr>
<td>25.0-29.9</td>
<td><strong>Overweight</strong></td>
<td><strong>26.5%</strong></td>
</tr>
<tr>
<td>&gt;30.0</td>
<td>Obese</td>
<td><strong>40.4%</strong></td>
</tr>
</tbody>
</table>

Figure 4. Percentage change in prepregnancy obesity between 2011 and 2014, by reporting area: 36 states and the District of Columbia.

Adipose tissue is an active endocrine organ!

- Dysregulatory effect on metabolism, vasculature, and alters inflammatory pathways when present in excess
- Nearly linear relationship to the degree of obesity and the presence of pregnancy complications such as preeclampsia
- Maternal obesity may effect long term offspring outcomes – Childhood obesity, neurodevelopmental effects, etc.

Ramsay 2002

Preconception

- 2016 survey of 1420 women, 126 indicated intent to become pregnant
- 51% of women had low awareness of obesity risk in pregnancy
- 47% did not see need to change diet, 76% did not have clear understanding of a healthy diet
- 71% of overweight/obese women intending to become pregnant misperceived their weight

Berenson AB et al 2015
Complications Related to Obesity in Pregnancy

• Antepartum
  – Early pregnancy loss; congenital anomalies
  – Diabetes (occult, gestational)
  – Pregnancy associated hypertensive disorders
  – OSA
  – Multifetal pregnancy (doubles risk dizygotic twins)

• Intrapartum
  – Indicated and spontaneous preterm birth
  – Post-term pregnancy
  – Delayed progress of labor
  – Cesarean Delivery
  – Anesthesia difficulties
  – Macrosomia complications

• Postpartum
  – VTE
  – Infection
  – Postpartum Depression

Antepartum Obesity Risks

• Miscarriage
  – 2011 Systematic review, 6 studies, >25,000 women
  – Rates first trimester spontaneous loss:
    • 3,800 obese (16.6%)
    • 3,792 overweight (11.8%)
    • 17,000 normal weight (10.7%)
  – Odds of having greater than 1 miscarriage higher for obese and overweight women as well
  – Perhaps related to chronic higher inflammatory state
Antepartum Obesity Risks

• Diabetes
  – (covered under DM in pregnancy lecture)
  – Risk gestational diabetes increases linearly with increasing maternal weight
    • Exaggerated increase in insulin resistance in the obese state

• Hypertension
  – Maternal obesity independent risk factor for development of a hypertensive disorder of pregnancy
  – Risk PEC doubles with every 5-7 kg/m² increase in pre-pregnancy BMI
  – Women undergoing pre-pregnancy bariatric surgery significantly decreases risk development HTN

O’Brien 2003, Maggard 2008

Antepartum Obesity Risks
Preterm Birth

Indicated
  – Development of DM, HTN, etc. may necessitate early delivery
  – 2010, obese women were 30% more likely to have to undergo induction for maternal indication
    • Risk increased linearly with increasing weight

Spontaneous
  – Less clear
  – Studies support risk VERY preterm delivery (22-27 weeks) as increased for obese women but at 28-36 weeks there is no difference compared with gravida of normal weight
  – Relationship between PCOS and spontaneous PTB requires more research

McDonald 2010, Cnattingius 2013
Antepartum Obesity Risk

- **OSA**
  - Chronic sleep disturbance
  - nocturnal hypoxemia
  - neuroendocrine alterations associated with OSA
    - impact fetal growth and well-being, based on several preliminary studies
    - results and outcomes reported of retrospective and prospective studies have been inconsistent.

- **Twin**
  - Ovulatory dysfunction related to insulin resistance
  - Risk of anovulation and/or releasing multiple eggs
  - Twin + obesity significantly increases risk GDM, HTN/PEC, cesarean delivery

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**AES Question**

[Image of a question mark]
**Question 1**  
**Labor for Obese Women**

You are caring for a woman in her first pregnancy. She is currently 12 weeks gestations. Her weight is 280 lb and she is 5 foot 3 inches. She is asking for information about how obesity might affect her labor progress and delivery. You inform her that available data suggest that obese women in labor are more likely to:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Have longer latent phase of labor</td>
</tr>
<tr>
<td>B.</td>
<td>Have longer active phase of labor</td>
</tr>
<tr>
<td>C.</td>
<td>Have a cesarean delivery</td>
</tr>
<tr>
<td>D.</td>
<td>A and B</td>
</tr>
<tr>
<td>E.</td>
<td>A and C</td>
</tr>
<tr>
<td>F.</td>
<td>A, B and C</td>
</tr>
</tbody>
</table>

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**AMERICAN ACADEMY OF FAMILY PHYSICIANS**

17

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**AMERICAN ACADEMY OF FAMILY PHYSICIANS**

18
Intrapartum Obesity Risks

• Labor dystocia
  – Obese patients have longer labors (7.9 hours from 4-10 cm) as compared to overweight (7.5 hours) and normal weight gravidas (6.2 hours)
    • Reported as medians
    • Measured as 4-10 cm dilation

Vahratian 2004, Wolfe 2011

First Stage of Labor Comparisons - Norman 2012
Intrapartum Obesity Risk - Ellekjaer et al 2017

Second Stage of Labor Comparisons – Ellekjaer et al 2017

* Calculated from the onset of regular contractions and a dilated cervical orifice > 3 cm
Intrapartum Complications

- One new study defining active labor as 6 cm or more and how it might differ with nulliparous obese women
  - No difference from 6 cm to birth, latent phase was again longer for those in spontaneous labor and those undergoing induction

- Median active labor duration:
  - 5.83 hr for normal weight
  - 6.08 hr for overweight
  - 5.90 hr for obese women

Ellekjaer et al 2017, Polonia Valente et al 2018

Intrapartum Complications

- Decreased risk spontaneous labor at each gestational age (Frovola et al 2018)

<table>
<thead>
<tr>
<th>BMI</th>
<th>37 wk</th>
<th>38 wk</th>
<th>39 wk</th>
<th>40 wk</th>
<th>41 wk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ref</td>
<td>0.66 (0.54–0.81)</td>
<td>0.81 (0.68–0.96)</td>
<td>0.85 (0.71–1.00)</td>
<td>0.85 (0.67–1.08)</td>
<td>0.99 (0.58–1.67)</td>
</tr>
<tr>
<td>BMI &lt; 25</td>
<td>0.53 (0.42–0.66)</td>
<td>0.64 (0.53–0.76)</td>
<td>0.66 (0.55–0.78)</td>
<td>0.63 (0.50–0.81)</td>
<td>0.70 (0.41–1.19)</td>
</tr>
<tr>
<td>BMI 25–29.9</td>
<td>0.52 (0.40–0.68)</td>
<td>0.50 (0.40–0.62)</td>
<td>0.53 (0.43–0.65)</td>
<td>0.51 (0.39–0.66)</td>
<td>0.70 (0.40–1.22)</td>
</tr>
<tr>
<td>BMI 30–34.9</td>
<td>0.42 (0.31–0.57)</td>
<td>0.40 (0.31–0.51)</td>
<td>0.41 (0.33–0.51)</td>
<td>0.50 (0.38–0.66)</td>
<td>0.56 (0.31–1.02)</td>
</tr>
</tbody>
</table>
Intrapartum Complications

• Induction dystocia
  – Twice as likely to experience a failed induction as normal weight gravidas, linear fashion with increasing degree of obesity

  Ellis et al 2019

  • Obese patients require higher oxytocin doses
    • 17 vs 13 milliunits/min maximum dosing for obese women vs. normal weight women to achieve progression of cervical dilation

  Hill 2015
Intrapartum Complications

• Cesarean delivery
  – Obesity is a risk factor for elective (and potentially emergency) cesarean
    • Earlier onset labor complications cited
  – Obese women granted fewer hours active labor

Intrapartum Complications

• Anesthesia risk
  – Increased rates difficult placement
  – Increased risk of general anesthesia
    • Local standards of care regarding use of outpatient consult to anesthesia will apply
Intrapartum complications

• Increased risk macrosomia in obese women.
  – Weiss et al 2005:
    • incidence of macrosomia, defined as a birth weight of over 4000 g, was 8.3% in a non-obese group
      13.3% in an obese group and 14.6% among morbidly obese women

• Usha Kiran et al (2005)
  – population database of 60,167 deliveries
  – women with a BMI of over 30 had an increased risk for postdates pregnancy, cesarean,
    macrosomia, and failed instrumental delivery.
  – Shoulder dystocia also increased at delivery but not to statistical significance
    • It is possible that an increase in cesarean section rates, particularly in obese women, has reduced
      the number of women who would have had shoulder dystocia in these analyses.

Summary-Intrapartum Risk

Obese women overall have longer labors, but active phase of labor is similar.
- inductions take longer due to prolonged latent phase
- increased oxytocin likely needed

Obese women have shorter or equal second stage of labor to normal weight women.

Obese women have increased risk postpartum hemorrhage

Obese women have higher induction rates

Obese women have an increased risk for macrosomic infants, cesarean delivery
Postpartum

- **VTE**
  - Women with Class 1 obesity are 2.5 times more likely, Class 2: 2.9 times, Class 3: 4.6 times more likely to experience VTE

- **Infection**
  - More likely for infection despite prophylactic antibiotic use
  - Increased dose prophylaxis needed

- **Depression**
  - 30% more likely in 2014 meta-analysis

Blunden 2016, Robinson 2005, Molyneaux 2014

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Pharmacology Review

- **Postpartum Hemorrhage**
- **Fyfe et al 2012** >10000 women
  - twofold increase in risk in obese nulliparous women that was independent of confounders, adjusted odds ratio [aOR (95% CI)] for all deliveries 1.86 (1.51-2.28)
  - being obese was a risk factor for major PPH following both cesarean 1.73 (1.32-2.28) and vaginal delivery 2.11 (1.54-2.89) and the latter risk was similar after exclusion of women with major perineal trauma and retained placenta.

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[Bar chart showing the percentage of postpartum hemorrhage by mode of delivery and obesity status.]

Blunden 2016, Robinson 2005, Molyneaux 2014
Offspring Risk

- Congenital anomalies
- Asphyxia and death
- Prematurity
- LGA
- Childhood obesity
- Neurodevelopment

Pre-pregnancy Weight Loss

- Weight reduction programs, medical weight loss, bariatric surgery are all options
  - 10% reduction in pre-pregnancy BMI may reduce risk medical complications by 10% and risks cesarean and shoulder dystocia by 20% and 30% respectively
- Best et al 2018
  - 40 studies were included, of which 14 were randomized control trials.
  - Primary outcomes were pregnancy, live birth rate and weight change.
  - reduced calorie diets and exercise interventions were more likely than control interventions to result in pregnancy [risk ratio 1.59, 95% CI (1.01, 2.50)]
  - Miscarriage rates were not reduced
- Wilcox et al 2018 Health in Pregnancy and Postpartum (HIPP)
  - large randomized trial regarding behavioral interventions to reduce weight gain in pregnancy and promote weight loss postpartum
    - Primary outcomes pending
Expected weight gain

- Obese women (BMI > 30 kg/m²) should limit weight gain to 5-11 kg during pregnancy to help prevent complications associated with increasing levels of obesity in pregnancy.
- Weight loss in pregnancy not recommended
  - Increased risk SGA infant


AES Question
Question 2
Regarding Obese Gravida…

Obesity is a chronic inflammatory state and is associated with increased potential for aneuploidy in offspring

A. True
B. False
Obesity and Fetal Aneuploidy Screening

- The obese gravida is not at increased risk for aneuploidy but IS at increased risk for congenital malformation in offspring, as previously mentioned
  - 50% more likely for NTDs
  - 30% more likely for cardiovascular defects
  - 23% more likely for cleft palate
  - 48% more likely for anorectal atresia
  - 34% more likely for limb reduction anomalies
  - Gastroschiesis greatly reduced in obese women

Rasmussen 2008, Cai 2014

Obese patients and NTD risk

- Obese patients have lower median rates B12 and folate
- In the UK obese women are recommended to take 5 mg folate daily
  - Conflicting data when studied in US whether higher dose folic acid for obese gravidas is effective

Mojtabai 2004, Tinker 2012
Women who had Weight-loss Surgery

• Supplement micronutrients including iron, calcium, B12 and folate
• Malabsorption
• Monitor maternal weight gain, caloric intake and fetal growth
• Recommend 12-18 month interval after surgery before pregnancy
  – More research is needed as banding and sleeve become more popular than bypass

Prenatal Care Recommendations for Obese Women

• Ensure sufficient weight gain 5-11 kg to prevent a SGA infant
• Screen for diabetes mellitus early and at 24-28 weeks
• Provide nutrition and exercise counseling
• Screen for obstructive sleep apnea, refer for evaluation and treatment if concerned
• Consider baseline PEC labs
Why BMI is a problem….

- Developed in the mid 19th century as a tool to assist actuaries in creating life insurance policies for Belgian (white) men

- HOW IS THIS RELEVANT NOW?
  - BMI does not = adiposity
  - Where weight is carried might actually be contributing to the inflammatory state
  - Ongoing research looking at new tools to assess inflammatory risk of obesity
Question 3
Regarding prevention of complications.....

The obese gravida may consider low dose aspirin as a prevention for pre-eclampsia with severe features

A. True
B. False
Question 3
Regarding prevention of complications…..

The obese gravida may consider low dose aspirin as a prevention for pre-eclampsia with severe features

A. True
B. False

Use of ASA in Obesity

• USPSTF, ACOG
  – "Obesity is a moderate risk factor for PEC and consider ASA if patient has several moderate risk factors"
  • Nulliparity, family history of PEC, low SES, maternal age >35, previous history SGA or LBW infant, previous pregnancy adverse outcome, > 10 year pregnancy interval ("functional nullipara")
Question 4
Obesity and Ultrasound

Fetal echocardiogram is recommended to assess cardiac malformations for all obese gravida

A. True
B. False
Question 4
Obesity and Ultrasound

Fetal echocardiogram is recommended to assess cardiac malformations for all obese gravida

A. True
B. False

Use of Ultrasound for Obese Gravida

- Ultrasound can be technically difficulty for obese patients
- If anatomy scan ultrasound does not achieve optimal results for visualizing cardiac structures, consider fetal echo
  - American Heart Association does not cite obesity as an indication for fetal echo
- Fetal growth scans are typically performed every 4-6 weeks
  - Local standards of care may apply
- Despite increased risk fetal loss, mechanism of loss in unclear and it is not recommended to perform antenatal testing for obesity alone

Wax 2014, Donofrio 2014
Question 5

Which intervention does not decrease morbidity in obese women requiring a cesarean delivery?

A. Mechanical thromboprophylaxis before surgery.
B. Placement of a subcutaneous drain.
C. Use of low molecular weight heparin post-op for thromboprophylaxis.
D. Administration of a pre-operative parenteral antibiotic.
Question 5

Which intervention does not decrease morbidity in obese women requiring a cesarean delivery?

A. Mechanical thromboprophylaxis before surgery.
B. **Placement of a subcutaneous drain.**
C. Use of low molecular weight heparin post-op for thromboprophylaxis.
D. Administration of a pre-operative parenteral antibiotic.

Obesity affects morbidity from cesarean delivery

- Venous thromboembolism
- Wound infection
- Wound dehiscence
Preventing complications of cesarean delivery in obese patients: venous thromboembolism

- Mechanical sequential compression devices before surgery
- Weight-based 0.5 mg/kg/dose low molecular weight heparin (LMWH) vs. fixed (40 mg daily enoxeparin) vs. 5000 units low molecular weight heparin BID until discharge for those with BMI > 35 kg/m² per CMQCC
- Early mobilization after surgery
  - Of the 20 women who died from VTE in 2002-2017:
    - 61% were obese, the highest proportion among all causes of pregnancy-related mortality
    - 25% of the women had BMI ≥40
    - 26% of the women who gave birth and died of VTE had a vaginal birth (n=7)
    - 74% had a cesarean delivery, primarily scheduled or unplanned during labor
  - Takeaway:
    - VTE mortality risk increases with increased BMI

Preventing complications of cesarean delivery in obese patients: wound infection and dehiscence

- Consider weight and volume of distribution for antibiotic dose and choices
- Meticulous hemostasis, closure of dead space, delayed absorbable fascial suture
- Fastidious post-operative wound care in hospital and at home
Oral antibiotics post cesarean for obese women

- JAMA 2017
- 403 randomized participants at OHSU
- Approximately halved risk postoperative wound infection in 30 days after cesarean using oral Cephalexin 500 mg po TID and Metronidazole 500 mg po TID for 48 hours post cesarean in addition to the usual pre-operative antibiotic regimen
- No adverse side effects were noted

Preventing complications of cesarean delivery in obese patients: delivery dystocia

- Plan incision type
- Adequate exposure with:
  - taping panniculus or use Traxi
  - having enough assistants
  - generous incision
- Using a self-retaining retractor such as the Alexis O retractor
- Use vacuum or forceps as necessary
Obesity and postpartum hemorrhage risk

<table>
<thead>
<tr>
<th>Low (No Prenatal Pretransfusion Testing Required)</th>
<th>Medium (Prenatal Type and Screen Performed, No RBC Units Cross-Matched)</th>
<th>High (2 Units of RBCs Cross-Matched)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No previous uterine incision</td>
<td>Previous cesarean delivery or uterine surgery</td>
<td>Placenta previa, low-lying placenta</td>
</tr>
<tr>
<td>Singleton pregnancy</td>
<td>Multiple gestation</td>
<td>Suspected placenta accreta or percreta</td>
</tr>
<tr>
<td>4 or fewer previous vaginal deliveries</td>
<td>More than 4 previous vaginal deliveries</td>
<td>Hematocrit less than 30 and other risk factor</td>
</tr>
<tr>
<td>No known bleeding disorder</td>
<td>Chorioamnionitis</td>
<td>Platelets less than 100,000</td>
</tr>
<tr>
<td>No history of peripartum hemorrhage</td>
<td>History of peripartum hemorrhage</td>
<td>Active bleeding (greater than show) on admission</td>
</tr>
<tr>
<td></td>
<td>Large uterine leiomyomans</td>
<td>Known coagulopathy</td>
</tr>
<tr>
<td></td>
<td>Estimated fetal weight more than 4 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Morbid obesity (BMI greater than 35 kg/m²)</td>
<td></td>
</tr>
</tbody>
</table>

RBC, red blood cell; BMI, body mass index.


Obese women are at higher risk postpartum of:

- **Difficulty with breastfeeding**
  - Research shows that mothers who are obese (with a BMI >30) are less likely to initiate lactation have delayed lactogenesis, and are prone to early cessation of breastfeeding
    - Delay increase prolactin after breastfeeding > 2 days
    - Higher Leptin inhibits milk ejection
    - For every 1 unit increase in BMI ~ 0.5 hour delay in lactogenesis

- **Postpartum weight retention**
- **Anemia**
  - Dilutional
Effective Postpartum Weight Loss Strategies

• Promote breastfeeding, lactation consult use in hospital and home when available
• Recommend combined diet, behavior modification and exercise to prevent postpartum weight retention

• *Discuss risks for subsequent pregnancies and development of chronic diseases associated with obesity

Barriers to Practice
Lack of Reimbursement - Nutritionists

• Many health insurances will only cover nutritional assessment and counseling if pre-existing or gestational diabetes is present.

Consider group prenatal visits that teach nutrition, family-based interventions, community resources and internet/smartphone resources.
Barriers to Practice
Difficulty in Monitoring Diet and Activity

• 72 hour dietary recall
• Written record of 1 week food intake- bring to office to review.
• Apple™ Health iphone app
• Myfitnesspal™ smartphone app
• Fitbit™

Barriers to Practice
Lack of Provider Tools and Training

• www.stopobesityalliance.org
• https://obesitymedicine.org/
  https://www.aafp.org/fpm/2016/0900/p32.html
Practice Recommendations

Recommend pregnancy weight gain goals for your patients based on their pre-pregnancy BMI. (SOR C)

Pay attention to antibiotic dosing pre-operatively for obese patients (SOR B)

Pay attention to use of VTE prophylaxis for postoperative obese patients (SOR A)

Consider low dose Aspirin for obese patients (SOR B)

Educate your overweight and obese pregnant patients about risks and difficulties anticipated with their pregnancies, delivery and postpartum courses. (SOR C)

Educate yourself about becoming a more effective clinician in assessing and treating obesity. (SOR C)

Use a standardized approach to decrease the risk of complications for your obese patients who require cesarean delivery. (SOR C)

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Answer Key

1. E
2. B
3. A
4. B
5. B

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