Mount Sinai Hospital
Sinai Health System
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Approach to the Bariatric Pregnant Patient

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Disclosure

- Speaking honoraria from Ferring Canada for talks on induction of labour
- This presentation has not received any financial or in-kind support from a profit or non-profit organization
- Mitigating potential bias
  - Avoiding the use of trade names consistently
  - Presenting an unbiased look at labour induction in this population

Learning objectives

At the conclusion of this lecture, with respect to the pregnant woman with obesity and the patient who has undergone bariatric surgery, participants will be able to:

1. Manage antenatal challenges unique to this patient population
2. Select the appropriate timing and mode of delivery
3. Anticipate and manage specific concerns that occur in labour

Every recommendation made in this presentation will need to take into account available resources in Northern Ontario

“Bariatric Pregnant Patient” – a word on terminology

frontiers in Psychology

OPINION
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What’s in a Word? On Weight Stigma and Terminology

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Keywords: weight stigma, weight bias, anti-fat prejudice, obesity, terminology, language, social justice, fat activism

Ultimately, whether you describe somebody as “fat,” “overweight” “obese,” “big,” “heavy,” “voluptuous,” or simply “higher-weight,” these labels all reflect certain culturally constructed values. It behooves us to ask ourselves whether the words we use do indeed affirm the respect and human dignity of the target group, whether they place the group as equal to other social groups, and whether they promote or hamper the wellbeing and empowerment of that group. If not, we will only perpetuate the stigma we are claiming to abolish. As a first step, we suggest that best practice in research, publishing, and healthcare would be to use neutral terms, with “weight” and “higher weight” likely to be suitable in the majority of situations. We would also exhort journal editors to remove the insistence on person-first terminology that precludes more nuanced consideration of the implications of language use.

Pregnancy in women with increased weight

- Antepartum
  - Miscarriage
  - Congenital anomalies
  - Gestational diabetes
  - Hypertensive disorders
  - Cardiovascular disease
  - Pre-existing comorbidities
  - Venous thromboembolism
  - Difficulty with fetal surveillance
  - Macrosomia
  - Fetal growth restriction
  - Placental insufficiency
  - Stillbirth
  - Social and mental health issues
- Peripartum
  - Preterm birth
  - Maternal and fetal surveillance
  - Failure of induction
  - Labour dystocia
  - Birth trauma
  - Antepartum infective morbidity
  - High operative delivery rates
  - Wound disruption
  - Prolonged hospital admission
  - Venous thromboembolism
  - Failure of lactation
  - Postpartum depression

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  - **High operative delivery rates**
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  - Failure of lactation
  - Postpartum depression

Antepartum considerations

The effects of Body Mass Index on pregnancy outcomes: a systematic review and meta-analysis

Horyn I, Pavlagantharajah S, Jacob CE, Zaffar N, **D'Souza** R. *(unpublished)*

19 studies, 1,499,238 pregnancies

Condition	BMI<18.5	BMI 18.5-24.99	BMI 25-29.99	BMI 30-34.99	BMI 35-39.99	BMI >40
Pre-gestational diabetes	0.31% (0, 0.84)	1.01% (0.11, 1.91)*	1.54% (0, 3.19)*	2.88% (0.15, 5.62)*	4.16% (0, 8.35)*	9.12% (4.94, 13.30)*
Essential hypertension	0.08% (0, 0.22)	0.50% (0.26, 0.74)	1.22% (1.05, 1.40)	2.48% (1.32, 3.63)*	3.93% (1.76, 6.11)*	9.12% (4.94, 13.30)*

BMI = Body mass index; numbers represent **percentage and 95% confidence limits**, * represents I^2 >75%

Condition	BMI<18.5	BMI 25-29.99	BMI 30-34.99	BMI 35-39.99	BMI >40
Pre-gestational diabetes	0.43 (0.22, 0.83)	2.03 (1.65, 2.49)	3.98 (2.82, 5.60)	5.57 (4.25, 7.28)	10.03 (4.96, 20.31)*
Essential hypertension	0.24 (0.08, 0.71)	2.58 (1.56, 4.29)*	5.12 (4.09, 6.41)	7.95 (6.13, 10.31)	15.10 (11.92, 19.14)

BMI = Body mass index; numbers represent **relative risk** and 95% confidence limits, * represents I^2 >75%

Practice Point I
Screen for pre-existing diabetes as early as possible

- Best test in the first trimester?
    1. Fasting blood sugar
    2. Random blood sugar
    3. Glucose challenge test (blood sugar one hour after sugar load)
    4. Glucose tolerance test (fasting blood sugar + one and two hours after sugar load)
    5. HbA1C

"In the first trimester, insulin secretion is increased and its anabolic actions are potentiated, decreasing fasting maternal glucose levels and promoting maternal energy storage."

"Insulin resistance develops in the second and third trimesters, due to increasing levels of human placental lactogen, cortisol, prolactin, placental GH, estrogen and progesterone this results in higher fasting glucose and enhanced lipolysis."

Practice Point I
Screen for pre-existing diabetes as early as possible

- Best test in the first trimester?
  1. Fasting blood sugar
  2. Random blood sugar
  3. Glucose challenge test (blood sugar one hour after sugar load)
  4. Glucose tolerance test (fasting blood sugar + one and two hours after sugar load)
  5. **HbA1C**

Low fasting blood sugar and nausea/vomiting in the first trimester

Insulin resistance and gestational diabetes cannot be truly confirmed before the second trimester

Practice Point II
Screening for other medical comorbidities

- Essential hypertension:
  - Baseline blood pressure and mean arterial pressure
- Cardiovascular conditions:
  - Cardiovascular examination
  - Baseline ECG and echocardiogram
- Other endocrinologic conditions
  - Thyroid function
- (Increased risk for) venous thromboembolism
  - Personal and family history
- Social/ mental health concerns

Make appropriate referrals

- Internal medicine
  - Review medications and optimize physical health
- Social work/ Counsellor
  - Review concerns and optimize social/ mental health

The effects of Body Mass Index on pregnancy outcomes: a systematic review and meta-analysis

Horyn I, Pavlagantharajah S, Jacob CE, Zaffar N, **D'Souza** R. *(submitted Obesity Reviews)*

19 studies, 1,499,238 pregnancies

Condition	BMI<18.5	BMI 18.5-24.99	BMI 25-29.99	BMI 30-34.99	BMI 35-39.99	BMI >40
Gestational diabetes	4.02% (1.24, 6.80)*	3.60% (1.63, 5.57)*	7.69% (4.93, 10.44)*	10.25% (6.24, 14.26)*	12.39% (7.94, 16.83)*	16.41% (11.67, 21.14)*
Hypertensive disorders of pregnancy	1.79% (1.10, 2.47)*	2.75% (1.64, 3.87)*	5.11% (3.16, 7.06)*	9.70% (8.26, 11.13)*	10.30% (7.43, 13.17)*	16.10% (12.98, 19.22)*

BMI = Body mass index; numbers represent **percentage and 95% confidence limits**, * represents I^2 >75%

Condition	BMI<18.5	BMI 25-29.99	BMI 30-34.99	BMI 35-39.99	BMI >40
Gestational diabetes	0.90 (0.83, 0.97)	1.83 (1.57, 2.14)*	2.63 (2.20, 3.14)*	3.23 (2.57, 4.06)*	4.55 (3.50, 5.92)*
Hypertensive disorders of pregnancy	0.71 (0.63, 0.80)	1.79 (1.59, 2.03)*	2.82 (2.19, 3.63)*	3.68 (2.85, 4.75)*	5.83 (4.36, 7.79)*

BMI = Body mass index; numbers represent **relative risk** and 95% confidence limits, * represents I^2 >75%

Practice Point III
Screen for gestational diabetes and hypertensive disorders

- Gestational diabetes
  - Always perform a GCT between 24-28 weeks
  - Consider an early GCT at 16 weeks
- Hypertensive disorders
  - Commence low-dose aspirin (162mg) daily at bedtime from <16 weeks until 36+ weeks
  - Use appropriate BP cuffs
  - Monitor the change in BP at each visit
  - Consider home BP monitoring
  - Inform women of warning signs of severe pre-eclampsia even in the absence of elevated BP

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Aspirin versus Placebo in Pregnancies at High Risk for Preterm Preeclampsia

Daniel L. Rolnik, M.D., David Wright, Ph.D., Liona C. Poon, M.D., Neil O'Gorman, M.D., Argyro Syngelaki, Ph.D., Catalina de Paco Matallana, M.D., Ranjit Akolekar, M.D., Simona Cicero, M.D., Deepa Janga, M.D., Mandeep Singh, M.D., Francisca S. Molina, M.D., Nicola Persico, M.D., Jacques C. Jani, M.D., Walter Plasencia, M.D., George Papaioannou, M.D., Kinneret Tenenbaum-Gavish, M.D., Hamutal Meiri, Ph.D., Sveinbjorn Gizurarson, Ph.D., Kate Maclagan, Ph.D., and Kypros H. Nicolaides, M.D.

At risk women: [Risk >1/100]
Dose: Aspirin 150mg
Initiation: Starting from 11-13+6 to 36 weeks
Timing: Taken at bedtime

Table 2. Outcomes According to Trial Group.

Outcome	Aspirin Group (N=798)	Placebo Group (N=822)	Odds Ratio (95% or 99% CI)*
Primary outcome: preterm preeclampsia at <37 wk of gestation — no. (%)	13 (1.6)	35 (4.3)	0.38 (0.20–0.74)

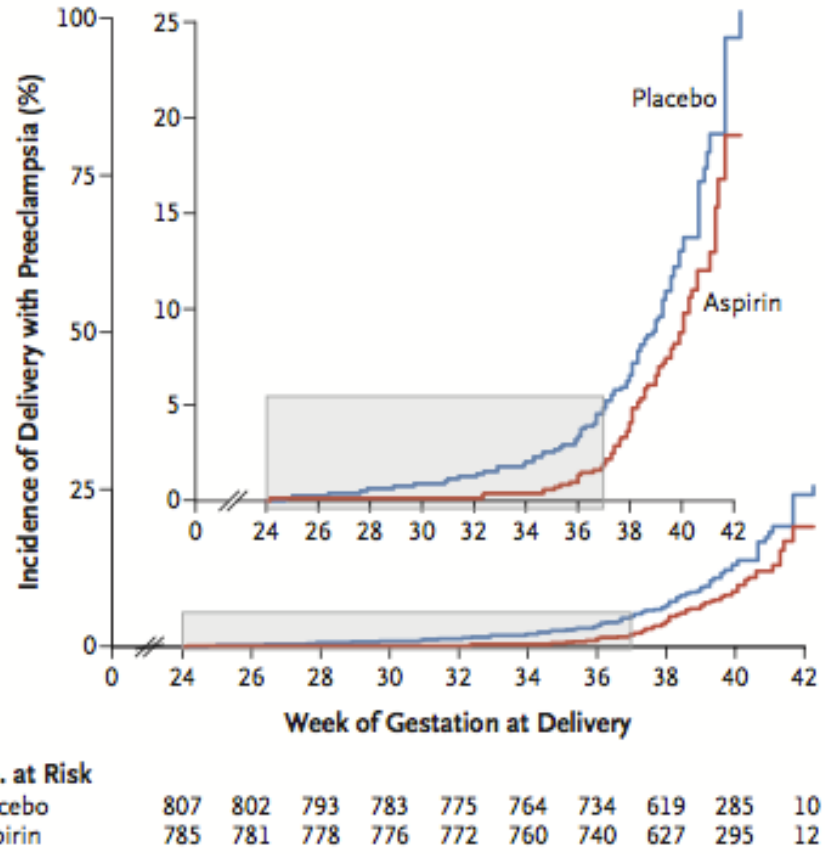

Figure 2. Kaplan–Meier Plot of Incidence of Delivery with Preeclampsia.
The gray box highlights the rate of preeclampsia before 37 weeks of gestation. Data were censored after deliveries not associated with preeclampsia. The inset shows the same data on an enlarged y axis.

CMAJ **PRACTICE**

FIVE THINGS TO KNOW ABOUT ...

Preeclampsia

Rohan D'Souza MD MSc, John Kingdom MD

Preeclampsia has been redefined

In recognition of preeclampsia's multiorgan involvement, the American College of Obstetricians and Gynecologists modified the diagnostic criteria: proteinuria is not essential for diagnosis. The diagnosis may be made with the presence of hypertension plus the new onset of any one of thrombocytopenia, renal insufficiency, liver dysfunction, pulmonary edema, or cerebral or visual disturbances.[1]

Preeclampsia increases the risk of premature cardiometabolic disease in women

Women with preeclampsia, especially early-onset preeclampsia, have a risk of premature cardiovascular disease and death five times higher than that among unaffected women, and a significantly higher risk of chronic kidney disease and type 2 diabetes mellitus.[1] Lifestyle modification after delivery is recommended, including a healthy weight, moderate physical activity, avoidance of smoking, and periodic surveillance of blood pressure, glucose and lipids.[1]

Established risk factors should be used to screen for preeclampsia

Screening using clinical risk factors is recommended[1,3] and can be done efficiently by physicians, nurses or midwives. A list of risk factors is presented in Box 1.

Box 1: Screening for preeclampsia before 16 weeks' gestation based on clinical risk factors[3]

Women should be considered at increased risk of preeclampsia if they have one major risk factor or at least two moderate risk factors

Major risk factors
- Prior preeclampsia
- Known antiphospholipid syndrome
- Known type 1 or type 2 diabetes mellitus
- Chronic hypertension
- Assisted reproductive therapy in current pregnancy
- Pre-pregnancy or early first-trimester BMI > 30

Moderate risk factors
- Prior placental abruption
- Prior stillbirth
- Prior fetal IUGR
- Maternal age > 40 yr
- Nulliparity
- Multifetal pregnancy
- Known chronic kidney disease
- Known systemic lupus erythematosus

Note: BMI = body mass index, IUGR = intrauterine growth restriction.

Preeclampsia is a syndrome rather than one disease

Near-term preeclampsia, occurring after 34 weeks' gestation, is often accompanied by increased cardiac output, mildly increased total vascular resistance and normal fetal growth.[2] By contrast, preterm preeclampsia — often associated with reduced maternal cardiac output, markedly elevated total vascular resistance and intrauterine growth restriction (IUGR)[2] — is more ominous and warrants aggressive surveillance of mother and fetus.

Preeclampsia can be prevented

In women identified to be at high risk of preeclampsia, the risk can be reduced substantially with low-dose acetylsalicylic acid (ASA) (e.g., 81 mg at bedtime) at 12–20 weeks' gestation, stopped at 37–38 weeks. The use of ASA is safe for mother and fetus. It confers a 24% reduction in relative risk for preeclampsia (95% confidence interval [CI] 5%–38%), a 20% reduction for IUGR (95% CI 1%–35%) and a 24% reduction for preterm birth (95% CI 2%–24%).[5]

Competing interests: None declared.

This article has been peer reviewed.

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Risk factors for pre-eclampsia

Moderate RCOG
- First pregnancy
- Age ≥ 40 years
- Pregnancy interval > 10 years
- BMI ≥ 35 kg/m^2 at first visit
- Family history of pre-eclampsia
- Multiple pregnancy

High
- Hypertensive disease during previous pregnancy
- Chronic kidney disease
- Autoimmune disease such as systemic lupus erythematosis or antiphospholipid syndrome
- Type 1 or type 2 diabetes
- Chronic hypertension

ACOG reccomendations[3]
Any risk factor

Risk factors

Nulliparity

Age >40 years

BMI >30 kg/m2

Conception by *in vitro* fertilization

History of previous pregnancy with PE

Family history of PE, chronic hypertension

Chronic renal disease

Diabetes mellitus

Systemic lupus erythematosus or thrombophilia

ASPIRIN - INDICATIONS

Box 1: Screening for preeclampsia before 16 weeks' gestation based on clinical risk factors[4]

Women should be considered at increased risk of preeclampsia if they have one major risk factor or at least two moderate risk factors

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Practice Point III
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  - Use appropriate BP cuffs
  - Monitor the change in BP at each visit
  - Consider home BP monitoring
  - Inform women of warning signs of severe pre-eclampsia even in the absence of elevated BP

Congenital anomalies

JAMA. 2009 Feb 11;301(6):636-50. doi: 10.1001/jama.2009.113.

Stothard KJ, Tennant PW, Bell R, Rankin J.

Maternal overweight and obesity and the risk of congenital anomalies: a systematic review and meta-analysis.

Compared with mothers of BMI<25, mothers with raised BMI were at increased odds of pregnancies affected by

- Neural tube defects (OR, 1.87; 95% confidence interval [CI], 1.62-2.15),
- Spina bifida (OR, 2.24; 95% CI, 1.86-2.69),
- Cardiovascular anomalies (OR, 1.30; 95% CI, 1.12-1.51),
- Septal anomalies (OR, 1.20; 95% CI, 1.09-1.31),
- Cleft palate (OR, 1.23; 95% CI, 1.03-1.47),
- Cleft lip and palate (OR, 1.20; 95% CI, 1.03-1.40),
- Anorectal atresia (OR, 1.48; 95% CI, 1.12-1.97),
- Hydrocephaly (OR, 1.68; 95% CI, 1.19-2.36), and
- Limb reduction anomalies (OR, 1.34; 95% CI, 1.03-1.73).
- The risk of **gastroschisis** among obese mothers was significantly reduced (OR, 0.17; 95% CI, 0.10-0.30)

Should an Early Anatomy Ultrasound Scan Be Offered Routinely to Obese Pregnant Women?

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Abstract

Objective: The primary objective of this study was to determine whether an early anatomic scan (EAS), either on its own or in combination with the routine transabdominal scan (R-TAS), would improve overall completion rates of the fetal anatomic survey in the obese pregnant woman. The study's secondary objectives were to compare patients' and sonographers' satisfaction with EAS versus R-TAS.

Methods: A prospective observational study was carried out over a 2.5-year period including consecutive pregnant women with a pre-pregnancy BMI ≥30 kg/m^2 who consented at a dating ultrasound appointment to undergo EAS at 15 ± 7 GA in addition to the second trimester R-TAS. Anatomic structures were categorized as normal, not well seen, or abnormal by using the institutional 26-item anatomic standardized reporting template. Examination completion and study duration were recorded. Neonatal follow-up was performed to evaluate for any missed diagnoses. Patients' and sonographers' satisfaction questionnaires were completed.

Results: A total of 120 pregnant women completed the study. Visualization of all anatomic components was complete in 14% at EAS and in 61% at R-TAS (combined completion rate, 90%). Mean scan time was 30.4 minutes at EAS and 51 minutes at R-TAS. No missed diagnoses of structural anomalies were identified at neonatal follow-up. EAS and R-TAS differed in terms of sonographers' reports of difficult or suboptimal scans (9% vs. 58%), well-seen anatomy (85% vs. 78%), and good visibility (44% vs. 12%). Most sonographers expressed a preference for performing EAS in future pregnancies, rather than the R-TAS (96% vs. 6%). Although patients reported greater satisfaction with EAS (93% vs. 74%), for reasons that could not be determined, they expressed a preference for R-TAS in a subsequent pregnancy (23% vs. 63%).

Conclusion: Performing EAS along with R-TAS improves completion rates for anatomic evaluation in the obese gravida and is associated with greater patient and sonographer satisfaction.

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Key Words: Fetal anatomic evaluation, early anatomy ultrasound, routine transabdominal ultrasound, obesity, pregnancy

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INTRODUCTION

Obesity in pregnancy is common, affecting more than one in five women, with the most significant rise in prevalence affecting class III or the morbidly obese pregnant population. Maternal obesity is associated with both an increased risk of congenital anomalies and higher rates of incomplete or suboptimal visualization at the time of the routine transabdominal scan (R-TAS) despite prolonging or delaying the examination.[1–9] In general, the greater the degree of obesity, the less likely the R-TAS is to be successful.[10–13]

We hypothesized that in the obese pregnant woman an early anatomic ultrasound scan (EAS) by the transvaginal approach at GA 15 ± 1 would improve fetal anatomic visualization by bypassing the abdominal adipose layer and using a higher-resolution probe to obtain high-quality diagnostic images. Early studies in women of average weight or in unselected women have demonstrated good preliminary results using this technique.[14]

The primary purpose of this study was to determine whether an EAS, either on its own or in combination with the R-TAS, would improve overall completion rates of the fetal anatomic survey in the obese pregnant woman. Our secondary objectives were to compare patients' and sonographers' satisfaction at the EAS versus the R-TAS [15,16]

Table 2. Comparison of visualized structures on early anatomy scan and routine transabdominal scan[a]

Region	Structure	Early anatomy scan				Routine transabdominal scan				*P* value comparing proportions seen
		Normal	Not well seen	Abnormal	% seen	Normal	Not well seen	Abnormal	% seen	
Head	Cavum septum pellucidum	52	68	0	43	118	2	0	98	<0.0001
	Ventricles	115	2	3[b]	98	119	1	0	99	1.000
	Cerebellum	114	6	0	95	119	1	0	99	0.125
	Cisterna magna	111	9	0	92	119	1	0	99	0.022
	Nuchal translucency-nuchal fold	108	12	0	90	119	1	0	99	0.003
Facial	Profile	97	23	0	81	105	15	0	88	0.230
	Nasal bone	99	21	0	82	110	10	0	92	0.061
	Orbits with lens	114	6	0	95	116	4	0	97	1.000
	Nose-lips	87	33	0	73	106	14	0	88	<0.001
Cardiac	4-chamber view	120	0	0	100	95	25	0	79	<0.001
	Right outflow tract	106	14	0	88	89	31	0	74	0.012
	Left outflow tract	110	10	0	92	88	32	0	73	<0.001
	3-vessel view	118	2	0	98	87	33	0	73	<0.001
	[illegible]									
	Left kidney	115	5	0	96	109	11	0	91	0.302
	Stomach	120	0	0	100	119	1	0	99	1.000
	Bladder	118	2	0	98	119	1	0	99	1.000
	Abdominal wall	120	0	0	100	119	1	0	99	1.000
	Umbilical cord	117	0	2[d]	100	116	0	3[d]	100	1.000
	Diaphragms	119	1	0	99	115	5	0	96	0.125
	Chest	119	1	0	99	118	2	0	98	1.000
Skeletal	Extremities	117	3	0	98	115	5	0	96	0.730
	Hands	120	0	0	100	116	4	0	97	0.125
	Feet	115	5	0	96	117	3	0	98	0.730
	Spine: cervical, thoracic, lumbar-sacral	93	27	0	78	105	15	0	88	0.073
	Skin overlying Lumbar-sacral spine	101	19	0	84	108	12	0	90	0.250

[a]Five cases were excluded for the following diagnoses made before the early anatomic scan: one case each of fetal demise and trisomy 21 confirmed on chorionic villous sampling at 14 weeks and three cases of multiple congenital anomalies.

[b]Four cases had choroid plexus cysts at early anatomy scan that resolved by routine transabdominal scan. No cases had associated abnormalities.

[c]Abnormal right kidney: 4.5-mm renal pelvis; the bladder did not empty during 50 minutes. The study was otherwise normal.

[d]Abnormal umbilical cord: two cases had two-vessel cords detected at early anatomy scan; in addition at routine transabdominal scan, an umbilical cord cyst was noted. No cases had associated abnormalities. The umbilical cord was assessed in 119 of 120 cases.

Early anatomy (transvaginal) ultrasound scan at 15-16 weeks (120 women)

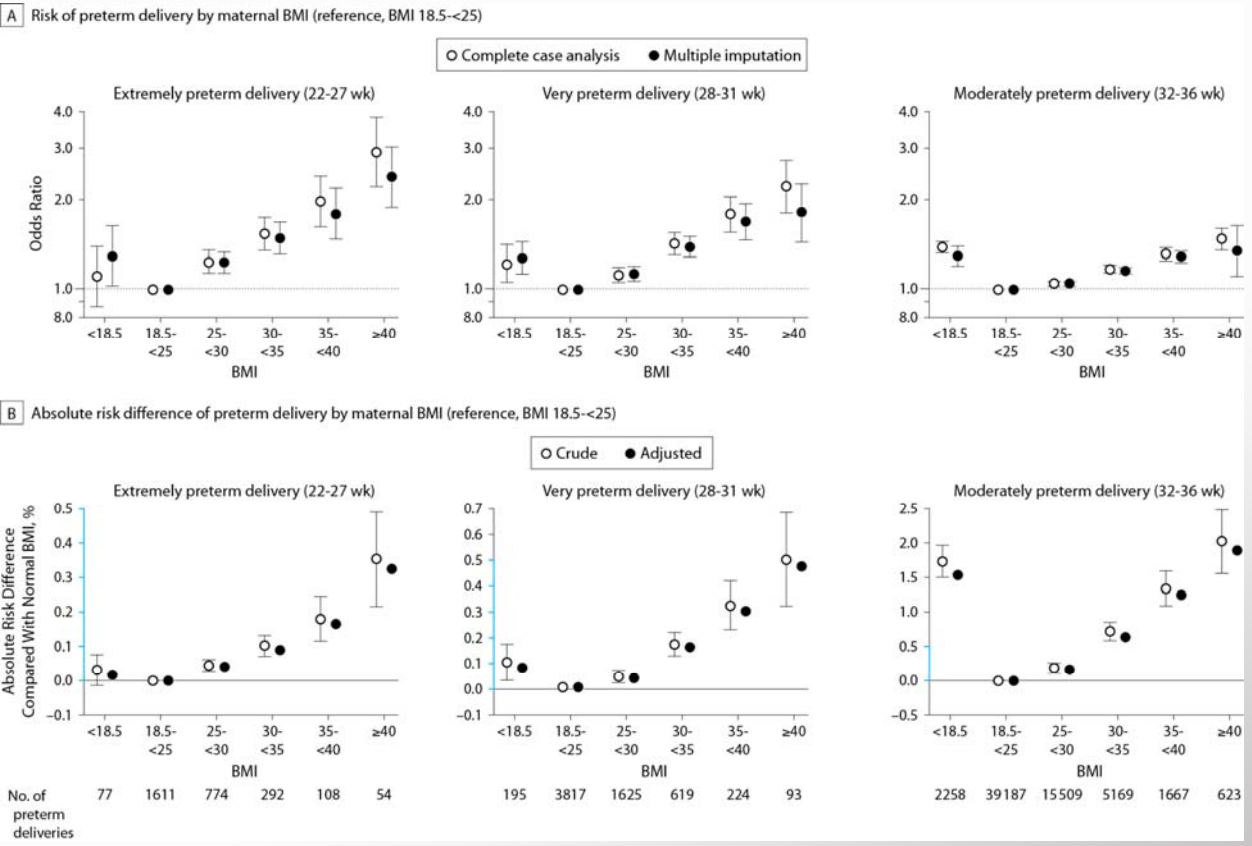
- Combined completion rate 90% vs. 61% at routine anatomy ultrasound
- Four-chamber view 100% vs. 79% at routine anatomy ultrasound
- Three-vessel view 98% vs. 73%

Practice Point IV
Mid-trimester scans

- Counsel women that their fetuses are at an increased risk for congenital anomalies. Commence folic acid pre-conceptionally.
- Consider an additional 16-week early anatomy transvaginal ultrasound
- Repeat a routine (transabdominal) ultrasound at 18-20 weeks
- If cardiac views are suboptimal, consider referral for fetal echocardiogram
- If spine/ other views are suboptimal, consider referral to a specialized centre

Preterm birth in pregnant women with BMI ≧30

Increased risk for preterm birth



Swedish Population-based study (1992-2010)

1,599,551 deliveries

Extreme (22-27 weeks) - 3082

Very (28-31) – 6893

Moderate (32-36) – 67,059

Stratified by iatrogenic and spontaneous

Adjusted for age, parity, smoking, education, height, country of birth and year of delivery

In Sweden, raised maternal BMI was associated with increased risk of preterm birth, especially extremely preterm birth

Cnattingius et al. JAMA 2013

Practice Point V
Screen and prevent preterm birth

- Consider transvaginal ultrasound at routine anatomy ultrasound scan to determine cervical length
- Role of serial cervical assessments?
- For those with a short cervix consider
  - Referral to a preterm birth clinic
  - Progesterone
  - Cervical stitch

Fetal growth and wellbeing

Which of these babies are growth restricted?

Baby	34 weeks
A	10th centile
B	25th centile
C	8th centile

Baby	26 weeks	30 weeks	34 weeks
A	30th centile	20th centile	10th centile
B	65th centile	40th centile	25th centile
C	5th centile	6th centile	8th centile

- Diagnosis of growth restriction and fetal wellbeing is challenging in this population
- Through proper assessment of fetal wellbeing, we might be able to prevent 'unexplained' stillbirths

Condition	BMI<18.5	BMI 25-29.99	BMI 30-34.99	BMI 35-39.99	BMI >40
Stillbirth	1.05 (0.74, 1.50)	1.22 (1.06, 1.40)	1.53 (1.28, 1.83)	1.24 (0.87, 1.77)	1.61 (1.01, 2.57)

BMI = Body mass index; numbers represent **relative risk** and 95% confidence limits, * represents I^2 >75%

Horyn, D'Souza et al (unpublished)

Practice Point VI
Serial fetal surveillance

- Fetal surveillance should include
  - Serial assessment of growth
  - Assessment of fetal wellbeing
    - Biophysical profile
    - Fetal Doppler assessment
      - Cerebro-placental ratio

Cerebroplacental ratio (CPR)

$$\frac{\text{Middle Cerebral Artery Pulsatility Index}}{\text{Umbilical Artery Pulsatility Index}}$$

More sensitive index for detecting poor perinatal outcome than MCA and UA Dopplers alone

Practice Point VII
Women that have undergone bariatric surgery

- Lower adverse delivery outcomes – Stephansson et al 2018
- Conception after maximum weight loss (12-24 months) vs. without delay – Rasteiro 2018, Harreiter 2018 and Yao 2017
- Nutritional deficiencies
  - Vitamin A – probably not much different than inner city population – Garretto 2018
  - Iron, B-complex, calcium, vitamin D, zinc, omega-3 fatty acids, folic acid – Costa 2018
- Screening for GDM – Benhalima et al. 2018
  - Lower risk than without bariatric surgery but higher than general population
  - GTT poorly tolerated; wide variations in glucose excursions make diagnosis difficult.
  - Capillary blood glucose measurements may be the most acceptable alternative
- Fetal growth restriction – Rottenstreich et al. 2018
- Increased risk of small bowel obstruction – D'Souza et al (unpublished)
  - Of 92 cases of small bowel obstruction in pregnancy, 55 were associated with prior abdominal surgery and 21 of these had undergone Roux-en-Y gastric bypass procedures

Peripartum concerns

A Friday morning at Mount Sinai Hospital, Toronto

- 07h45: Phone call from a community hospital
  - Request to accept transfer of an pregnant woman **(BMI >30)** at term in breech presentation
- 07h55: Second phone call
  - Request for urgent transfer as the woman is in labour
  - Anaesthetists consider her to be at very high risk for anaesthesia –requesting transfer to Mount Sinai Hospital
- 08h00: Third phone call
  - Informed that patient was on her way
- 08h15: Patient arrives

Patient profile

- Short, Sri Lankan descent, in a hospital gown with an intravenous line in situ
- (She was the only person smiling!)
- BMI 50
- History
  - Nulliparous with a fetus in breech presentation; 39+ weeks
  - No other medical/surgical comorbidities documented – However, anaesthetists noted that she had obstructive sleep apnoea; high risk for general anaesthetic
  - Planned caesarean delivery at 9am
- Examination
  - Normal vitals; oedema ++; pannus +++
  - Not in labour
  - No apparent fetal concerns

What had not been done/noted in the antepartum period

- Baseline cardiac evaluation
- Excessive weight gain in pregnancy
- "Risk assessment"
- Anaesthesia consult and assessment of airway/spine
- Referral to a higher centre earlier in pregnancy

Practice Point - VIII
Peripartum Care Plan

- Discuss peripartum risks and uncertainties
  - Group 1 – Those that go into spontaneous labour:
    - Labour dystocia and response to augmentation
  - Group 2 – Those that require labour induction
    - Indications
    - Timing
    - Mode
  - Group 3 – Those that require planned caesarean deliveries
- Mandatory referral to obstetric anaesthesia team
- Referral to centres with expertise in intrapartum/surgical management
- Individualized peri-operative care bundle

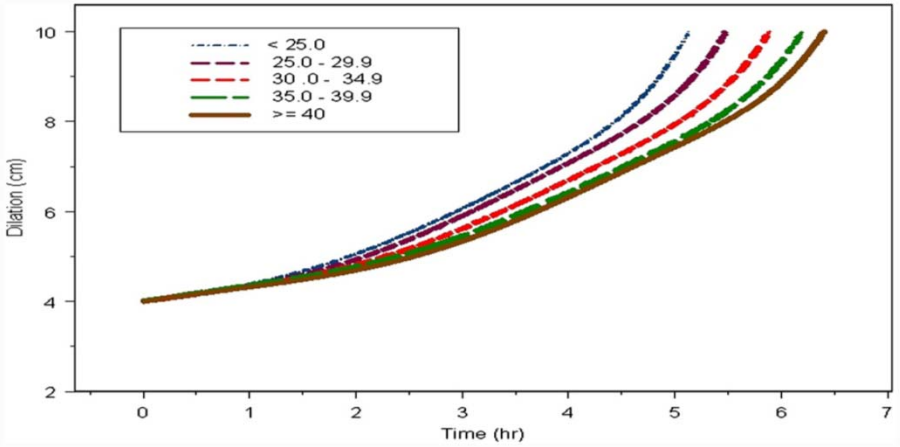
Group 1 - Those that go into spontaneous labour

Labour progression is slower

- **Decreased responsiveness of myometrial cells to oxytocin** (Zhang 2007, Cedergren 2010)
- **Decreased oxytocin receptors and connexin-43 connections between myocytes** (Garabedian 2011, Elmes 2011)
- **Increased Leptin and cholesterol disrupts uterine contractility** (Wendremaire 2012, Moynihan 2006, Smith 2005)
- **Larger babies** (?)

FIGURE 2

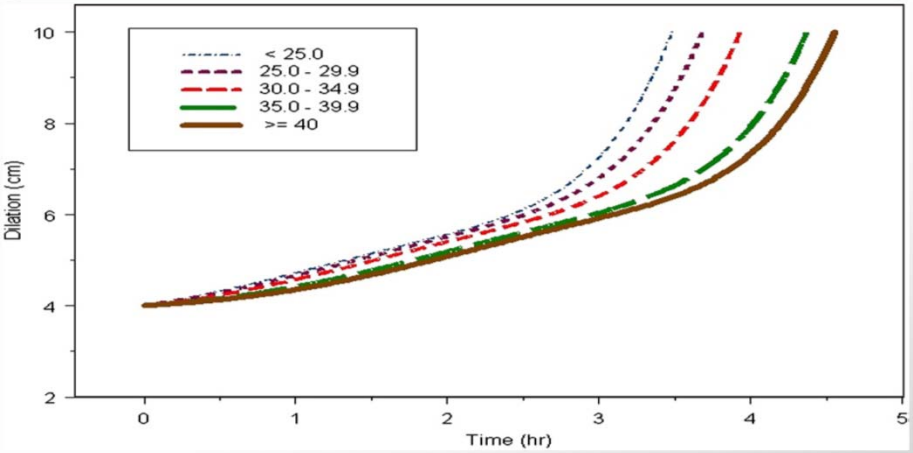
Labor curves in nulliparas by body mass index category



Kominiarek. Labor patterns by BMI. Am J Obstet Gynecol 2011.

FIGURE 3

Labor curves in multiparas by body mass index category



Kominiarek. Labor patterns by BMI. Am J Obstet Gynecol 2011.

TABLE 4

Adjusted duration of labor (hours) in multiparas by body mass index category

	Body mass index categories (kg/m^2) at admission, with median traverse times (95th percentile)					*P* value for trend
Cervical dilation, cm	<25.0	25.0-29.9	30.0-34.9	35.0-39.9	≥40.0	
4-5	1.2 (5.4)	1.2 (5.3)	1.2 (5.6)	1.2 (5.7)	1.5 (6.8)	< .0001
5-6	0.7 (2.7)	0.7 (2.7)	0.7 (2.7)	0.7 (2.9)	0.7 (2.9)	< .0001
6-7	0.5 (1.6)	0.5 (1.6)	0.5 (1.6)	0.5 (1.7)	0.5 (1.8)	< .0001
7-8	0.4 (1.1)	0.4 (1.1)	0.4 (1.1)	0.4 (1.1)	0.4 (1.1)	.67
8-9	0.3 (0.9)	0.3 (0.9)	0.3 (0.9)	0.3 (0.9)	0.3 (0.9)	.92
9-10	0.3 (0.8)	0.3 (0.8)	0.3 (0.8)	0.3 (0.9)	0.3 (0.9)	.02
4-10	4.6 (17.5)	4.5 (17.4)	4.7 (17.9)	5.0 (19.0)	5.4 (20.6)	< .0001
Second stage without epidural	0.17 (1.0)	0.17 (1.0)	0.15 (0.9)	0.15 (0.9)	0.12 (0.7)	< .0001
Second stage with epidural	0.40 (1.7)	0.33 (1.5)	0.27 (1.2)	0.25 (1.1)	0.36 (1.6)	< .0001

Adjusted model controlled for age, height, race, gestational age, diabetes, induction, augmentation, epidural (first stage only), operative vaginal delivery (second stage only), and birthweight.

Kominiarek. Labor patterns by BMI. Am J Obstet Gynecol 2011.

TABLE 3

Adjusted duration of labor (hours) in nulliparas by body mass index category

	Body mass index categories (kg/m^2) at admission, with median traverse times (95th percentile)					*P* value for trend
Cervical dilation, cm	<25.0	25.0-29.9	30.0-34.9	35.0-39.9	≥40.0	
3-4	1.7 (8.5)	1.8 (8.8)	2.0 (9.8)	2.1 (10.5)	2.3 (11.5)	< .0001
4-5	1.2 (5.6)	1.3 (6.0)	1.4 (6.3)	1.5 (7.2)	1.9 (9.0)	< .0001
5-6	0.8 (3.4)	0.8 (3.5)	0.9 (3.7)	1.0 (4.2)	1.2 (5.0)	< .0001
6-7	0.6 (2.4)	0.6 (2.4)	0.7 (2.5)	0.7 (2.7)	0.8 (3.0)	< .0001
7-8	0.5 (1.8)	0.5 (1.8)	0.5 (1.8)	0.6 (2.0)	0.6 (2.0)	< .0001
8-9	0.5 (1.6)	0.5 (1.6)	0.5 (1.6)	0.5 (1.6)	0.5 (1.7)	.0002
9-10	0.6 (1.9)	0.6 (2.0)	0.6 (2.1)	0.6 (2.2)	0.6 (2.2)	< .0001
4-10	5.4 (18.2)	5.7 (18.8)	6.0 (19.9)	6.7 (22.2)	7.7 (25.6)	< .0001
Second stage without epidural	0.61 (2.5)	0.44 (1.9)	0.50 (2.1)	0.44 (1.9)	0.65 (2.7)	.49
Second stage with epidural	0.75 (2.6)	0.83 (2.8)	0.79 (2.7)	0.69 (2.4)	1.18 (3.7)	.81

Adjusted model controlled for age, height, race, gestational age, diabetes, induction, augmentation, epidural (first stage only), operative vaginal delivery (second stage only), and birthweight.

Kominiarek. Labor patterns by BMI. Am J Obstet Gynecol 2011.

Kominiarek, Am J Obstet Gynecol 2011

n=118,978

	Nulliparous women	**Multiparous women**
Commencement of active phase (acceleration of labour)	Difficult to determine	6cm
Time to progress from cm to cm in the active phase of the first stage of labour	Increased with increasing BMI	Increased with increasing BMI
Median traverse time from 4 – 10 cm	5.4 hours for BMI<25 vs. 7.7 hours for BMI≧40	4.6 hours for BMI<25 vs. 5.4 hours for BMI≧40
Second stage of labour with/without epidural	No difference	Decreased as BMI increased

Kominiarek, Am J Obstet Gynecol 2011

How long is too long?

Table 3

Adjusted[a] Duration of Labor (hours) in Nulliparas by Body Mass Index Category

	Body Mass Index Categories (kg/m^2) at Admission with Median Traverse Times (95th%)					P-value for Trend
Cervical Dilation (cm)	<25.0	25.0–29.9	30.0–34.9	35.0–39.9	≥40.0	
3 – 4	1.7 (8.5)	1.8 (8.8)	2.0 (9.8)	2.1 (10.5)	2.3 (11.5)	<0.0001
4 – 5	1.2 (5.6)	1.3 (6.0)	1.4 (6.3)	1.5 (7.2)	1.9 (9.0)	<0.0001
5 – 6	0.8 (3.4)	0.8 (3.5)	0.9 (3.7)	1.0 (4.2)	1.2 (5.0)	<0.0001
6 – 7	0.6 (2.4)	0.6 (2.4)	0.7 (2.5)	0.7 (2.7)	0.8 (3.0)	<0.0001
7 – 8	0.5 (1.8)	0.5 (1.8)	0.5 (1.8)	0.6 (2.0)	0.6 (2.0)	<0.0001

Table 4

Adjusted[a] Duration of Labor (hours) in Multiparas by Body Mass Index Category

	Body Mass Index Categories (kg/m^2) at Admission with Median Traverse Times (95th%)					P-value for Trend
Cervical Dilation (cm)	<25.0	25.0–29.9	30.0–34.9	35.0–39.9	≥40.0	
4–5	1.2 (5.4)	1.2 (5.3)	1.2 (5.6)	1.2 (5.7)	1.5 (6.8)	<0.0001
5–6	0.7 (2.7)	0.7 (2.7)	0.7 (2.7)	0.7 (2.9)	0.7 (2.9)	<0.0001
6–7	0.5 (1.6)	0.5 (1.6)	0.5 (1.6)	0.5 (1.7)	0.5 (1.8)	<0.0001
7–8	0.4 (1.1)	0.4 (1.1)	0.4 (1.1)	0.4 (1.1)	0.4 (1.1)	0.67
8–9	0.3 (0.9)	0.3 (0.9)	0.3 (0.9)	0.3 (0.9)	0.3 (0.9)	0.92

Note the numbers in brackets – these represent the 95th centile of median traverse times per cm dilatation

Practice Point IX
"Normal" labour in women with increased weight

- Managing labour in women with increased weight requires a change in our understanding of 'normal' labour and our attitude
- Latent phase might be extremely prolonged.
  - Avoid early admissions (Jackson, 2003)
  - Avoid early rupture of membranes in the latent phase (Smyth, 2013)
  - Epidural
    - Con: Some studies suggest this may prolong latent phase of labour
    - Pros:
      - Difficult epidurals better positioned in early rather than late labour
      - Excellent labour analgesia, avoiding narcotics
      - Avoids need for general anaesthesia in case of emergency caesarean delivery
- Labour curves are not the same as those for women with BMI<25
  - Allow more time for labour to progress as long as mother and baby are well

Challenges with intrapartum fetal monitoring

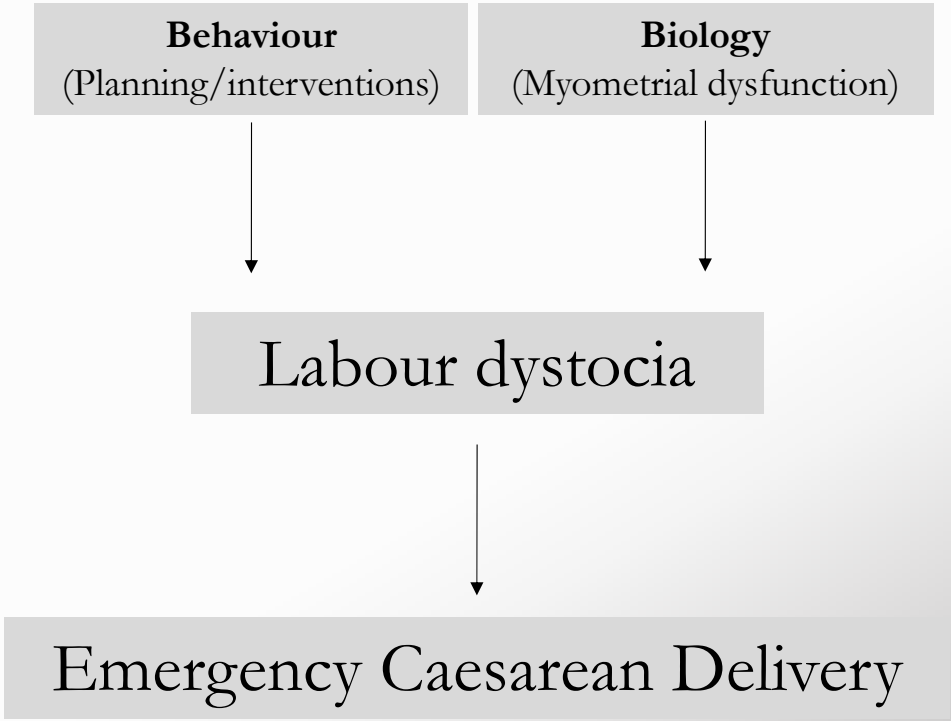
- Women with higher BMI spend more time unmonitored by electronic fetal monitoring
  - 337 patients (104 BMI <30 vs. 156 BMI 30-40 vs. 77 BMI >40)
  - Percentage unmonitored 5% vs. 7% vs. 11% ($r=0.344$, $p<0.0001$)
    - Brocato et al J Matern Fetal Neonatal Med 2017
- Fetal scalp monitoring would reduce unmonitored periods BUT
- Do not rupture membranes too early
  - In view of of prolonged labour duration
  - Higher rates of infective morbidity

Challenges with intrapartum maternal monitoring

- Maternal monitoring should ideally include
  - Monitoring of blood pressure using appropriate cuffs and sugar as appropriate
  - Pulse-oximetry to rule out respiratory depression especially in those with obstructive sleep apnoea
  - Consider use of intrauterine pressure catheter (IUPC) to monitor uterine activity and guide oxytocin administration

Poorer response to oxytocin augmentation with increasing BMI

Study	Findings
Nuthalpaty, Obstet Gynecol 2004	Despite **higher average oxytocin (24mU/min vs. 16mU/min),** caesarean delivery rates due to labour dystocia were higher
Walsh J Matern Fetal Neonatal Med. 2011	**Poorer response to oxytocin** noted in women with increased BMI
Hill et al. J Perinat Med 2015	**Greater oxytocin administration in the first stage** (11.6 ± 4.8 vs. 8.6 ± 4.1 mU/min) **and total rate** in labour (17.7 +/- 4.7 vs. 13.1 +/- 5.0 mU/m)
Lassiter et al J Matern Fetal Neontal Med 2016	**Longer duration of oxytocin** prior to delivery ($p<0.02$) and higher caesarean delivery rate (0.0006)


Behaviour
(Planning/interventions)
Biology
(Myometrial dysfunction)
Labour dystocia
Emergency Caesarean Delivery

Practice Point X
Intrapartum monitoring

- Response to oxytocin may be poor
  - Avoid prolonged use of oxytocin especially in the latent phases of labour
  - Monitor the response to oxytocin using an IUPC when possible
  - Consider wash-out periods if oxytocin has been given for prolonged periods
  - Higher doses of oxytocin may be required for longer periods of time
- Trade-off between early rupture of membranes and the use of scalp electrodes and IUPC for intrapartum monitoring
- Maternal monitoring should also include
  - Pulse-oximetry
  - BP (and blood sugar) monitoring
- Cautious use of opioids in labour if obstructive sleep apnoea

Group 2 – Those requiring induction of labour

Questions

- Indications
  - Maternal reasons: Hypertension, diabetes, obstetric indications…
  - Fetal concerns: Growth restriction, atypical surveillance
  - **Induction based solely on raised BMI?**
- Method
  - What is the best method for inducing labour in women with higher weight?
- Timing
  - When is the best time to induce labour in women with raised BMI?

Non-medically indicated labour induction in morbidly obese women

- BMI>40; 37+0 – 41+6 weeks
- Non-medical inductions: 429 (22.7%) nullips and 791 (32.2%) multips
- Nulliparous women
  - Lower rates of macrosomia (2.2% vs. 11%, aOR 0.24, 95% CI 0.05-0.70)
  - Decreased NICU admission (5.1% vs. 8.9%, aOR 0.59, 95% CI 0.33-0.98)
  - No difference in caesarean rates
- Multiparous women
  - Lower rates of macrosomia (4.2% vs. 14.3%, aOR 0.30, 95%CI 0.13-0.60)
  - Lower composite adverse neonatal outcome (0% vs. 0.6%, aOR 0.10, 95%CI <0.01-0.89)
  - Lower caesarean delivery rates (5.4% vs. 7.9%, aOR 0.64, 95%CI 0.41-0.98)
- Non-medically indicated labour induction in women with BMI>40 is not associated with an increased risk of caesarean delivery

Kawakita et al. AJOG Oct 2017

IOL at various gestational ages

- BMI>30; n=74725
- Compared IOL at 37, 38, 39, 40 weeks vs. expectant management and presented odds for caesarean delivery
- **Nulliparous**
  - IOL at 37 weeks [OR 0.55 (0.34-0.90)] and
  - IOL at 39 weeks [OR 0.77 (0.63-0.95)]
- **Multiparous**
  - IOL at 37 weeks [OR 0.39 (0.24–0.64)],
  - IOL at 38 weeks [OR 0.65 (0.51– 0.82)], and
  - 39 weeks (OR 0.67 (0.56–0.81)]

Lee et al, BJOG 2016

Timing of delivery in women with BMI>40
Gill and Holbert. J Matern Fetal Neonatal Med Feb 2017

- Decision analysis model
- 100,000 pregnant women with BMI>40
- When compared with expectant management and IOL at 41 weeks, routine IOL at 39 weeks would
  - Reduce 387 stillbirths,
  - Reduce 9234 cesarean deliveries
  - Save 30 million US dollars in delivery-related health care costs

Induction of labour is as much of a nightmare!

- Failed induction 13% in women with BMI 18.5-24.99 vs. 29% when BMI>40
- In women with BMI>40, with macrosomic fetuses and no previous vaginal delivery, failure was 80%
  - Wolfe et al. Am J Obstet Gynecol 2011
- Failure rate of the **first attempt** at cervical ripening with prostaglandin E2 (dinoprostone): 53.7% when BMI > 30 vs. 34.5% when BMI 20-25 (p=0.0016)
  - Gauthier et al. J Mat Fetal Neonatal Med 2012

Prostaglandin E2 vs. mechanical methods

- 46 women with BMI >30 comparing double-balloon catheter vs. prostaglandin E2 (dinoprostone)
  - After 24hours – favourable Bishop Score (>6) in 80.4% vs. 47.8%, p=0.001
  - After adjustment, mechanical method was associated with an efficient cervical ripening compared with dinoprostone aOR 7.81, 95%CI 2.58-23.60)
  - No difference in induction to delivery time (34.5 vs. 36.5 hours, p=0.53)
  - No difference in caesarean deliveries (39.1% in each group, p=0.96)

- Grange et al. (French) 2017

Prostaglandin E1 vs. prostaglandin E2

- Cervical ripening rate was higher with prostaglandin E1 (misoprostol) than prostaglandin E2 (dinoprostone)
  - 78.1% vs. 66.7%, OR 1.79 (1.23-2.60) with no difference in adverse outcomes
    - Suidan Am J Perinatol 2015
- More doses of prostaglandin E1 (misoprostol), $p<0.01$
    - Lassiter J Matern Fetal Neonatal Med 2016

Prostaglandin E1 vs. mechanical methods

- Compared with women that had BMI 18.5-24.99, those with BMI>30 had a higher caesarean delivery rate with misoprostol (35% vs. 26%, p =0.03) but not with mechanical ripening (31% vs. 29% p =0.69)
- Failure to achieve active labour (24% vs 15% p = 0.01) but not with mechanical ripening (19% vs. 15% p = 0.55)
    - Beckwith et al. J Matern Fetal Neonatal Med 2017

Contraction frequency after administration of misoprostol in obese versus nonobese women.

J Matern Fetal Neonatal Med. 2018 Apr 30:1-5.

Stefely E, Warshak CR. **Contraction frequency after administration of misoprostol in obese versus nonobese women.**

- Women with BMI<25 had more contractions at baseline, 7 ± 5 versus 4 ± 5 contractions/hour ($p < 0.001$).
- At all four time intervals after misoprostol administration women with BMI>40 had fewer contractions per hour and a lower rate of increase in contraction frequency over the course of all four hours.
- This suggests a lower bioavailability of misoprostol in women with a larger volume of distribution which would likely impact the efficacy of misoprostol in women with increased weight, when given the same dose of misoprostol. It is unknown if higher misoprostol dosing would increase efficacy of misoprostol in obese women.
- PMID: 29656680 DOI: 10.1080/14767058.2018.1465919

Practice Point XI
Optimal mode and timing of delivery

- Cohort studies still seem to support induction of labour before 40 weeks in women with increased weight
- Even in the absence of other indications, IOL at 39 weeks may reduce stillbirths, emergency caesarean deliveries and costs
- In women with raised BMI, IOL could involve a multi-step approach over days
- IOL should probably begin with mechanical methods and followed by prostaglandins, with prostaglandin E1 seemingly more effective than Prostaglandin E2

Caesarean delivery rates with increasing BMI

- 11.7% for BMI <25 vs. 44.8% for BMI≧40 [Kominiarek Am J Obstet Gynecol 2011]
- 5% increase in the risk of unplanned caesarean delivery with each increase in BMI of 1kg/m^2 primarily linked to labour dystocia [Kominiarek Am J Obstet Gynecol 2011]
- For each additional 10kg of maternal weight, there was a 17% increase in caesarean deliveries [Nuthalpaty, Obstet Gynecol 2004]

Odds ratios for caesarean delivery by BMI category as determined by meta-analyses					
Systematic Review	Inclusion criteria	BMI 20-24	BMI 25-29	BMI 30-35	BMI>35
Chu 2007	33 studies, nulliparous and multiparous with co-morbidities	1	1.46 (1.34-1.60)	2.05 (1.86-2.27)	2.89 (2.28-3.79)
Poobolan 2008	11 studies, only nulliparous, no comorbidities, planned vaginal birth	1	1.64 (1.55-1.73)	2.23 (2.07-2.42)	NR

Condition	Underweight	Overweight	BMI 30-34.9	BMI 35-39.9	BMI >40
Caesarean	0.78 (0.73, 0.83)	1.24 (1.21, 1.28)	1.45 (1.37, 1.52)*	1.62 (1.47, 1.78)*	1.89 (1.64, 2.17)*

BMI = Body mass index; numbers represent **relative risk** and 95% confidence limits, * represents I^2 >75%

Horyn, D'Souza et al (unpublished)

IOL vs. planned caesarean deliveries

If almost 50% are going to need an emergency intrapartum caesarean (and since emergency caesareans are associated with higher costs and poorer outcomes), is an elective caesarean a better option ?

- BMI>50: Despite high cesarean delivery rates, **labour is associated with lower maternal and neonatal morbidity**. [Grasch Obstet Gynecol 2017]
- BMI>40: Planned **cesarean delivery does not appear to reduce maternal and neonatal morbidity** compared with IOL. [Subramaniam AJOG 2014]
- BMI>30: **Term IOL may decrease the risk of caesarean delivery, particularly in multiparas, without increasing risks of other adverse outcomes** when compared with expectant management. [Lee BJOG 2016]
- BMI>40 without other comorbidity: **non-medically indicated IOL is not associated with increased risk of cesarean delivery.** [Kawakita et al AJOG 2017]

What is the optimal mode of delivery in obese pregnant women?

PROSPERO
International prospective register of systematic reviews

NHS
National Institute for Health Research

Mode of delivery and delivery outcomes in pregnant women who are obese: a systematic review and meta-analysis

Rohan D'Souza, Claude-Emilie Jacob, Nusrat Zaffar, Cynthia Maxwell

Citation

Rohan D'Souza, Claude-Emilie Jacob, Nusrat Zaffar, Cynthia Maxwell. Mode of delivery and delivery outcomes in pregnant women who are obese: a systematic review and meta-analysis. PROSPERO 2017 CRD42017074290 Available from: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42017074290

Planned mode of delivery

Vaginal birth vs. caesarean delivery

	Successful VD	Intrapartum CD	RR (95%CI)
Postpartum haemorrhage	**29/399 (7.27)**	**9/262 (3.44)**	**2.12 (1.02, 4.40)**
5-min Apgar < 7	18/399 (4.51)	4/262 (1.53)	2.96 (1.01, 8.63)

Three studies (1597 pregnancies)

There were no significant differences between those that had a planned vaginal vs. caesarean for most outcomes except the group with planned vaginal birth had a higher proportion of

- Postpartum haemorrhage
- Low Apgar scores at 5 minutes

Planned mode of delivery after caesarean
TOLAC vs. Planned CD

	TOLAC	Planned CD	RR (95%CI)
Endometritis	86/1729 (4.97)	53/2415 (2.19)	2.22 (1.60, 3.09)
Hospital stay > 4 days	496/1638 (30.3)	603/2315 (26.0)	1.16 (1.05, 1.29)
5-min Apgar <	84/1699 (4.94)	40/2376 (1.68)	2.98 (2.03, 4.28)
Birth trauma	18/1699 (1.06)	5/2376 (0.21)	4.61 (1.77, 12.03)

- Three studies (4144 pregnancies)
- Pregnancy outcomes were similar in the two groups except that women in the TOLAC group were more likely to have
  - Endometritis
  - Low Apgar Scores at 5 minutes
  - (Neonatal) birth trauma
  - Prolonged hospital stay (>4 days)

Actual mode of delivery

Successful vaginal delivery vs. intrapartum caesarean

	Successful VD	Intrapartum CD	RR (95%CI)
Postpartum haemorrhage	410/2723 (15.06)	631/902 (69.96)	0.21 (0.19, 0.23)
Wound disruption	0/211 (0.00)	4/90 (4.44)	0.05 (0.003, 0.88)
Hospital stay > 4 days	4/211 (1.90)	6/90 (6.67)	0.28 (0.08, 0.98)
5-min Apgar < 7	2/211 (0.95)	5/90 (5.56)	0.17 (0.03, 0.86)
Birth trauma	22/372 (5.91)	1/177 (0.56)	6.56 (1.26, 34.10)

Three studies (3625 pregnancies)

Of those attempting vaginal birth, women that had a successful vaginal birth were at a lower risk for

- Postpartum haemorrhage
- Wound infection or disruption
- Hospital stay >4 days
- Low Apgar scores at 5 minutes

But a higher risk of (neonatal) birth trauma

Optimal mode of delivery in women with BMI>40

Labour and delivery outcomes in women with BMI ≥40 based on planned and actual mode of delivery: a systematic review and meta-analysis
D'Souza R, **Horyn** I, **Jacob** CE, **Zaffar** N, **Maxwell** C *(unpublished)*

BIRTHSTARS TRIAL

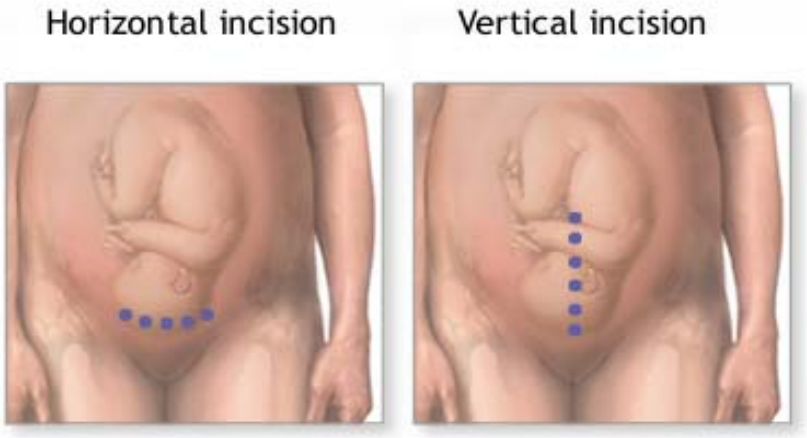
Conclusions:

- In women with BMI ≥40, intrapartum complications are higher with planned VD vs. planned CD and TOLAC vs. repeat CD, but lower with successful VD vs. emergency CD.
- The optimal mode of delivery needs to be determined by a randomized trial

Group 3 – The planned caesarean delivery

- The operating table
  - Ensure table can meet weight requirements/ consider two tables
  - Distance between surgeon and patient
- Surgical staff
  - Staff experienced in the particular type of surgery
  - Appropriate assistance
- Anaesthesia
  - Adequate armboards, large BP cuff, consider arterial line
  - Adequate regional anaesthesia under ultrasound guidance

Skin Incision
Traditional approaches



- more secure
- less discomfort
- earlier mobility
- improved breathing
- difficult retraction
- Reduced exposure
- skin fold moist

- ? less secure
- ? more discomfort
- later mobility
- more atelectasis
- easier retraction
- better exposure
- easier wound care

Vertical incisions are associated with a higher rates of wound complications.

Wall, Deucy, Glanz et al.

Abdominal entry

- Miami Method:
  - Vertical skin incision peri-umbically, *and* uterine fundus then pull baby out feet first.
- Modification to the Miami Method:
  - Transverse infra- (or supra-) umbilical skin incision at the point of least thickness
  - Use a self-retaining retractor – deliver vertex through lower segment incision

High and low transverse incisions have not been shown to differ in postoperative morbidity

However, in women with BMI>40, skin microbiota in the sub-pannicular fold differs from and is more diverse than that on the anterior panniculus (Edwards J Matern Fetal Neonatal Med 2016)

Closure: Fascia

- Interrupted or continuous suturing similar in outcome
- Delayed absorbable or non-absorbable preferable to rapid absorbable suture
- However more incisional discomfort with permanent sutures

Van't Riet M et al, BJS 2002

REVIEW

Suture Closure of Subcutaneous Fat and Wound Disruption After Cesarean Delivery: A Meta-Analysis

David Chelmow, MD, Elisa J. Rodriguez, MD, and Marie M. Sabatini, MD

If fat thickness > 2 cm, subcutaneous suturing reduces wound disruption by 34%

Subcutaneous Tissue Reapproximation, Alone or in Combination With Drain, in Obese Women Undergoing Cesarean Delivery

Patrick S. Ramsey, MD, MSPH, Anna M. White, MD, Debra A. Guinn, MD, George C. Lu, MD, Susan M. Ramin, MD, Jill K. Davies, MD, Cherry L. Neely, Crystal Newby, MD, Linda Fonseca, MD, Ashley S. Case, MD, Richard A. Kaslow, MD, MPH, Russell S. Kirby, PhD, Dwight J. Rouse, MD, MSPH, and John C. Hauth, MD

- Drains:
  - Do not decrease wound infections
  - May increase wound complications

Gates S et al, Cochrane 2006

Skin closure

- Staples and subcuticular closure are equivalent for wound complications
- Subcuticular closure with a delayed absorbable monofilament suture may be superior for cosmetic outcome, post-op pain and cost factors
- No evidence for tape closure of abdominal incisions in gynecology but may be as effective as other techniques
- Tissue glue needs further study

DVT prophylaxis

- Early ambulation and hydration is key
- High risk group requires weight-adjusted thromboprophylaxis. However, watch this space…

Stein et al. Obesity and VTE. AJM 2005

Antibiotics

Effect of Post–Cesarean Delivery Oral Cephalexin and Metronidazole on Surgical Site Infection Among Obese Women

A Randomized Clinical Trial

- **Question** Does postpartum prophylactic oral cephalexin and metronidazole decrease surgical site infection rates among obese women who receive standard preoperative antimicrobial prophylaxis and undergo caesarean delivery?
- **Findings** In this randomized clinical trial among 403 obese women, the rate of surgical site infection within 30 days following caesarean delivery was 6% with oral cephalexin and metronidazole and 15% with placebo, a significant difference.
- **Meaning** Among obese women who undergo caesarean delivery, use of prophylactic oral cephalexin and metronidazole may be warranted for prevention of surgical site infection.

Valent et al. JAMA 2017

Wound disruption following cesarean delivery in women with class III obesity: a retrospective observational study

Sagi Y, Snelgrove J, Vernon J, D'Souza R, Maxwell C [JOGC – accepted]

- **Background:** We sought to identify risk factors associated with wound disruption following cesarean delivery (CD) in women with class-III obesity and determine the value of individualized perioperative care-plans in reducing its incidence.
- **Methods:** We included women with class-III obesity that underwent CD after 24 weeks of gestation at Mount Sinai Hospital, Toronto between 2011 and 2015 and collected data on demographics, clinical history and perioperative details. Multivariable logistic regression analysis was performed to identify factors likely to contribute to higher incidence of wound disruption.
- **Results:** Of the 334 identified cases, with a mean BMI of 48.20+ 7.52, there were 60 cases of wound disruption (18%). The commonest perioperative interventions involved Pfannenstiel skin incisions (75.6%), subcutaneous tissue closure (65.4%), use of pressure dressings (65%) and thromboprophylaxis (71.8%). On bivariable analysis, surgical time >1 hour (24.2% vs. 13.5%; OR=2.03, p=0.017) and the use of thromboprophylaxis (20.1% vs. 10.6%; OR=2.22, p=0.031) was associated with increased wound disruption, but these associations were attenuated on multivariable regression analysis.
- **Conclusions:** No single risk factor or perioperative intervention was independently associated with wound disruption. Yet, the use of individualized perioperative care-plans resulted in fewer wound disruptions in our cohort when compared with published literature.

Practice point XII (a)
Reducing morbidity from caesarean deliveries

- Appropriate dose of antibiotics
- Skin incision – consider infraumbilical transverse
- Prepping if the incision is under the pannus?
- Entry
  - as bloodless and atraumatic as possible
  - Incise towards the umbilicus to get to the fascia
- Appreciate the difference in anatomy
- Minimize tissue handling
  - Mobius retractor
- Uterine incision as low on the uterus as possible; U-incision; use bandage scissors if required
- Consider delivering the baby with a vacuum

Practice point XII (b)
Reducing morbidity from caesarean deliveries

- Meticulous haemostasis; liberal use of uterotonics and anti-fibrinolytics
- Do not leave out the posterior rectus sheath while closing the fascia
- Multiple layer closure of the subcutaneous tissue – leave no dead space
- Keep the subcutaneous tissue dry – not burnt!
- Subcuticular skin sutures
- Negative Pressure Wound Therapy Dressing to skin
- 48 hour antibiotic cover
- Thromboprophylaxis?
  - Is it necessary? When should one commence it?
- Post-operative monitoring on a high-dependency unit; cautious with opioids

Summary

- The management of pregnancy in women with higher weight requires an experienced multidisciplinary team and is bound to be resource-intensive

- The management of labour and delivery in these women requires a shift in our understanding of what constitutes 'normal' labour

- Checklists and algorithms based on the proposed 12-point practice plan, which take into consideration, regional resources, could go a long way in improving health outcomes for women with higher weight and their babies


Thank you!