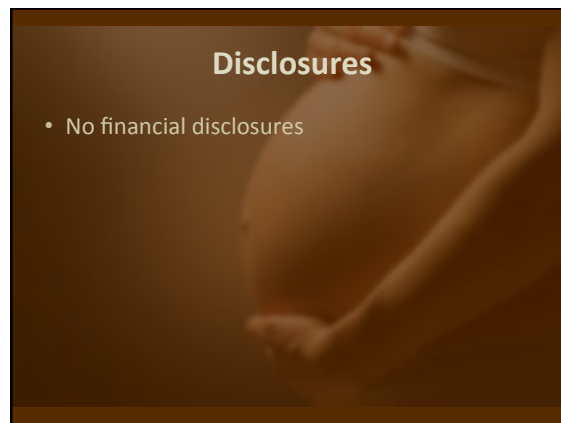


Point-of-Care Ultrasound in the Assessment of the Imminent Delivery

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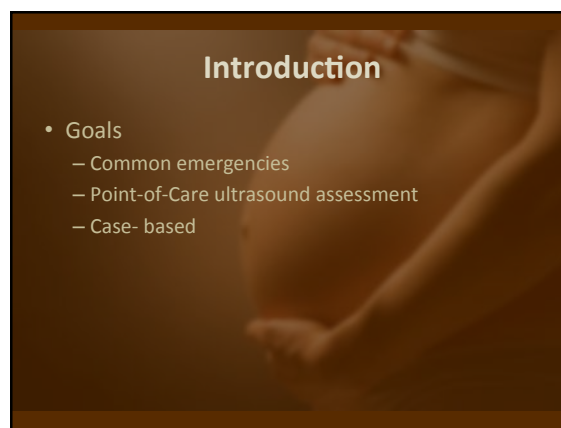
Disclosures

- No financial disclosures



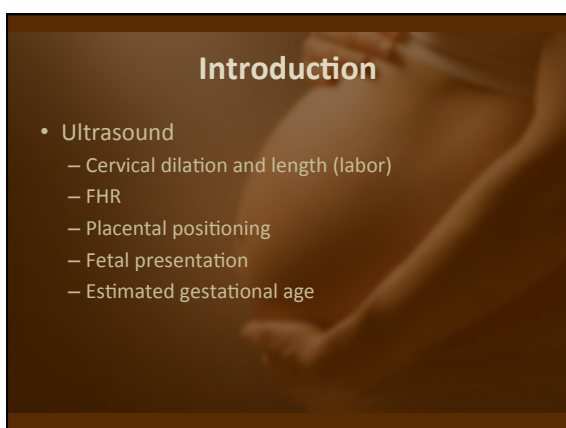
Introduction

- Emergency department delivery



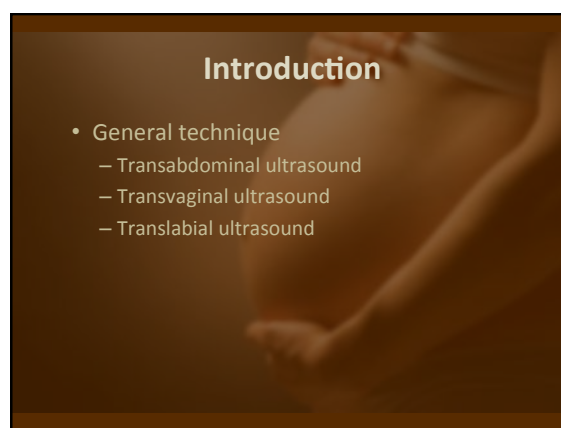
Introduction

- Goals
 - Common emergencies
 - Point-of-Care ultrasound assessment
 - Case- based



Introduction

- Ultrasound
 - Cervical dilation and length (labor)
 - FHR
 - Placental positioning
 - Fetal presentation
 - Estimated gestational age



Introduction

- General technique
 - Transabdominal ultrasound
 - Transvaginal ultrasound
 - Translabial ultrasound

Introduction

- General technique
 - Curvilinear probe
 - Indicator to patient's head (for most applications)
 - OB setting



CASE: THE COMBATIVE GRAVID

Case: The Combative Gravid

- 20 yo G1P0 BIBA CC: "I'm having a baby"
- Hx IVDA
- No prenatal care
- "I think I'm 5 months pregnant"
- Gush of bloody fluid several hours ago

Case: The Combative Gravid



Case: The Combative Gravid

- History limitations: All of them
 - Limited history and exam
 - Gestational age not really clear
 - Never had confirmation of IUP
 - Never had assessment for complications
 - Refusing speculum exam

Case: The Combative Gravid

- What do you want to know?
 - Is she actually in labor?
 - FHR
 - Placental position
 - Fetal presentation
 - Estimated gestational age

Case: The Combative Gravid

- What do you want to know?
 - **Is she actually in labor?**
 - FHR
 - Placental position
 - Fetal presentation
 - Estimated gestational age

Labor

- True vs False Labor
 - Cervical dilation
 - Cervical length (effacement)
 - Cervical funneling
- Stage of Labor
 - Degree of cervical changes

Labor

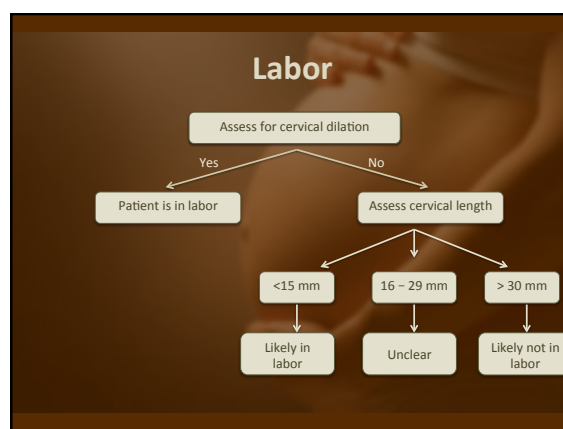
False Labor	True Labor
• Irregular contractions	• Regular contractions
• No change in intervals	• Gradually shortening intervals
• No change in intensity	• Gradually increasing intensity
• No cervical changes	• Cervical changes present

Labor

- Stage of Labor
 - Stage 1
 - Regular contractions → Cervical effacement → Full cervical dilation
 - Active phase at cervical dilation of 3 to 4 cm
 - Dilation at rate of 1.2 cm/hr nulliparous (~5 hours)
 - Dilation at rate 1.5 cm/hr multiparous (~4 hours)
 - Stage 2
 - Full cervical dilation → Delivery of infant
 - Mean 54 minutes nulliparous women
 - Mean 20 minutes multiparous women
 - DO NOT TRANSPORT
 - Stage 3
 - Delivery of infant → Delivery of placenta

Labor

- What does this really mean for me?
 - Assessment of cervix
 - Dilated: definitely in labor
 - Includes funneling
 - » Dilatation of internal os
 - » One of the earliest signs of labor
 - Cervix not dilated, may be in latent phase of stage 1 labor
 - Assess cervical length (effacement)



Labor

- Cervical dilation

This is what your cervix does in labour

Labor

- Cervical dilation by digital exam
 - Patient cooperation
 - Performer confidence
 - Contraindications
 - Vaginal bleeding
 - Rupture of membranes suspected
 - Preterm patients where prolongation of gestation is desired

Labor

- Cervical dilation by ultrasound
 - Yes or no
 - Degree
 - 10 cm = full dilation

Labor

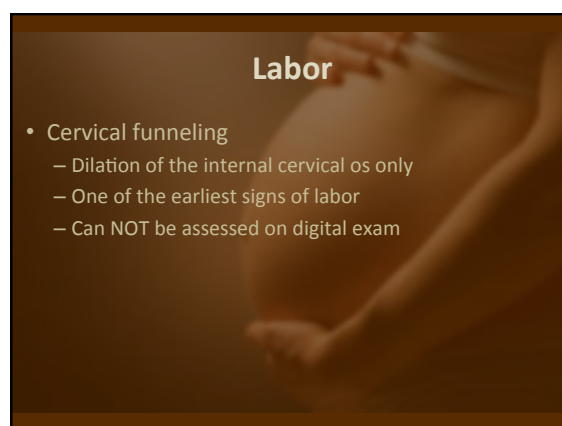
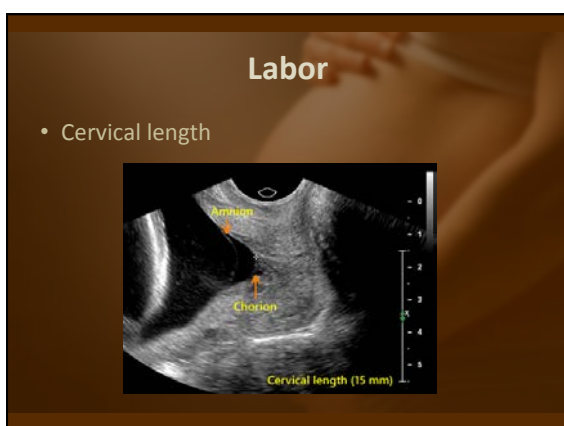
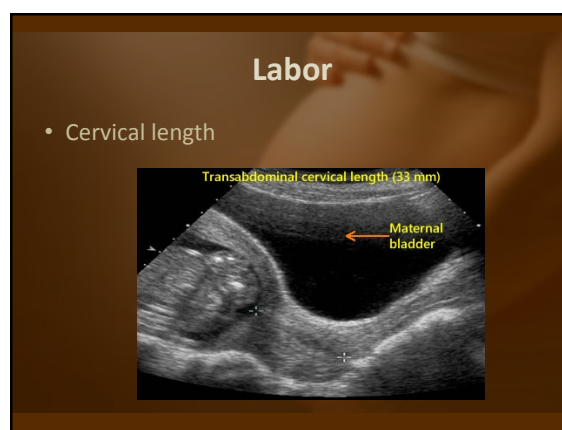
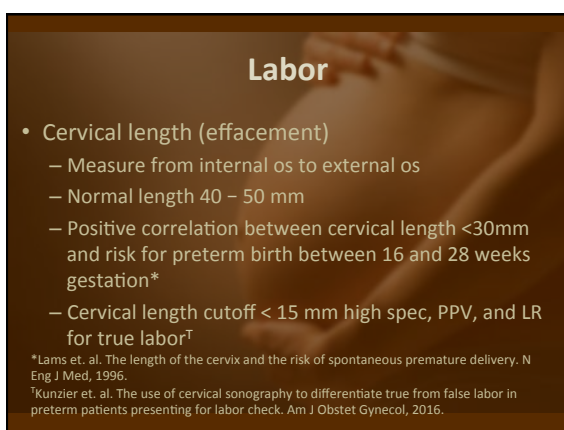
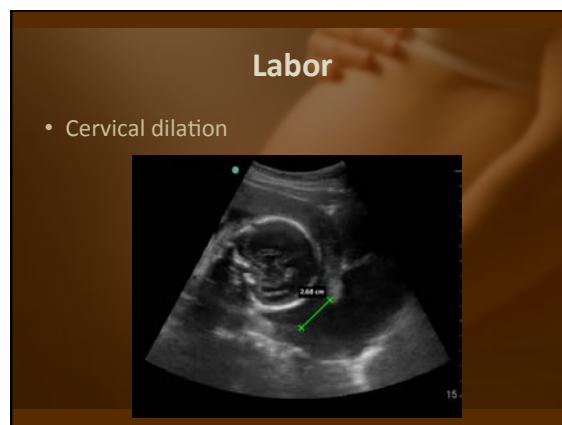
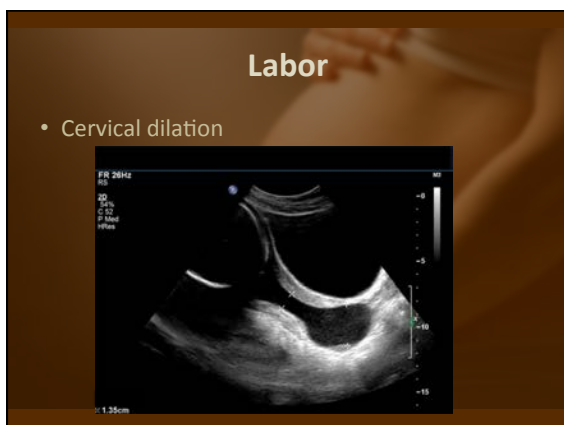
- Cervical dilation by ultrasound
 - Less accurate than transvag or translabial
 - Technical considerations
 - Full bladder very important for visualization
 - Body habitus
 - Fetal positioning

Labor

- Cervical dilation

Labor


- Cervical dilation



Labor

- Cervical funneling
 - (58)
 - 79% rate of preterm delivery with funneling > 50%

Labor

- Cervical length
 - 

Case: The Combative Gravid



Case: The Combative Gravid

- What do you want to know?
 - **Is she actually in labor? YES**
 - Probably first stage, latent phase
 - FHR
 - Placental position
 - Fetal presentation
 - Estimated gestational age

Case: The Combative Gravid

- What do you want to know?
 - **Is she actually in labor? YES**
 - **FHR**
 - Placental position
 - Fetal presentation
 - Estimated gestational age

Fetal Heart Rate

- Measure FHR
 - Ultrasound assessment
 - Measure FHR
 - Monitor for decelerations?

Fetal Heart Rate

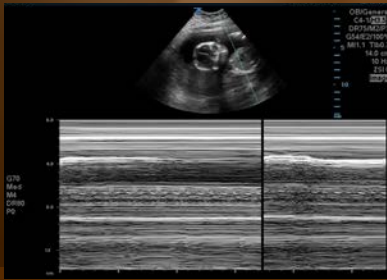
- FHR indicator of fetal well-being
 - > 20 weeks gestation
 - 120 – 160 bpm normal
 - Bradycardia: FHR < 110
 - Sign of fetal distress
 - Late decelerations
 - Tachycardia: FHR > 160 bpm

Fetal Heart Rate

- Ultrasound assessment
 - M-mode
 - Tracing of heart movement over time
 - Measure peak-to-peak or trough-to-trough
 - Dynamic monitoring?
 - In place of tocometry

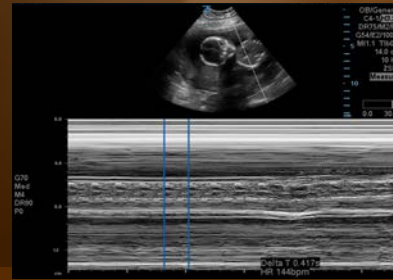
Fetal Heart Rate

- Ultrasound assessment



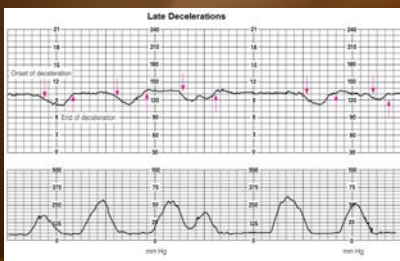
Fetal Heart Rate

- Ultrasound assessment



Fetal Heart Rate

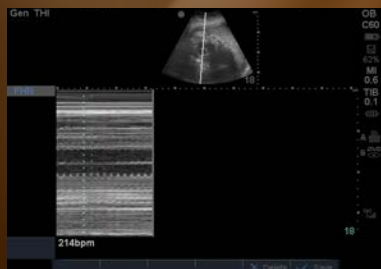
- Monitor for decelerations



Fetal Heart Rate



Fetal Heart Rate



Fetal Heart Rate

- Fetal SVT
 - Flecainide

Case: The Combative Gravid



Case: The Combative Gravid

- What do you want to know?
 - Is she actually in labor? **YES**
 - **FHR 136**
 - Placental position
 - Fetal presentation
 - Estimated gestational age

Case: The Combative Gravid

- What do you want to know?
 - Is she actually in labor? **YES**
 - **FHR 136**
 - **Placental position**
 - Fetal presentation
 - Estimated gestational age

Placental Position

- Placental abnormalities
 - Placenta previa
 - All the other ones

Placental Position

- Placenta previa
 - Placental tissue overlying os by transab u/s
 - <2.8 cm from internal cervical os highly specific*
 - > 4.2 cm highly specific*
 - Low-lying placenta
 - Typical presentation
 - Painless vaginal bleeding
 - 2nd half of pregnancy and later
 - **CONTRAINDICATION TO DIGITAL EXAM**

Quant, et. al. Transabdominal ultrasonography as a screening test for second-trimester placenta previa. Obstet Gynecol, 2014.

Placental Positioning

- Ultrasound assessment
 - Placenta visualized at or near the fundus
 - 92-98% sensitive for placenta previa*
 - Placenta visualized near the cervix
 - Low-lying placenta
 - Concerning for possible previa
 - Placenta visualized overlying the os
 - Confirms diagnosis of placenta previa
 - Can confirm with
 - Transvaginal u/s
 - Translabial ultrasound

*Feldstein et. al. Ultrasound of the placenta and umbilical cord. In: Callen PW. Ultrasonography in Obstetrics and Gynecology, 4th edition.

Placental Positioning

- Ultrasound assessment
 - Limitations in up to 31%
 - Contractions
 - Obesity
 - Overdistended bladder
 - Fetal skull

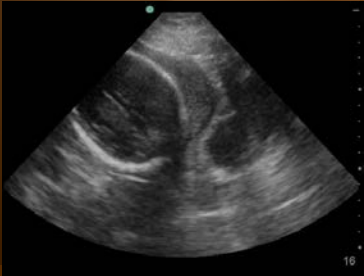
Placental Positioning

- Normal placental positioning




Placental Positioning

- Low-lying placenta



Placental Positioning

- Placenta previa

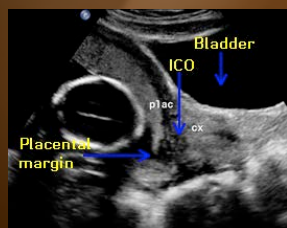


Transabdominal placenta previa

Obimages.net

Placental Positioning

- Placenta previa



Obimages.net

Case: The Combative Gravid



Case: The Combative Gravid

- What do you want to know?
 - Is she actually in labor? **YES**
 - FHR 136
 - Placental position low-lying, ? previa
 - Fetal presentation
 - Estimated gestational age

Case: The Combative Gravid

- What do you want to know?
 - Is she actually in labor? **YES**
 - FHR 136
 - Placental position low-lying, ? previa
 - Fetal presentation
 - Estimated gestational age

Fetal presentation

- Malpresentations
 - Transverse lie
 - Breech presentation

Fetal presentation

- Breech presentation
 - 3-4% term pregnancies
 - Complications
 - Umbilical cord prolapse
 - Trauma
 - Hypoxia
 - Fetal distress
 - Head entrapment
 - Premature infants

Fetal Presentation

- Breech presentation
 - OK to allow delivery:
 - Frank breech
 - Complete breech
 - Not safe for vaginal delivery
 - Footling breech
 - Incomplete breech

The diagram illustrates four types of breech presentations:

- Frank Breech (95%):** The baby's hip joints are flexed and knee joints are extended.
- Complete Breech (5%):** The baby's hip and knee joints are flexed.
- Footling Breech:** The baby's hip and knee joints are extended on one or both sides.
- Incomplete Breech (25%):** The baby's hip joints are extended and knee joints are flexed on one or both sides.

<http://www.michigancerebralpalsyatorneys.com>

Fetal Presentation

- Presentation
 - Is the head down or not?
 - If not: breech or transverse lie

Fetal Presentation

- Breech presentation
 - Is the head down or not?

Case: The Combative Gravid

Case: The Combative Gravid

Case: The Combative Gravid

- Head NOT down
 - Uh-oh

Case: The Combative Gravid

- What do you want to know?
 - Is she actually in labor? **YES**
 - FHR 136
 - Placental position low-lying, ? previa
 - Fetal presentation **BREECH**
 - Estimated gestational age

Case: The Combative Gravid

- What do you want to know?
 - Is she actually in labor? **YES**
 - FHR 136
 - Placental position low-lying, ? previa
 - Fetal presentation **BREECH**
 - Estimated gestational age

Estimated Gestational Age

- Viability
 - 0% survival 21 weeks
 - 75% survival at 25 weeks
 - <32 weeks gestation highest risk for adverse events
 - Varies from hospital to hospital
 - 22 weeks gestation or older, initiate resuscitation

Estimated Gestational Age

- By LMP
 - From first day of LMP
 - Fetal viability > 24 weeks

Estimated Gestational Age

- By ultrasound
 - Methods
 - First trimester: 0 – 12 wks
 - CRL
 - Second (13 – 28 wks) and Third (29 – 40 wks)
 - Head circumference
 - Biparietal diameter
 - Femur length

Estimated Gestational Age

- By ultrasound
 - GA assessment less accurate later in pregnancy

TABLE 1: Precision of Predictors of Gestational Age in the Second and Third Trimesters

Predictor	Gestational Age Interval (in Weeks)			
	14–20	20–26	26–32	32–42
BPD	1.4 (108)	2.1 (81)	3.8 (100)	4.1 (171)
Corrected BPD	1.2 (100)	1.9 (78)	3.3 (85)	3.8 (85)
FL	1.4 (100)	2.5 (79)	3.1 (104)	3.5 (174)
HC	1.2 (100)	1.9 (78)	3.4 (85)	3.8 (85)
AC	2.1 (98)	3.7 (83)	3.0 (101)	4.5 (156)

Note.—Numbers are two SDs (in weeks) for predicted gestational age based on number of patients (indicated in parentheses). BPD = biparietal diameter, FL = femoral length, HC = head circumference, AC = abdominal circumference.

Benson and Doubilet. Sonographic Prediction of Gestational Age: Accuracy of Second- and Third-Trimester Fetal Measurements. AJR 1991.

Estimated Gestational Age

- By ultrasound
 - GA assessment less accurate later in pregnancy
 - Variability of GA estimate = 8% of predicted age*
 - E.g. GA = 32 weeks, true GA +/-18 days
 - Alternative if history or patient unreliable

*Galan et. al. Ultrasound evaluation of fetal biometry and normal and abnormal fetal growth. In: Callen PW, Ultrasonography in Obstetrics and Gynecology, 5th ed. 2008

Estimated Gestational Age

- Second trimester
 - Head circumference
 - Better predictive validity
 - VERY operator dependent
 - Biparietal diameter
 - Any plane will do
 - Must intersect thalamus and third ventricle
- Third trimester
 - Femur length
 - Better than BPD
 - Ossified distal epiphysis
 - > 29 weeks
 - BPD
 - Still fairly accurate
 - Can be difficult if head engaged

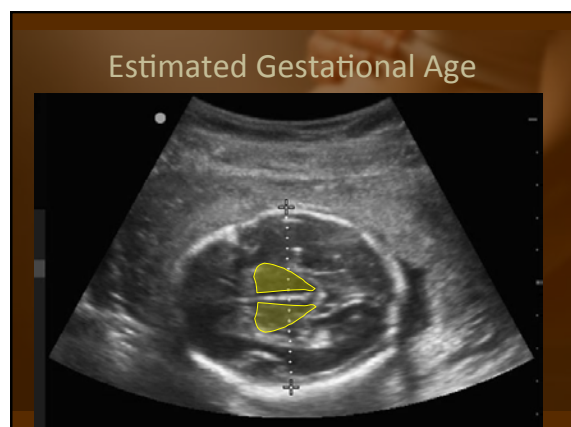
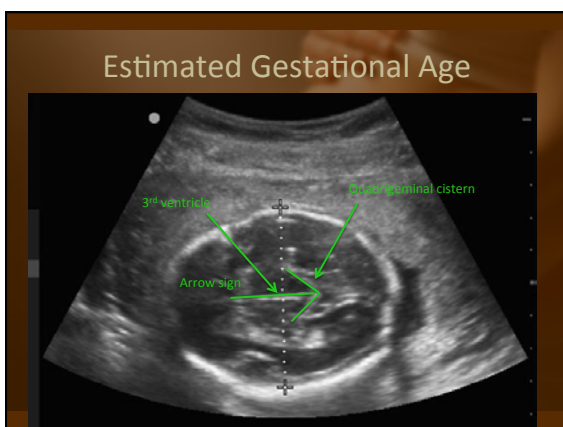
Estimated Gestational Age

- Biparietal diameter
 - Best choice after 14 weeks
 - Predictive validity
 - Ease of measurement
 - Better than LMP up to 20 weeks gestation
 - Less accurate than HC, but less operator-dependent
 - BPD > 54mm single best predictor of survival*

*Smith & Bottoms. Ultrasound prediction of neonatal survival in extremely low birth weight infants. Am J Obstet Gynecol, 1993.

Estimated Gestational Age

- Biparietal diameter
 - Technique
 - Fan through skull to level of the 3rd ventricle and paired thalami
 - Thalami often mistaken for ventricles
 - Look for the "arrow sign"
 - Junction of 3rd ventricle and quadrigeminal cistern
 - Measure from OUTER skull table to INNER skull table



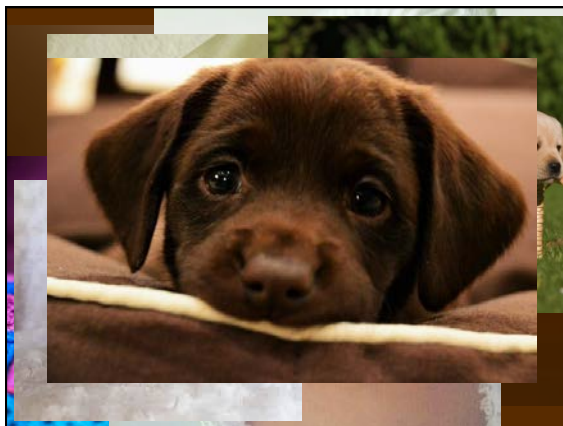


Case: The Combative Gravid

- What do you want to know?
 - Is she actually in labor? **YES**
 - FHR 136
 - Placental position low-lying, ? previa
 - Fetal lie BREECH
 - Estimated gestational age 18w4d

Case: The Combative Gravid

- Admitted to OB
- Patient delivered non-viable preterm infant



Final Thoughts

- Ultrasound is awesome
- Excellent tool for evaluating pregnancy
- Helpful in assessment of emergent delivery
- Basic or advanced

Cheers

