



UCSF Benioff Children's Hospitals

# Maternal History and Risk Factors

*UCSF RNC Prep Course*

Valerie Huwe, RNC-OB, MS, CNS

UCSF Benioff Children's Hospital Outreach Services, Mission Bay

December, 2018

# Objectives

- Cite 3 common preexisting medical conditions that may alter normal fetal development during pregnancy
- Describe the usefulness of maternal prenatal tests and fetal surveillance.
- Discuss intrapartum complications that place the newborn at risk for severe morbidity or death.

# What to Know/Study

- **Effects of maternal medical complications**

- Hematologic
- Hypertension, Renal disease
- Infections

- Problems associated with amniotic fluid & membranes**

- Amniotic bands
- Oligohydramnios, Polyhydramnios
- PROM & Chorioamnionitis

- Significance of findings**

- AFP/Triple screen
- Biophysical profile
- Diagnostic ultrasound
- Lung maturation studies

- Recognize neonatal significance of fetal heart rate patterns**

- Variability, Decelerations
- Tachycardia, bradycardia

- Neonatal effects of maternal medications**

- Tocolytics, Analgesia, anesthesia

- Problems in labor-impact on the neonate**

- Breech & other
- Malpresentation
- Maternal hemorrhage, Meconium

- OB emergencies (impact on neonate)**

- Abruptio placenta, Cord prolapse
- Placenta previa

- Impact of methods of delivery on the neonate (forceps, vacuum, C/S)**

# Maternal Medical/Obstetric History

- The prenatal record
  - Medical and prior obstetric history: Obesity, Diabetes, Thyroid, Chronic HTN, Renal, Cardiac
  - Risk factors can determine
    - Problems with the fetus
    - Potential problems with the newborn
  - Opportunity to prepare for plan of care
    - Induction verses spontaneous labor
    - Vaginal birth verses scheduled C/S
    - Staff in attendance at time of birth
    - Neonatal care/surveillance at birth and beyond

# Fetal Risks: Obesity/Diabetes

- Structural birth defects
  - Neural tube : spina bifida, septal anomalies, cleft palate  
cardiac defects, anorectal atresia, limb reduction defects,  
omphalocele
- Prematurity
- Macrosomia
- Birth Injury
  - Shoulder dystocia
- NICU admissions

# Maternal History and Risk Factors: Prenatal Exposure

- There are various components of maternal history which identify risk factors
  - Prenatal exposures
    - Medication and drugs
      - Cigarettes, alcohol, methamphetamine, other substances
    - Radiation
    - Chemicals
    - Infections
      - Group B strep.
    - Viruses
      - Toxoplasmosis, Other viruses (Zika /Varicella), Rubella, CMV, HSV (TORCH)
    - Food
      - Listeria, mercury, lead, hepatitis A

## Let's review some physiology...

- Pregnancy is a high volume, low resistance state
- Circulating blood volume increases up to 45%
  - Hemodiluted Hyperdynamic
  - Increase  $\uparrow$  1200-1600 mL
- Cardiac Output  $\uparrow$  50 %
- Renal blood flow  $\uparrow$  GFR
  - \* More pronounced in multiple gestation pregnancies

# Maternal Hematologic Issues

## Anemia

- Low Hgb (<9mg/dL) associated with:
  - Decreased oxygen carrying capacity to fetus leading to:
    - Growth restriction
    - Prematurity
    - IUFD

## • Thrombocytopenia

- Most commonly from:
  - Preeclampsia
  - HeLLP
- Most worrisome when plts <50,000
- Effect on fetus/newborn
  - IUFD
  - Transient thrombocytopenia



# Placenta Anatomy and Physiology

- Circulation by **17<sup>th</sup> day** of gestation
- Placenta completely develops and functions by **10<sup>th</sup> week** but continues forming until the end of the 16<sup>th</sup> week of gestation.
- 3 weeks after fertilization, small projections appear and form the chorionic villi.
- These villi erode the walls of the maternal blood vessels and open sinuses where maternal blood pools.
- It is a temporary endocrine organ and has a blood flow ***of 1000 mL per minute.***

# Placenta Anatomy and Physiology

- The maternal surface has **15-20 cotyledons** each containing major branches of the umbilical blood vessels.
- The **villi** hang in the **intervillous space** inside the uterine wall that is filled with mom's blood. This is where the exchange of nutrients, oxygen, and waste products occur.
- It serves as an organ for **respiration**, **nutrition**, **excretion**, and protection as well as secreting **hormones** to stabilize pregnancy.

# Placental Abruption

- Abruption can be occult or visible
- Abruption of more than 50% of the placenta is associated with fetal death

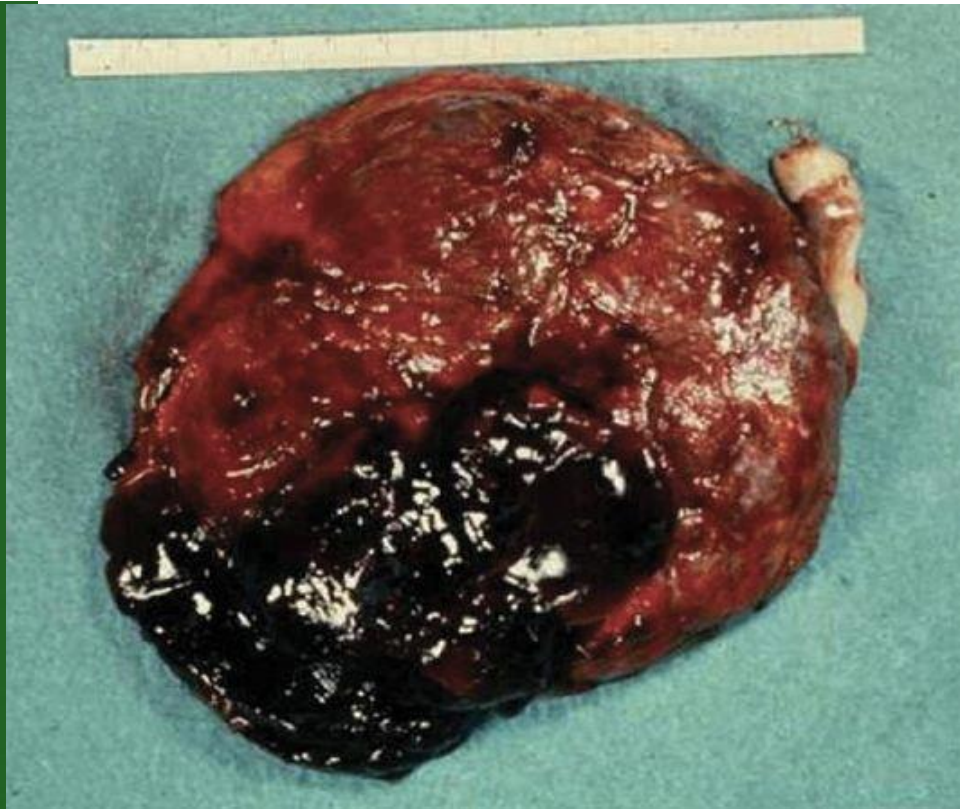
# Risk Factors for Placental Abruption

- Prior abruption
- Smoking
- Cocaine use
- Trauma
- Hypertension
- Thrombophilias
- Older age
- PPROM
- Intrauterine infections
- Hydramnios

# Chronic vs Traumatic Abruption

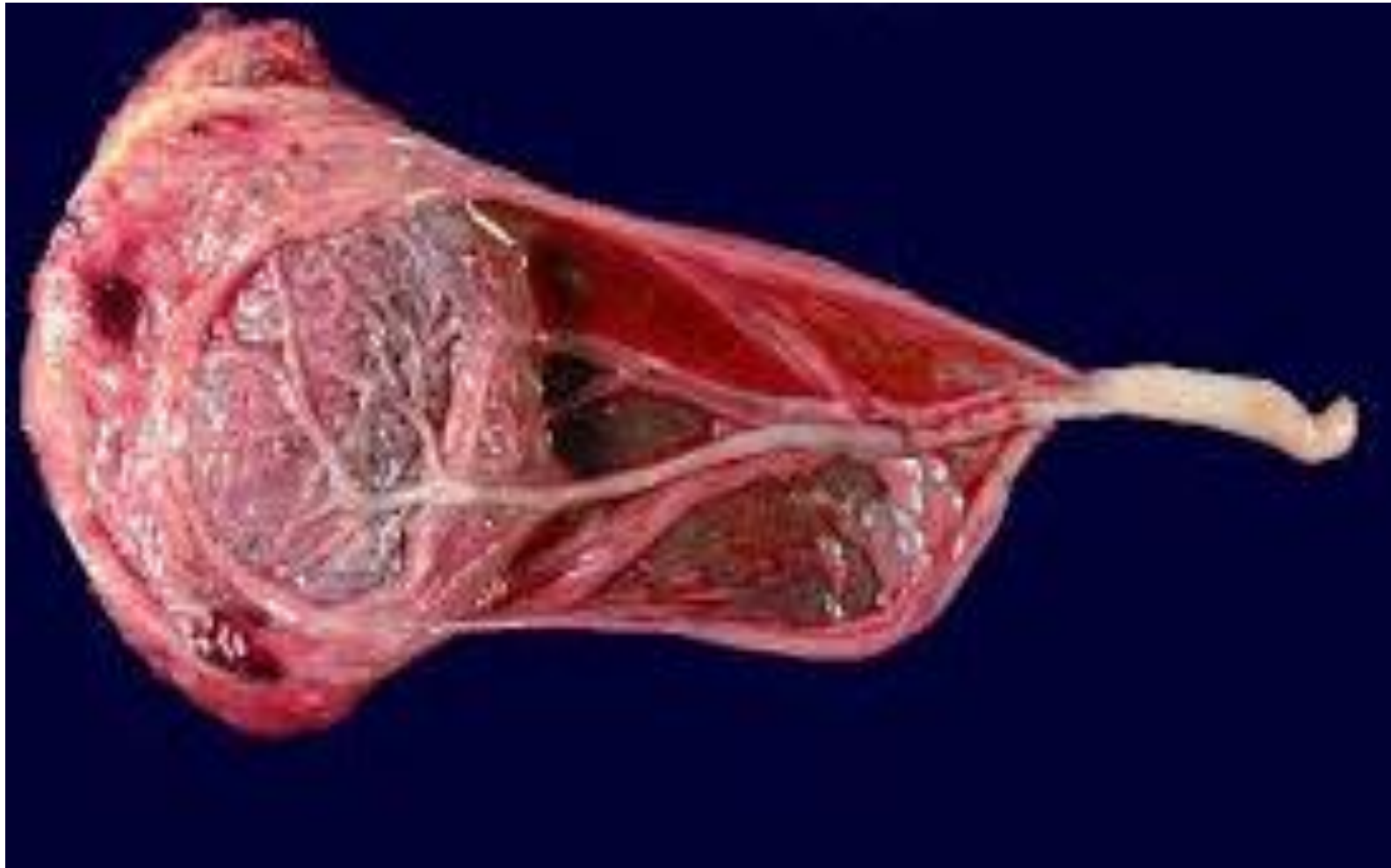


[library.med.utah.edu](http://library.med.utah.edu)



[neundimension.tistory.com](http://neundimension.tistory.com)

# Abnormal Cord Insertion



[midwifemuse.wordpress.com](http://midwifemuse.wordpress.com)

# Vasa Previa

---

[vasaprevia.com](http://vasaprevia.com)

# Velamentous Insertion with accessory lobe





# Placenta Previa

- Placenta previa refers to the presence of placental tissue overlying or proximate to the internal cervical os
- The main complication of placenta previa is bleeding
- Several forms of the disorder have been described

# Types of Placenta Previa

All of these are considered placenta previa

# Placenta Previa

# Clinical Manifestations of Placenta Previa

- Painless vaginal bleeding in 70 to 80% of patients
- 10 to 20% of women present with uterine contractions associated with bleeding
- Initial bleeding episode usually at approximately 34 weeks
- Emergency or scheduled delivery usually at a mean gestational age of 36 weeks
- Absence of abdominal pain and uterine contractions has been the distinguishing feature between placenta previa and placenta abruptio

# Maternal Preeclampsia/Hypertension

- Four categories
  - Preeclampsia/eclampsia
  - Chronic hypertension
  - Chronic hypertension with superimposed preeclampsia
  - Gestational hypertension

# Hypertensive Disorders

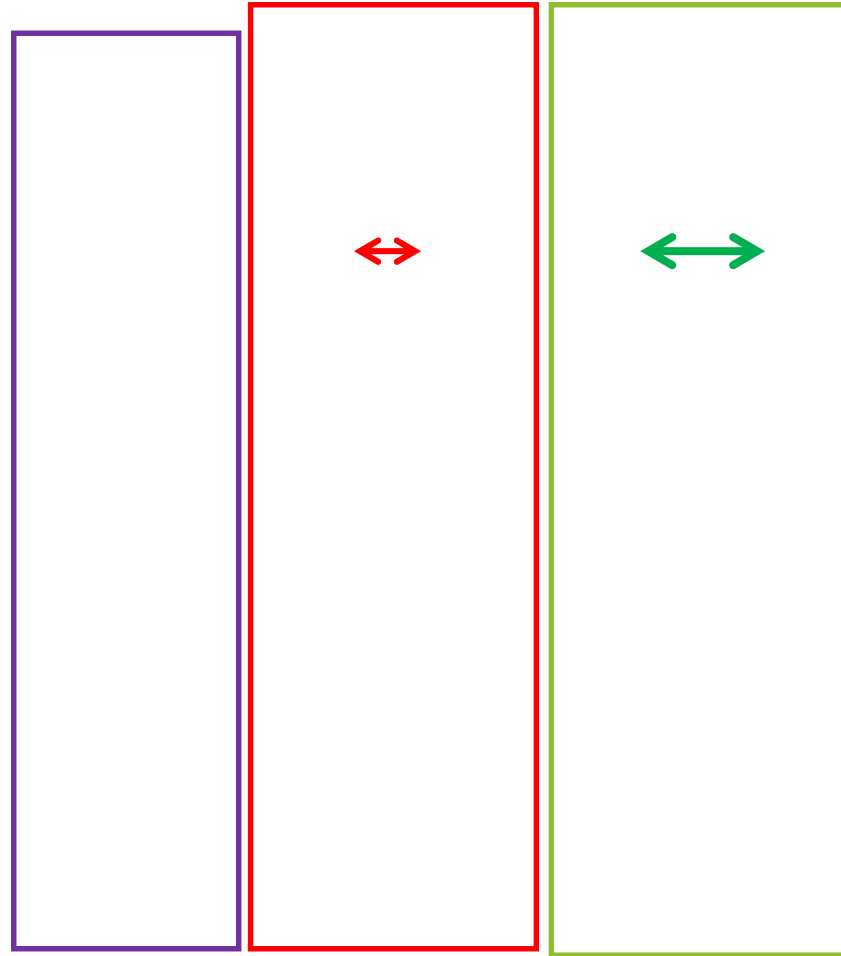
- Most common medical complication of pregnancy
- **Chronic hypertension** is increasing in the general population
- Native American, African American, and Hispanic women affected disproportionately
- **Preeclampsia**
  - Complicates 3% to 6% of all pregnancies
  - Reason for up to 25% of VLBW births
  - Highest Morbidity occurs when GA <35 weeks (early onset)

# Preeclampsia

- A multiorgan syndrome characterized by endothelial damage and vasospasm

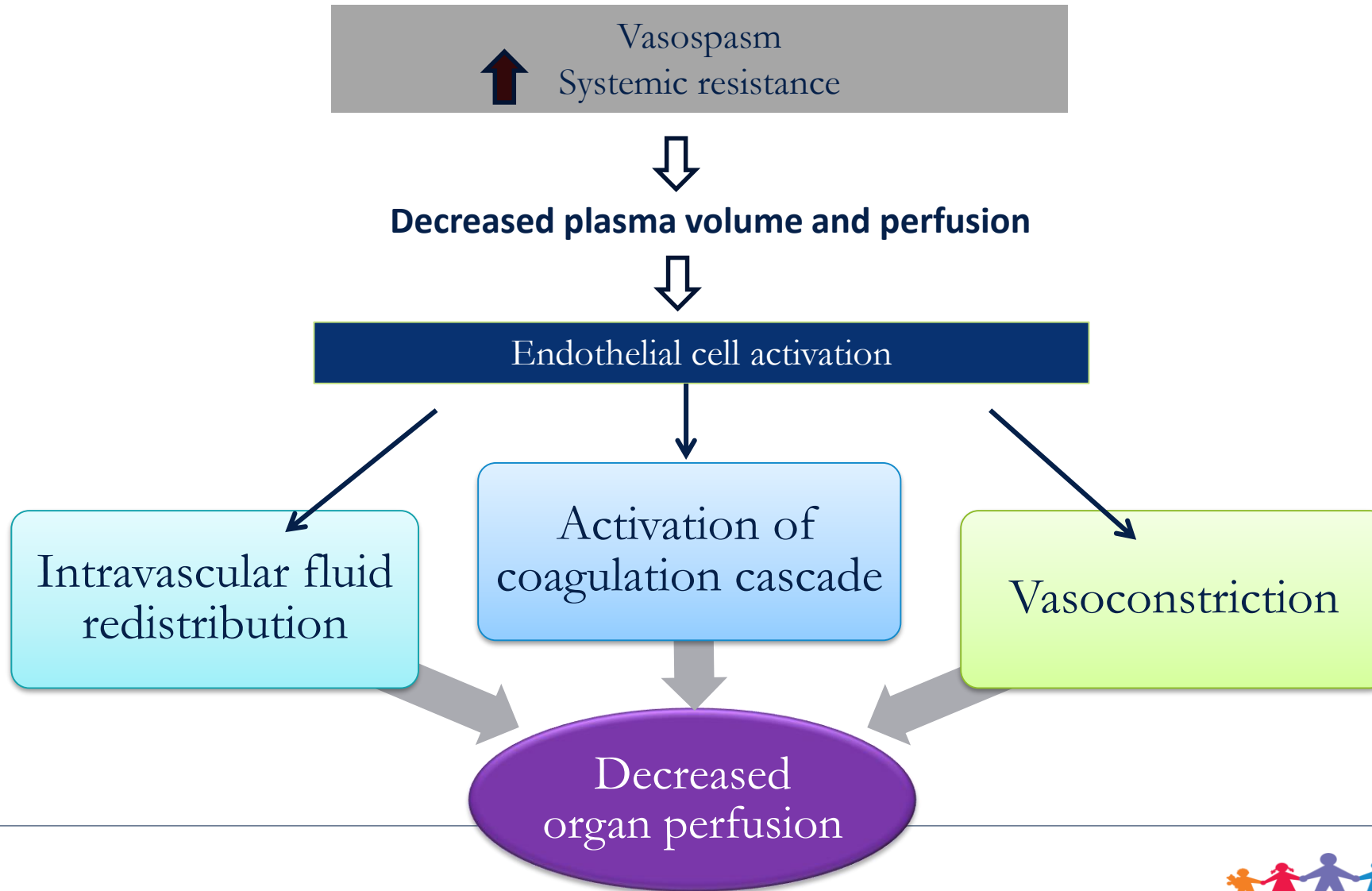
# Pathophysiology of Preeclampsia

- Failure of maternal spiral artery remodeling in early second trimester sets the stage
- Leads to release of vascular damaging agents





# Cycle of Reactivity



# Hypertensive Disorders: Pre-E, Eclampsia, HELLP

- Usual management:
  - Hospitalization if severe
  - Medication to lower blood pressure
  - **Magnesium Sulfate** for seizure prophylaxis
  - BMZ if premature
  - Close observation of fetal well-being
    - Fetal Heart Rate monitoring
    - Biophysical Profiles
    - Fetal Growth
  - Pre E with severe features → **IOL** or @ 37 weeks

# Potential Fetal/Neonatal Effects

- Fetal

- Decreased uterine blood flow
- Decreased placental perfusion
- IUGR
- Abruptio
- Intolerance of labor → C/S
- Intrauterine fetal demise

- Neonatal

- SGA
- Prematurity
- Emergent delivery
- Hypotonia
- Thrombocytopenia

# Maternal Renal Disease

## **Maternal risks**

- Superimposed preeclampsia
- UTIs
- Bacteremia
- Risks increase if dialysis or transplant patient

## **• Fetal risks**

- Growth restriction
- Infection

## **• Neonatal risks**

- Preterm delivery
- Hyperviscosity

# Intrauterine Infections

- TORCH(S)
  - Toxoplasmosis
  - **O**ther
  - **R**ubella
  - **CMV**
  - **HSV**
  - **Syphilis**
- Consider TORCH When a Baby Presents with:
  - IUGR
  - Hepatosplenomegaly
  - Microcephaly
  - Intracranial calcifications
  - Conjunctivitis
  - Hearing loss
  - Rash
  - Thrombocytophilia

# Intrauterine Infections

## Congenital Rubella

- Hearing loss 60%
- CHD: 45% (PDA, PPS)
- Cataracts 25%
- Microcephaly 27%
- IUGR (symmetric)
- Developmental delay
- Purpura “Blueberry muffin rash”

## Toxoplasmosis

- May be asymptomatic at birth
- Classic triad of sx:
  - Chorioretinitis
  - Hydrocephalus
  - Cranial calcifications

# CMV

- Primary exposure during pregnancy carries up to 50% chance of transmission to fetus
- CMV causes viral placentitis in turn causing uteroplacental insufficiency
- 5-20% newborns infected with CMV are symptomatic at birth
- Symptoms include: petechiae, jaundice, hepatosplenomegaly, microcephaly, IUGR, chorioretinitis, thrombocytopenia and anemia
- Long term sequelae include: hearing loss, vision problems, and psychomotor developmental delay

# Maternal Infections

## Intrauterine HSV-Rare

## Perinatally acquired HSV

- Sx may be non-specific as in early sepsis
- Lesions may be noted on Skin Eyes, Mouth (SEM)

- Infection progresses rapidly to hypotension, DIC, shock

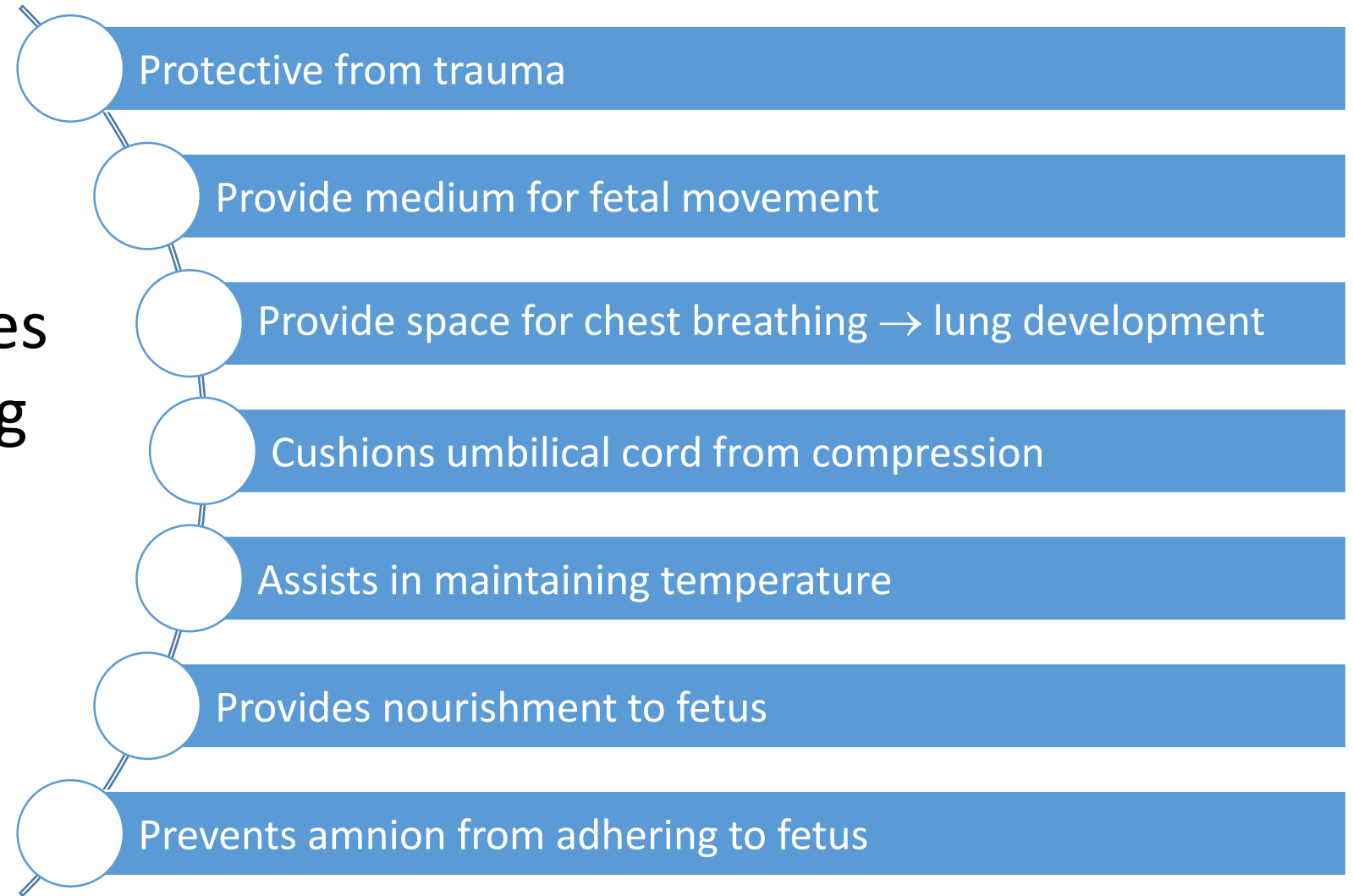


# Maternal Infections: Syphilis

- Stillbirth
- Preterm
- Low birth weight
- Non-immune hydrops
- Rhinitis “snuffles”
- Rashes
- Lymphadenopathy
- Radiographic bone abnormalities
- Hematologic issues

# Amniotic Fluid: Review

Amniotic fluid bathes fetus/embryo during gestational period

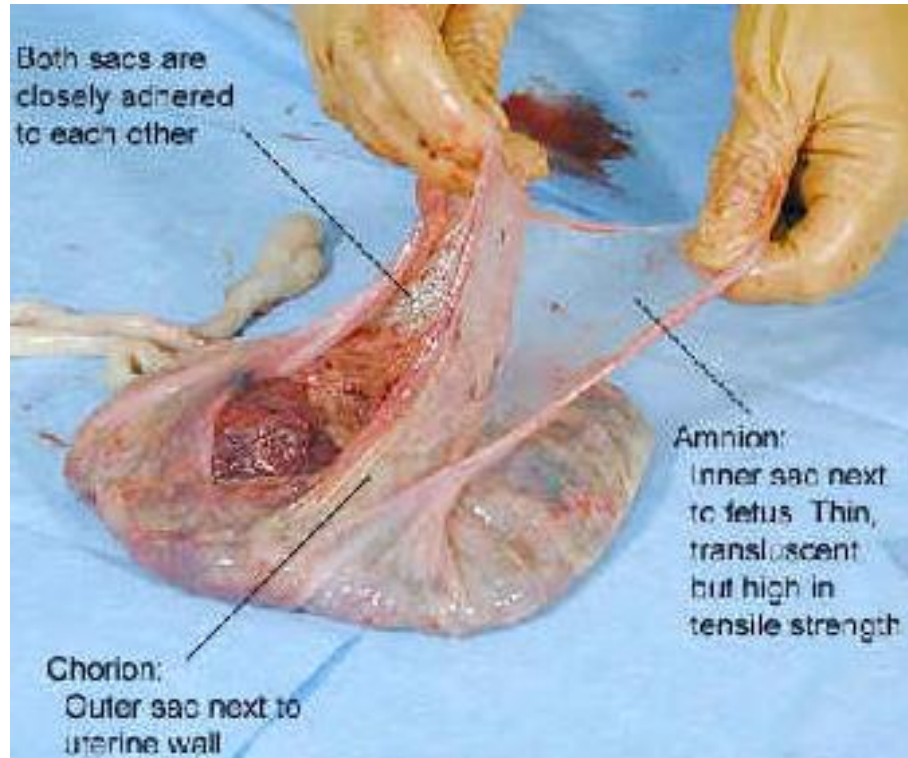


# Amniotic Fluid Disorders: Oligohydramnios

- Oligohydramnios (Hydramnios) is when amniotic fluid is severely reduced and is concentrated
  - Cause is unknown
  - Maternal risk → dysfunctional labor
  - Fetal and neonatal risk
    - Postmaturity
    - IUGR
    - Placental insufficiency
    - Hypoxia
    - Pulmonary hypoplasia
    - Renal and urinary malfunctions
    - Amniotic leak

# Problems with Amniotic Fluid and Membranes

- Amniotic Band Sequence
- Not genetic



Fetal entanglement in the bands  
Birth defects from restricted blood flow  
Impaired fetal development

# Amniotic Fluid Index (AFI)

- Measurement total of the largest pockets of amniotic fluid in four different quadrants of the uterus
- If amniotic fluid index is less than 5 centimeters → oligohydramnios
- If it is  $\geq 25$  centimeters → polyhydramnios

# Problems with Amniotic Fluid and Membranes

**PROM:** Premature rupture of membranes

- Spontaneous rupture of membranes at term gestation prior to the onset of labor

**PPROM:** Preterm premature rupture of membranes

- Spontaneous rupture of membranes **before** 37 weeks gestation without onset of labor

**Meconium Aspiration**

- Associated with prolonged fetal stress
  - Late decelerations
  - Compensatory fetal gasping

# Problems with Amniotic Fluid and Membranes: Chorioamnionitis

- Dysfunctional labor
- Foul smelling vaginal discharge
- Maternal fever
- Uterine tetany
- Uterine irritability
- Hemorrhage
- Endometritis
- Sepsis



# Chorioamnionitis: Potential Fetal Effects

- Fetal tachycardia
- Fetal intolerance to labor
- Poor neurologic outcome, but why?
- Frequency highest in preterm deliveries with PROM
  - < 27 weeks (41%)
  - 28-36 weeks (15%)
  - Term (2%)



# Mechanisms of Hypoxia/Asphyxia

## **Acute**

- Placental abruption, vasa previa, maternal hemorrhage, uterine rupture

## **Intermittent**

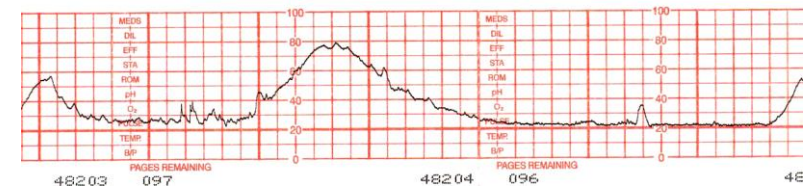
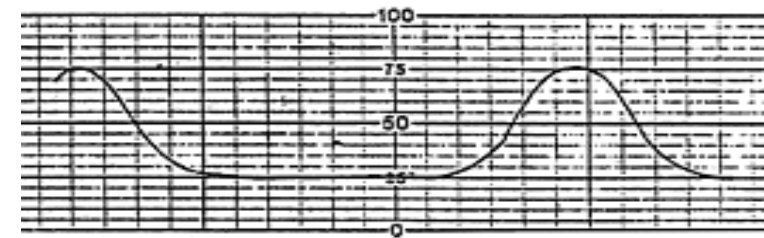
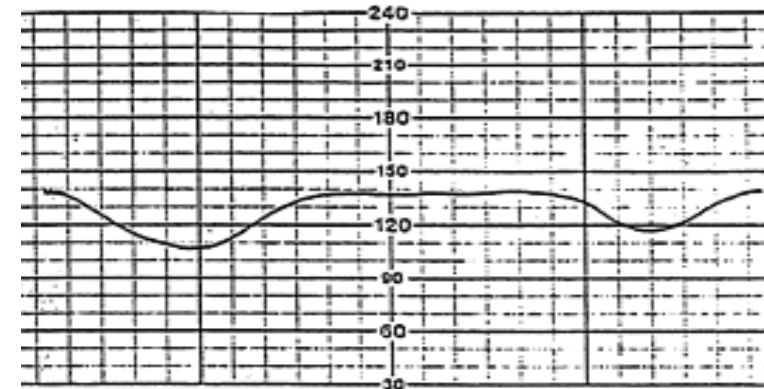
- Contraction, cord compression

## **Chronic**

- Maternal: hypertension, preeclampsia, asthma, diabetes, lupus, renal disease, pulmonary edema
- Fetal: anemia, infection

# FHR Patterns Consistently Associated with Newborn Acidemia: **Category 3 Tracing**

- Absent variability and
  - Recurrent late decelerations
  - Recurrent variable decelerations
- Absent variability and
  - Tachycardia
  - Bradycardia (< 80 bpm)
- Sinusoidal pattern



# Rh Isoimmunization

- Rh negative mother who has been exposed to Rh positive blood cells and now carrying Rh + fetus
- Fetal cells enter the maternal circulation, stimulating an antibody response
- Maternal antibodies cross the placenta and destroy fetal red blood cells
- Severity generally increases with subsequent affected pregnancies
  - First exposure (first pregnancy), usually not affected

# Rh Isoimmunization

## RhoGAM

- Coats the antigens of the fetal cells in the circulation
- Masks the Rh+ cells from the maternal immune system, preventing sensitization
- **Given at 28 weeks gestation**, at delivery, and for **any event** that may transfer cells (amniocentesis, miscarriage, abdominal trauma, etc.)

# Twins



Monochorionic/Monoamniotic



Monochorionic/Diamniotic

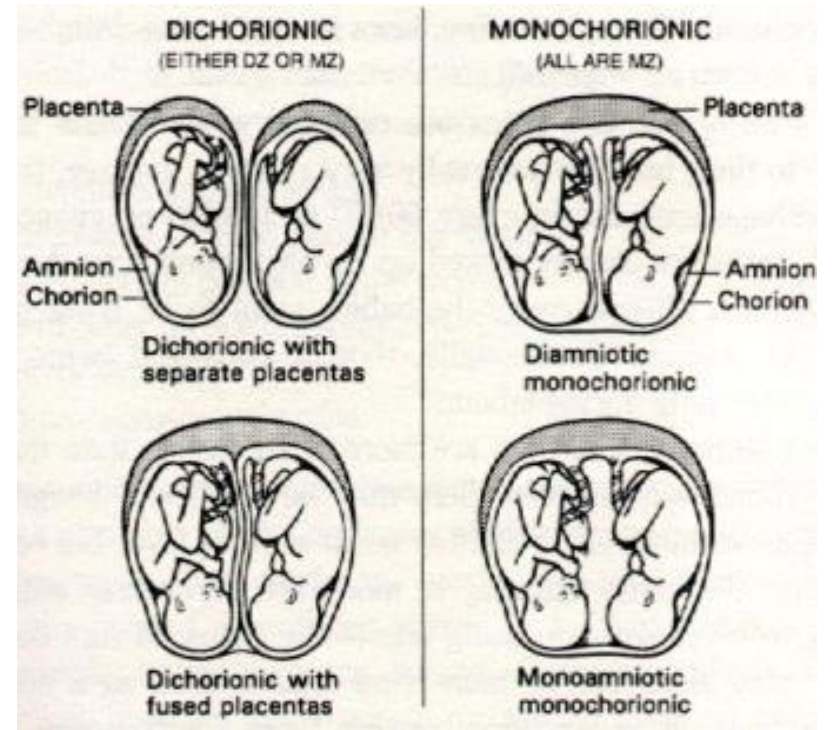


Dichorionic/Diamniotic  
(Fused Placenta)



Dichorionic/Diamniotic  
(Separate Placenta)

- Di/Di
- Mono/Di
- Mono/Mono



# Antenatal Testing: Triple and Quad Screen

## Triple Screen

- Measures presence of:
  - AFP
  - HCG
  - Estriol
- Done at 15-20 weeks gestation
- Screens for:
  - Trisomy 18, 21
  - Neural tube defects
  - Gastroschisis

## Quad screen

- Measures presence of:
  - AFP
  - HCG
  - Estriol
  - Inhibin A
    - more specific for Trisomy 21
    - less false positive test
- Done at 15-20 weeks gestation
- Screens for:
  - Trisomy 18, 21
  - Neural tube defects

# Testing for Lung Maturity

- **Lamellar body count**

- Direct measure of surfactant production by Type II pneumocytes
- >30,000-50,000 per microliter = maturity

- **Phosphatidylglycerol**

- Produced at 35 wks
- > 2% suggests maturity

- **L/S ratio (Lecithin/Sphingomyelin)**

- Ratios equal at 32-33 weeks
- “L” amt increases “S” doesn’t
- Ratio 2:1 suggests maturity

# Antenatal Testing: Non-Stress Test (NST) and Biophysical Profile (BPP)

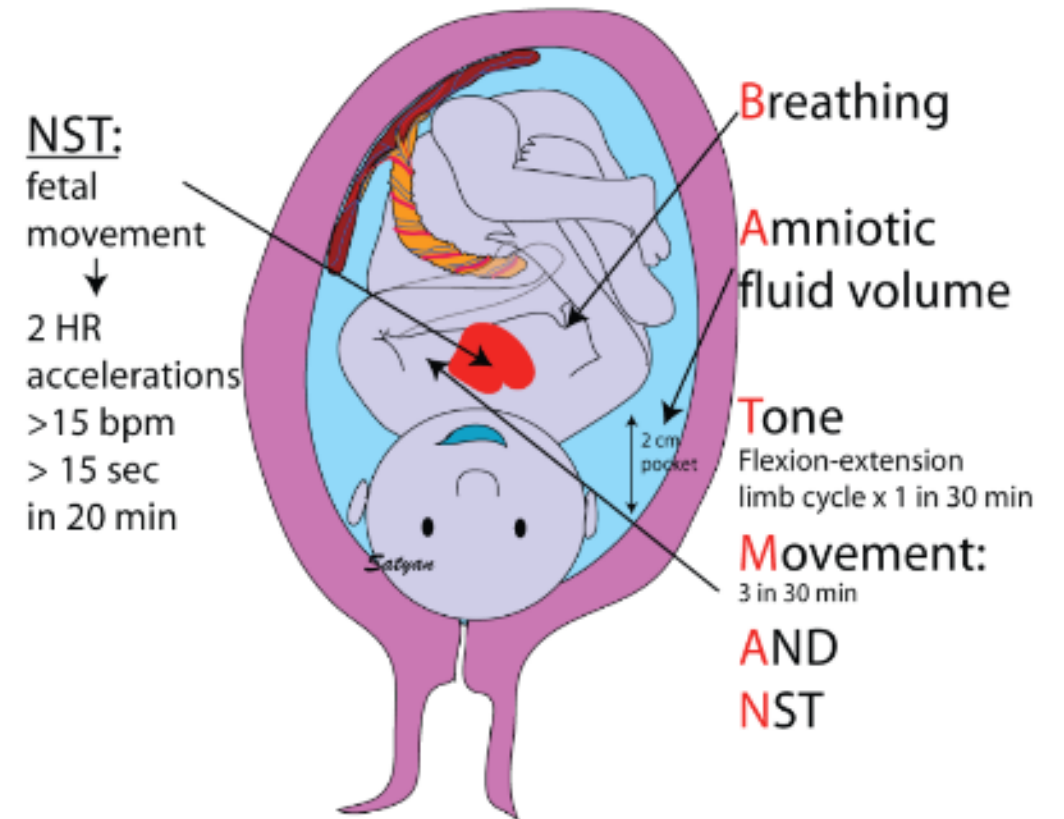
## Reactive

- 2 FHR accels >15 bpm lasting > 15 secs in 20 minute timeframe

## Prior to 32 weeks

- 2 FHR accels >10 bpm lasting > 10 secs in 20 minute timeframe

Biophysical Profile (BPP) - Composed of 5 categories with each scoring 2 or 0





# Maternal Medications and Effect on Fetus

- **NSAIDS/Indomethacin**

- Decreased AFI
- Premature closure of the PDA in utero

- **Magnesium Sulfate**

- Decreased FHR Variability
- Decreased muscle tone
- Decreased calcium

- **Betamethasone**

- Decreased FHRV and BPP scores

- **Anesthesia/Analgesia**

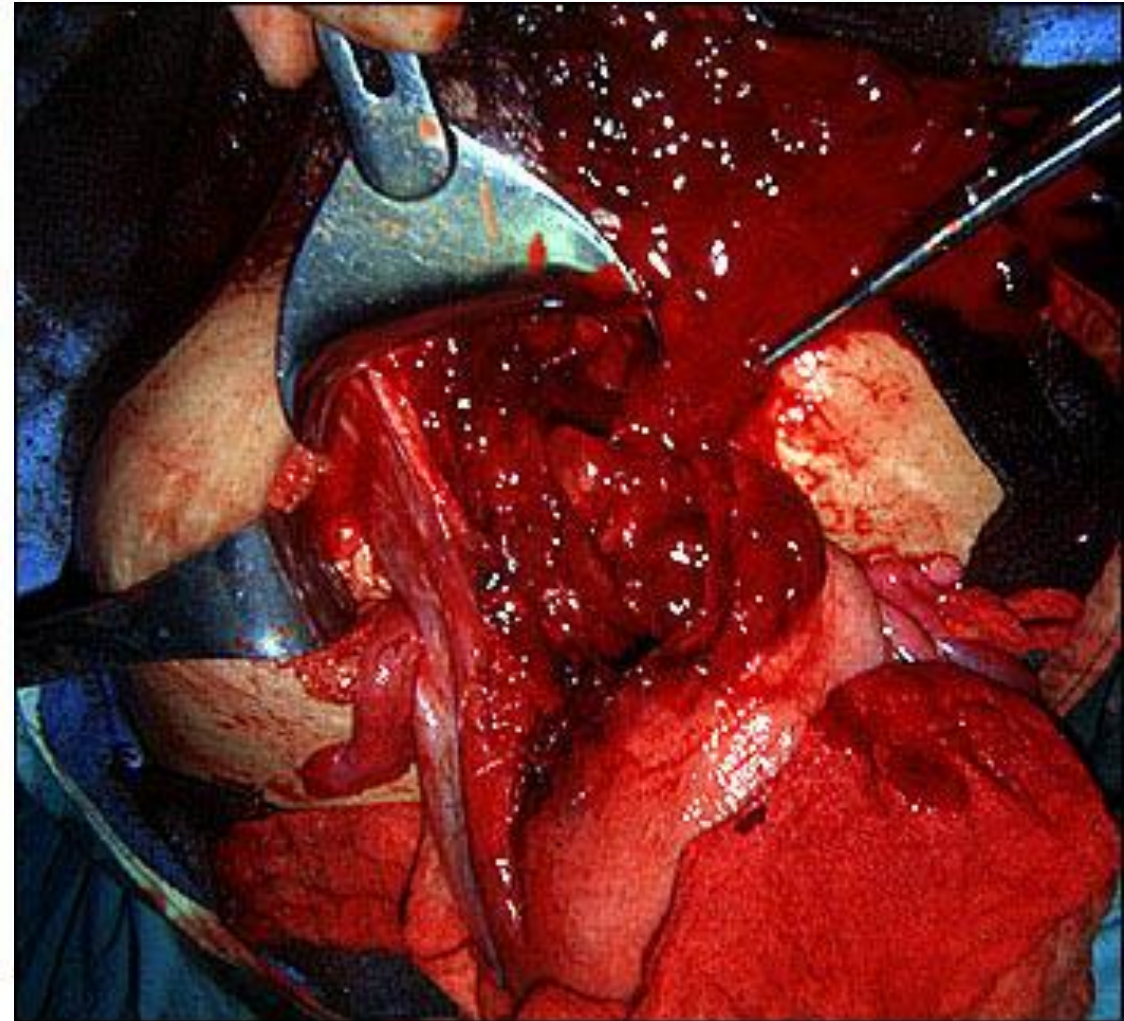
- Respiratory depression
- Fetal bradycardia
- CNS depression

- **Terbutaline**

- Increased growth
- Elevated HR

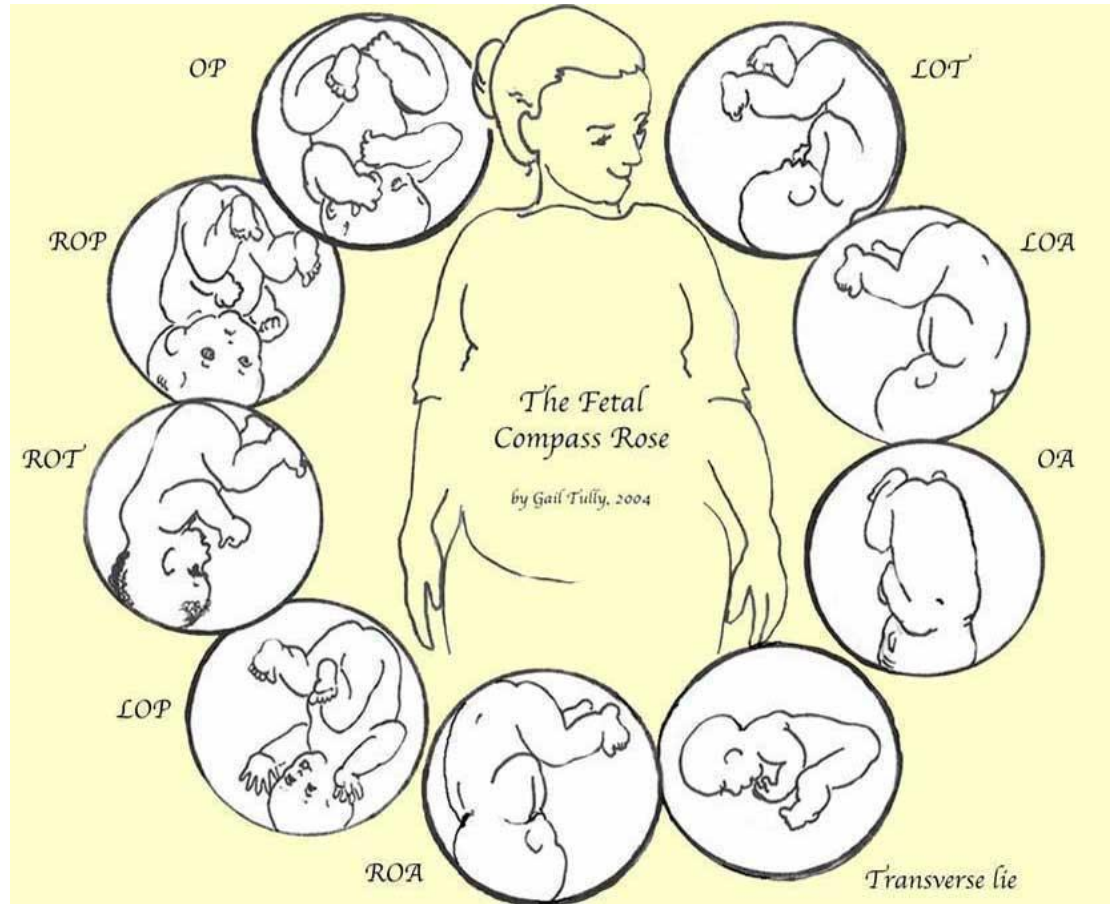
# Intrapartum Emergencies

- Umbilical Cord Prolapse
- Uterine Rupture
  - TOLAC
  - Nulliparous
    - Primary
- Acute placental abruption
- Fetal Bradycardia



# Fetal Position and Risk

- Breech
  - Hypoxia
- Shoulder dystocia
  - HIE
  - Brachial plexus injury
  - Fractured clavicle



# Be calm

- **B** Breathe, do not push
- **E** Elevate legs into a McRoberts position
  
- **C** Call for help
- **A** Apply suprapubic pressure
- **L** Enlarge the vaginal opening (episiotomy)
- **M** Maneuvers (Rubin, Woods, Gaskin)

Camune, B. and Brucker, Mary (2007) An Overview of Shoulder Dystocia. [Nursing for Women's Health.](#)

# Complications following Shoulder Dystocia

## ■ Mom:

- Postpartum hemorrhage
- 3<sup>rd</sup> or 4<sup>th</sup> degree lacerations
- Symphysis separation
- Uterine rupture

## ■ Fetus: 5% of fetus's will sustain injury following SD

- Brachial plexus palsy (3-16% transient)
  - **Endogenous** forces of labor and birth
  - **Exogenous** forces by birth attendant
- Fractured clavicle or humerus (0.1 to 42%)
- Hypoxic brain injury (0.3%)
- Death (0.35%)

# Instrumentation and Effect on the Neonate

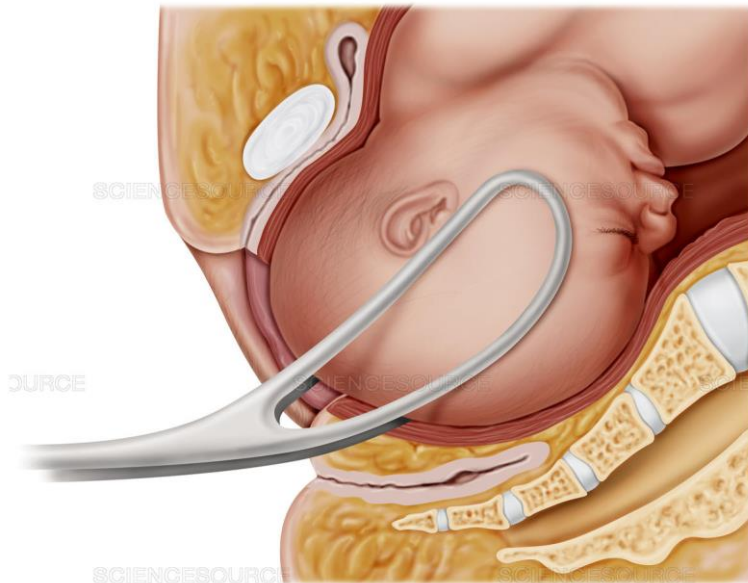
- Vacuum

- Scalp swellings
- Subgaleal hemorrhage
- Skin breakdown
- Neuro sequelae



- Forceps

- Skin breakdown
- Bruising
- Skull fracture
- Nerve injury



# Resuscitation of the Newborn

## **Communication**

- Prenatal record
- Intrapartum changes

## **Resuscitation should be done by qualified team members**

NRP Guidelines

Evidence based approach

Effective team performance

Prompt care of the newborn at the time of birth

- Apgar, growth chart, newborn assessment: gestational age
- Routine care or higher level of surveillance required based on newborn assessment

**Nurses are a valuable  
source of information  
and support for women  
and their families**



**UCSF Benioff Children's Hospitals**

*Thank You*

Valerie.Huwe@ucsf.edu