Preterm Labor

Current Management and Nursing Care

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Objectives

- Compare and contrast the possible etiologies and pathophysiology of preterm labor
- Describe the importance of Perinatal Care Measure 3: Antenatal Steroid Administration
- Review evidence that supports treatment recommendations for women with preterm labor
- Cite ways to apply evidence based nursing care to improve outcomes for women and preterm infants
Historical Perspective
Preterm Birth
New York City, 1950
Transport by Ambulance
“State of the art” incubator
Historical Perspective

- Maternal Transports
- Corticosteroids
- NICU’s
- Tocolysis

National Center for Health Statistics. 2007
Percent distribution of preterm births in the U.S.

- 28–31 weeks (10.0%)
- Less than 28 weeks (6.0%)
- 32–33 weeks (12.7%)
- 34–36 weeks (71.2%) (late preterm)


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The Cost of Preterm Birth

- US Preterm birth cost was 26.2 billion in 2005

- The cost is 10 X’s greater for preterm than term in the first year of life.
  - 32,325 preterm
  - 3,325

March of Dimes Peristats, National Center for health Statistics
www.marchofdimes.com/peristats
2017 PREMATURE BIRTH REPORT CARD

United States

<table>
<thead>
<tr>
<th>Preterm Birth Rate</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.8%</td>
<td>C</td>
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</table>

Premature Birth Report Card grades are assigned by comparing the 2016 preterm birth rate in a state or locality to the March of Dimes goal of 8.1 percent by 2020. The Report Card highlights priority areas for action with city and racial/ethnic disparities data and a disparity ratio. Report Cards are intended to spur action to improve equity and reduce preterm birth, with the goal of giving every mother and baby a fair chance for a healthy pregnancy and birth.

Source: marchofdimes.org/reportcard
© 2017 March of Dimes Foundation
2017 PREMATURE BIRTH REPORT CARD

RACE & ETHNICITY IN THE UNITED STATES

Aggregate 2013-2015 preterm birth rates are shown for each of the five bridged racial and ethnic groups. The racial/ethnic group with the highest rate is compared to the combined rate for all other racial/ethnic groups.

Percentage of live births in 2013-2015 (average) that are preterm

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian/Pacific Islander</td>
<td>8.5</td>
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<tr>
<td>White</td>
<td>8.9</td>
</tr>
<tr>
<td>Hispanic</td>
<td>9.1</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>10.5</td>
</tr>
<tr>
<td>Black</td>
<td>13.3</td>
</tr>
</tbody>
</table>

49%

In the United States, the preterm birth rate among black women is 49% higher than the rate among all other women.
Late Preterm Infants: Associated Risks (34+0 – 36+6 weeks gestation)

- Respiratory Distress
- Hypoglycemia
- Hypothermia
- Jaundice
Moderate Preterm Infants
(32 - 36 weeks)

7X increased risk of morbidity/mortality than babies of 37 weeks

- Respiratory Distress
- Hypoglycemia
- Hypothermia
- Jaundice
Very Preterm Infants
(Less than 32 weeks)

In America 83,004 babies are born preterm every week

• 10,512 of these are very preterm

- RDS
- IVH
- NEC
- Sepsis

www.marchofdimes.com/peristats
Almost half of hospital charges for premature infants, or about $7.4 billion, were billed to employers and other private insurers.

*Includes Medicare
# The Morbidity of Prematurity

## Neonatal
- Respiratory distress syndrome (RDS)
- Intraventricular hemorrhage (IVH) & periventricular leukomalacia (PVL)
- Necrotizing enterocolitis (NEC)
- Patent ductus arteriosus (PDA)
- Infection
- Metabolic abnormalities
- Nutritional deficiencies

## Short term
- Feeding and growth difficulties
- Infection
- Apnea
- Neurodevelopmental difficulties
- Retinopathy
- Transient dystonia

## Long term
- Cerebral palsy
- Sensory deficits
- Special health care needs
- Incomplete catch-up growth
- School difficulties
- Behavioral problems
- Chronic lung disease

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Perinatal Morbidity & Gestational Age

Long-term Care Costs

- Health-care costs
  - e.g., monetary value related to use of community health services

- Educational costs
  - e.g., additional assistance (such as special education) required as a result of school failure & learning problems

- Social service costs
  - e.g., utilization of developmental services such as day care programs, case management & counseling, or respite care & residential care

- Out-of-pocket expenses
  - e.g., additional travel costs related to going to health & social care providers or accommodation expenses

Effect of Preterm Birth on Families

- Families of very low birthweight infants had higher stress levels, ongoing medical problems and more school problems.

- During the first six months after the birth of low-birthweight infants, most mothers had to leave their employment.

- Parents continue to exhibit high stress levels at year 3 related to developmental delays.

Preterm Birth: common and complex

- Genetic contribution
- Environmental influences
- Gene-environment interactions
Pathways to Preterm Birth

- Inflammation
  - Infection - ~40%

- Activation of the maternal-fetal hypothalamic–pituitary–adrenal (HPA) Axis
  - Stress - ~30%

- Decidual hemorrhage
  - Abruption - ~20%

- Uterine distension
  - Stretching - ~10%

Lockwood CJ, Iams JD. Precis: Obstetrics, 3rd ed. ACOG, 2005
Pathways to Preterm Birth

Activation of Maternal-Fetal HPA Axis
- Maternal-Fetal Stress
- Premature Onset of Physiologic Initiators

Inflammation
- Infection:
  - Chorion-Decidual
  - Systemic

Decidual Hemorrhage
- Abruption
  - Thrombin
  - Thrombin Rc
  - CRH
  - E1-E3

Pathological Uterine Distention
- Multifetal Pregnancy
- Polyhydramnios
- Uterine Abnormality
- Mechanical Stretch

Mechanical Stretch
- Gap jct
- PG synthase
- Oxt recep

CRH

UTEROTONINS
- CRH

Proteases

Cervical Change

PPROM

PTD

Uterine Contractions

Source: Lockwood CL. 2002
Inflammation

- Maternal and fetal cytokine response (interleukin-1β and tumor necrosis factor α)
  - Stimulates prostaglandin production
    → **Uterine contractions**
  - Enhanced protease and cytokine production (Matrix metalloproteinases and interleukin-8)
    → **Breakdown of fetal membranes and cervix**
Inflammation, Preterm Birth & Neonatal Outcomes

Bacteria

Pro-Inflammatory Maternal Factors

Anti-Inflammatory Maternal Factors

Fetal Response

Maternal Response

Normal

Neonatal Mortality Morbidity

Long-Term Morbidities

Inflammation

Amniochorionic-decidual systemic inflammation

IL-6
CRH

TNF/IL-1

FasL

Uterotonins (PG, endothelin)

Proteases/apoptosis

contractions

cervical change

rupture of membranes

Infections Associated with Preterm Birth

• Sexually transmitted infections
• Bacterial vaginosis
• Genitourinary infections
  – Asymptomatic bacteriuria
  – Pyelonephritis
• Pneumonia
• Peritonitis
• Periodontal disease
Maternal/Fetal HPA Axis Activation

- ↑ Corticotropin-releasing hormone (CRH)
  - ↑ Maternal and fetal adrenal cortisol
    ▪ → Prostaglandin production
  - ↑ Fetal adrenal dehydroepiandrosterone sulfate (DHEAS) production
    ▪ → Placental estrogen production
HPA Axis Activation: The Role of CRH

Maternal/Fetal HPA Axis

↑ glucocorticoid

↑ placental/membrane/decidual
CRH

↑ PGs

CRH-BP

+ contractions

cervical change

rupture of membranes

HPA Axis Activation: The Role of Estrogens & Cortisol

**UPV abnormality** → Activation of Fetal HPA Axis → Early onset physiologic initiators

- ACTH
  - Adrenal
    - cortisol
      - Placenta, Decidua
        - Fetal Membrane
      - CRH
        - Placenta, Decidua
          - Fetal Membrane
        - CRH
          - Myometrial oxytocin receptors, gap jct, MLCK calmodulin, PG synthase
          - PG
            - contractions
            - cervical change
            - rupture of membranes

- DHEA/16-OH DHEA
  - Placenta
    - ? membranes
  - E1-E3

Risk Factors Associated With HPA Axis Activation

- **Maternal psychosocial stress**
  - Domestic violence
  - Racism

- **Fetal physiological stress**
  - Compromised uteroplacental blood flow
  - Placental pathology
Decidual Hemorrhage

• Release of decidual tissue factor
• Initiation of coagulation cascade and thrombin production causing:
  – Cervical ripening
  – Fetal membrane damage → PPROM
  – Uterine contractions
Decidual Hemorrhage

Extravasation of clotting factors

FVIIa/TF

FXa

Thrombin

uPA + tPA

plasmin

ECM Degradation

Active MMPs

clot

contractions

cervical change

rupture of membranes

Risk Factors for Decidual Hemorrhage

- Placental abruption
- Maternal smoking
- Maternal cocaine use
- Chronic hypertension with superimposed preeclampsia
- Maternal trauma
- IUGR
- Hereditary coagulopathies
Demographic Characteristics of Women at Risk for Preterm Birth

- Maternal age (<18 and >35 years)
- Low socioeconomic status (SES)
- Unmarried
- African-American ancestry
Obesity Complications

Class I Obesity – BMI 30 – 34.9
Class II Obesity – BMI 35 – 39.9
Class III Obesity – BMI ≥ 40

Indicated Preterm Birth
- Hypertension
- Preeclampsia
- Diabetes

Difficult Assessment
- Thromboembolic clots
- Longer hospital stays
- Infections
- Lower rates of breastfeeding
# Types of Preterm Birth

<table>
<thead>
<tr>
<th>Spontaneous Preterm Birth</th>
<th>Indicated Preterm Delivery</th>
</tr>
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<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>▪ Preterm Labor</td>
<td>▪ Medical</td>
</tr>
<tr>
<td>▪ Preterm PROM</td>
<td>– Chronic hypertension</td>
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<tr>
<td></td>
<td>– Diabetes</td>
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<tr>
<td></td>
<td>– Asthma</td>
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<tr>
<td>▪ Related disorders</td>
<td>▪ Obstetrical</td>
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<tr>
<td></td>
<td>– Bleeding</td>
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<tr>
<td></td>
<td>– Hypertension</td>
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<tr>
<td></td>
<td>– Fetal compromise</td>
</tr>
<tr>
<td>▪ Premature cervical effacement and dilation</td>
<td></td>
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<tr>
<td>▪ Cervical insufficiency</td>
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What is Preterm Labor?

- 20-36 weeks’ gestation and
- Documented uterine contractions and
- Documented cervical effacement of 80%

or

- Cervical dilatation of more than 1 cm

Once the diagnosis is made treatment should be initiated

- Digital exam < 3 cm is subjective / imprecise
- Most women in triage are < 3 cm

Once the diagnosis is made...

- Attempt to determine underlying causes or co-morbidities
- Confirm gestational age
- Assess OB and Neo resources – evaluate need for transport
- Consider tocolytics (<34 weeks)
- Administer steroids
- Consider antibiotics

30% of preterm labor will spontaneously resolve
50% of patients hospitalized for PTL give birth at term

ACOG Practice Bulletin 171 June 2016
Goals for Care of Women at Risk for Preterm Labor

- Care to keep pregnancy normal
- Vigilance for signs of preterm labor
- Intervene based on objective evidence
- Monitor effectiveness and need for reassessment
- Maintain normal life of woman’s family
Determine Accurate Gestational Age

- Last menstrual period
- Pregnancy test - serum or urine
  - human chorionic gonadotropin
- U/S measurement consistent with LMP
- Documented Fetal Heart Tones
Information for parents of an infant at the threshold of viability

- Data on neonatal survival rates in general and for the particular institution
- An overview of potential problems and their treatments and complications
- The possibility of long-term disabilities
- The possibility that expectations for the baby may change after birth depending on the condition of the newborn

A single course of corticosteroids may be considered at 23 weeks gestation if at risk of PTB w/i 7 days based on family decision regarding resuscitation (ACOG Practice Bulletin # 1, 2016)
Phone Triage for Preterm Labor

Department guideline?

Additionally:

Level of recent activity
Complications of pregnancy / Hx. PTL
Recent cervical exam.
Assess stay home & call back/come in

"Better safe than sorry policy"
Risk Factors for Preterm Birth

- History of preterm birth*
- Mother or sister with preterm birth
- Unintended pregnancy
- Previous fetal or neonatal death
- 3+ spontaneous losses*
- Assisted reproductive technology*
- Multiple gestation*/Polyhydramnios
- Short cervical length
- Genetic predisposition*
- Folic acid deficiency
- Fetal intrauterine risks IUGR
- Infection*
- Bleeding into the myometrium
- Environmental toxins
- Low pre-pregnancy weight <100lbs
- Obesity *
- Anemia
- Lack of social support
- Tobacco use > 1 pack per day
- Alcohol abuse
- Illicit drug use
- Severe socioeconomic stress

* Identified at highest risk factors (Reedy, 2007)

Standardized Pathway for Improving Outcomes

Woman presents at hospital with the signs & symptoms of preterm labor

No cervical change
- Discharge home undelivered with educational materials

Cervical change
- Appropriate disposition decision
- Magnesium for neuroprotection
- Antenatal corticosteroids
  - Tocolytic therapy (if appropriate)
  - Admit or transport

Appropriate patient assessment by clinicians (SSE, SVE, TVU, fFN)
Value of Standardized Assessment

- Identifying those patients in true labor will benefit all women who present in triage with signs and symptoms of suspected preterm labor.

- Hospitals providing all levels of care will achieve the following outcomes within a relatively brief timeframe:
  - Timely and appropriate interventions
  - Optimal maternal-fetal safety
  - Hospitalization of only those patients at greatest risk for preterm delivery
  - Effective transport of preterm labor patients to higher, more appropriate levels of care
  - Avoidance of unnecessary treatments, interventions and medications
Tools to Standardize Assessment

Standardized assessment to diagnose preterm labor:
• Consistent definition by clinical criteria as regular uterine contractions accompanied by presentation with cervical dilation of at least 2 cm or a change in cervical exam (dilation and/or effacement) on serial exam.

Standardized assessment of risk factors associated with preterm birth:
• Consistent use of objective information to assess symptomatic women who do not meet the clinical criteria for preterm labor noted above.
• Examples include prior preterm birth as well as risk assessment via Transvaginal Ultrasound (TVU) and Fetal Fibronectin test (fFN)
Initial Assessment of Preterm Labor

- Health history - suspicion
- Reproductive history – be careful
- Appropriate physical exam
- Prenatal course of current pregnancy (record)
- Determine accurate gestational age
- Routine obstetric clinical parameters
- Describe signs/symptoms of PTL
- Education of woman and support system
Describe signs/symptoms of PTL

- Cramping, abdominal tightening, sometimes confused with fetal activity
- Contractions
- Backache
- “Pressure”
- Increased vaginal discharge
- Spotting
- Changing lower uterine segment
- Subtle changes in cervical exam
Hospital Triage: Assessments & Interventions

- Concise MD order set
- Clean catch urine specimen
- HOB ↑ 20-30 degrees - lateral decubitus position
- Vital Signs and current weight
- Obtain History
- Assess hydration status
- EFM monitoring for fetal wellbeing
- Sterile Speculum procedure  
  - GBS Procedure  
  - Fetal fibronectin  
  - Amnisure™ testing
- Nursing Competencies  
  - Sterile speculum exam  
  - Amnisure™ testing  
  - Fern testing
AmniSure® Test for Rupture of Membranes

Four STEPS

1. Sample of vaginal secretion is taken by sterile vaginal swab (no speculum required!).
2. Swab is rinsed in a vial with solvent and then disposed of.
3. Test strip is dipped into the vial for ~5 minutes.
4. Test strip is extracted from the vial and results are observed.

One line - there is NO membrane rupture
Two lines - there IS a rupture
No lines - test is invalid - retake

INVALID - - +
Tests to Diagnose Preterm Delivery

Fetal Fibronectin

Secreted by the chorionic trophoblasts through pregnancy.

Glycoprotein

Blastocyst implantation
Fetal Fibronectin
Tests to Diagnose Preterm Delivery < 7 days
All had symptoms or signs of preterm labor & Cx < 3 cm

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Sens %</th>
<th>Spec %</th>
<th>PPV %</th>
<th>NPV %</th>
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<tbody>
<tr>
<td>FFN</td>
<td>93</td>
<td>82</td>
<td>29</td>
<td>99</td>
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<tr>
<td>Bleeding</td>
<td>36</td>
<td>89</td>
<td>21</td>
<td>97</td>
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<tr>
<td>Cx &gt; 1cm</td>
<td>29</td>
<td>82</td>
<td>11</td>
<td>94</td>
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<tr>
<td>Contractions</td>
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<tr>
<td>= 4 / hr</td>
<td>58</td>
<td>45</td>
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<tr>
<td>= 6 / hr</td>
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<td>55</td>
<td>9</td>
<td>95</td>
</tr>
<tr>
<td>= 8 / hr</td>
<td>42</td>
<td>67</td>
<td>9</td>
<td>94</td>
</tr>
</tbody>
</table>

UC’s do not reliably predict cervical change

Fetal Fibronectin

In symptomatic women, the fFN test has a negative predictive value of:
- 99.2% for delivery within the next 14 days and
- 99.5% for delivery in the next 7 days

A single negative test indicates:
- < 1% chance preterm delivery within the next 14 days

The tests negative predictive value is its most positive feature.

The positive predictive value of a positive FFN or a short cervix alone is poor and **should not be used exclusively** to direct management in the setting of acute symptoms (ACOG Practice Bulletin #127, 2012).
fFN Swab Technique
Guidelines: Testing for fetal fibronectin

The interpretation must be used with regard to other risk factors:
- Clinical exam
- Prior risk history (i.e. PTD’s)
- Sonographic measurement of cervical length.

The fFN test should not be used for asymptomatic women with:
- Multiple gestations (including twins)
  - Placenta previa (partial or complete)
  - Cervical cerclage
  - Moderate or gross vaginal bleeding
  - Had sexual intercourse in the preceding 24 hours
Transvaginal Cervical Sonography

Source: Reprinted from Ultrasonography in Obstetrics and Gynaecology, 4th ed., Callen PW, Copyright 2000
Cervical Effacement = T Y V U

Cervical Length by Vaginal Ultrasound

- **Cervix > 30 mm (1.2”)**
  - *not preterm labor*

- **Cervix 20–30 mm**
  - *maybe preterm labor*

- **Cervix < 20 mm (0.78”)**
  - *probably preterm labor*

Sources: ACOG Practice Bulletin. #43, 2003
Preparing Parents for a Preterm Delivery

A neonatal and perinatal provider counsels parents:

- Explains reasons for and details about maternal transport, if necessary
- Answers questions and validates concerns
- Gives parents information about the logistics of delivery and NICU care
- Supports the family with compassion
- Provides grief counseling, when needed
Management of Preterm Birth

- Stabilization of pregnant woman
- Transfer of pregnant woman to an appropriate hospital
- Fetal treatment with corticosteroids given to the mother
- Prophylaxis of neonatal group B strep infection with intrapartum antibiotics
- Consider Magnesium Sulfate for neuroprotection

Update on Antenatal Steroids: 36+5 weeks

• **Betamethasone** (partial treatment helps)
  – 12 mg intramuscularly, every 24 hours x 2
• **Dexamethasone**
  – 6 mg intramuscularly, every 12 hours x 4

**Benefits**

– Reduce perinatal mortality
– Reduce respiratory distress syndrome (RDS)
– Reduce intraventricular hemorrhage (IVH) < 32 wks
– Reduce necrotizing enterocolitis (NEC)
– Acts synergistically with surfactant

Sources: ACOG Committee Opinion. #273, 2002
Antenatal Steroids: Candidates for Treatment

• Risk of preterm birth between 24–37 wks

• ↑ risk of preterm delivery in next 7–14 days
  – Preterm labor
  – Preterm premature rupture of membranes
  – Bleeding

A candidate for tocolysis = steroid candidate

PC-03 Antenatal Steroids

Patients at risk of preterm delivery at 24-32 weeks gestation receiving antenatal steroids prior to delivering preterm newborns

- **Numerator**: Patients with a full course of antenatal steroids completed prior to delivering preterm newborns

- **Denominator**: Patients delivering preterm newborns with 24-32 weeks gestation completed

- **Exclusions**: Patients with documented reason for not administering antenatal steroids
**Treatment After Preterm Labor or PPROM**

### Preterm Labor
- Make accurate diagnosis
- Allow labor or attempt to prolong pregnancy
- Administer tocolytics
- Reduce mortality and morbidity
  - Steroids
  - Antibiotics (+GBS, +Chorio)
  - Others

### Preterm PROM
- Make accurate diagnosis
- **Induce or delay** labor
- Reduce mortality and morbidity
  - Steroids
  - Antibiotics – (latency <34 wks)
  - Others
- **Initiate fetal surveillance**

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Treatment for PPROM

Preterm PROM - Accounts for 1/3 of Preterm Birth

- **Induce** or **delay** labor?
  - The use of tocolysis is still controversial
  - 2011 Cochrane Database of Systematic Review
    - 8 Studies * – a total of 408 women
      - Associated with longer latency (~73 hours)
      - Fewer births within 48 hours
      - However
        - ↑ 5 minute APGAR < 7
        - ↑ need for neonatal ventilation
        - ↑ Risk of Chorioamnionitis

- *These studies did not consistently administer steroids and antibiotics which are considered standard of care

Treatment for PPROM

- 2011 Cochrane Database of Systematic Review
  - The use of tocolysis is still controversial
  - It is unclear whether should be used for women with PPROM
  - Tocolysis did not effect perinatal death
  - Tocolysis did increase latency
  - Tocolysis may increase maternal and neonatal morbidity
  - There is insufficient evidence to support tocolytic therapy for women with PPROM

Hydration

- Freda & DeVore 1996 –
- Lit review and RTC suggest routine hydration is not effective.
- Guinn et al 1997 –
  - Hydration was no more effective than one does of IM Terbutaline to suppress UC’s
  - More costly and requires more intensive nursing care.

- In theory hydration can ↑ uterine blood flow and ↓ UC’s
- Hydration therapy w/o clear evidence of dehydration can lead to serious sequelae (next step in mgmt is tocolytic therapy)
- **Strict I&Os must be implemented and maintained if used = $$**
Monitoring

• Apply external fetal monitor and TOCO.
• Assess FHR. R/O serious alterations
• Assess uterine activity for:
  Uterine irritability
  Discreet UCs uterine activity > 30 seconds duration
• Organization of uterine activity -
  regularity / rhythmicity of uterine activity.
• Baseline activity and change from baseline - pts with PTL dx
• Strength - palpation and per pt hx
• Precipitating factors - UTI, constipation, irritable bowel,
  excessive maternal activity, maternal fluid status)
Use of Continuous Electronic Fetal Monitoring in a Preterm Fetus: Clinical Dilemmas and Recommendations for Practice
(Afors, K., et al, 2011)

- Can pose a clinical dilemma
- Need to understand:
  - physiology of the preterm fetal heart
  - rate dependent
  - development of CV and Neuro systems
- Physiologic reserves available to combat hypoxia < term infant
- Discuss mode of delivery
  - maternal and fetal
  - risk/benefits

Parasympathetic (vagal) outflow slows the FHR to reduce cardiac output and lower blood pressure
Gestational Age Criteria

- Parasympathetic Nervous System progressively influences FHR as gestational age (GA) advances.
- Increase in GA is associated with slowing of baseline FHR.
- Parasympathetic nervous system is consistently developed by the 3rd trimester.
- FHR variability is rarely present before 24 weeks gestation, but absence of variability is abnormal after 28 weeks GA.
- Regardless of GA, loss of variability is an abnormal finding once a fetus has demonstrated normal oscillatory input of Parasympathetic system.
National Institute of Child Health and Development (NICHD)

- Non-stress testing is commonly used for antepartum assessment and surveillance of fetal well-being.
- The 1997 NICHD report and ACOG practice bulletin #70, #106 defined terminology with intrapartum patients.
- Clearly states that the FHR interpretation “definitions may also be applicable to antepartum observations.”
Antepartum Testing Options

• **Fetal Movement Assessment—”Kick Counts”**
  Maternal perception of decrease in fetal movement often precedes fetal death.

• **Contraction Stress Test (CST)**
  Based on premise that fetal oxygenation will be transiently worsened by uterine contractions.

• **Biophysical Profile (BPP)**
  NST combined with 4 real-time ultrasonography observations of fetus: breathing movements, movement, tone and amniotic fluid volume.

• **Umbilical Artery Doppler Velocity**
  Ultrasound assessment of hemodynamic components of vascular impedance.
Non-stress Testing

- Premise: the normal fetus moves at various intervals and the central nervous system and myocardium responds to movement with acceleration of the fetal heart rate.

- Heart rate reactivity is thought to be a good indicator of normal fetal autonomic function. Reactive NST: Test is considered Reactive when 2 or more FHR accelerations of 15 bpm above the baseline and lasting at least 15 seconds occur within a 20 minute time frame with or without maternal perception of fetal movement.

- Test may be extended to 40 minutes to account for normal fetal sleep cycles.
Non-reactive NST

Non-reactive FHR does not meet acceleration criteria in a 40 minute test period.

Non-reactivity may be a sign of fetal hypoxemia or acidosis.

Non-reactivity may also be benign and temporary due to fetal immaturity, quiet fetal sleep or maternal smoking.

The NST of a non-compromised preterm fetus is frequently Non-reactive.

At 24-28 weeks gestation, up to 50% of NSTs may not be reactive.
Preterm Labor Re-Evaluation

- Monitor 30 minutes - 2 hrs
- Ask patient
- Palpate contractions to assess strength of UCs and document on flow sheet
- Document frequency, length, quality of UCs over 30 minutes
  - Fetal monitoring is a SCREENING TEST
  - Fetal monitoring CANNOT diagnose preterm labor
  - Fetal monitoring CANNOT diagnose cerebral palsy
  - Use standard definitions and interpretation
  - Be as consistent as possible
Anecdotal Preterm Labor Management: Practices without supportive evidence

- Hydration
- Sedation
- Subcutaneous (SQ) terbutaline
  - Pro – Cost effective as screening test
  - Con – Danger of prescribing without preterm labor diagnosis
- Pelvic rest
- Bedrest – Sosa C et al, 2004

Antepartum Activity Restriction (Bedrest) 
Women’s Experiences

• Adverse physiological effects
  – Weight loss
  – Muscle loss
  – Calcium loss

• ↑ Stress for the woman /family
  – Negative emotions
  – Role reversals
  – “Missing out”
  – Being a prisoner

Heaman M, Gupton A. Birth 1998; 
Bedrest for Suppression of Uterine Activity

• Efficacy of bed rest to decrease uterine activity has not been shown according to a meta-analysis of randomized clinical trials (Cochrane Review 2003, ACOG, 2003)

• Activity restriction may be helpful for a subset of women with shortened cervix or funneling. (Shellhass & Iams, 1998)

• The continued use of bed rest indicates a neglect to consider the full range of evidence about the efficacy and safety of bed-rest treatment for both the mother and the infant. (Maloni, 2010)

Clinical Recommendations on Bedrest

June 2012 ACOG Practice Guideline #127 replaces # 43

“Bed rest, hydration, and pelvic rest have not been shown to be effective for the prevention of preterm birth and should not be routinely recommended.”
Inpatient Antepartum Assessment

- Begin shift by rounding on patient – *bedside report*
- Familiarize yourself with patients’ “normal“
- Check toco and doppler placements (cough test)
- Check monitoring parameters
- Assess pt. level of awareness of UC’s
- Don't treat the monitor!
- Check medication orders, verify IV pump settings
- Inform MD/CNM of pertinent changes.
Medications

– Progestational agents
– Betamimetics for inhibiting uterine contractions/ PTL
– Antenatal corticosteroids for fetal lung maturity
– Magnesium sulfate as a tocolytic
– Magnesium sulfate as a neuroprotector
– Calcium channel blockers
– Nonsteroidal anti-inflammatory drugs (NSAIDs)
– Antibiotics for GBS and PPROM
Progestational Agents

- Dose: 17 $\alpha$-Hydroxyprogesterone caproate 250 mg IM
- Given weekly starting at 16 weeks through 36 weeks
- Progesterone suppositories also given weekly
- Mechanism of action:
  - Not well understood but thought to have inhibitory effect on uterine contractions. (Anti-inflammatory action)

- For women with prior PTB < 36+6 wks Progesterone can ↓ PTB by 35% in singletons
Tocolytics

- Prior to 1990s - thought to indefinitely delay PTB
- Creates a 24-72 hr window to begin administration of antenatal glucocorticoids.
- There are no “first line” tocolytic medications to manage preterm labor.

- Betamimetics
  - Ritodrine, Terbutaline
- Magnesium Sulfate
- Nonsteroidal antiinflammatory drugs (NSAIDs)
  - Indomethacin, Ibuprofen
- Calcium Channel Blockers
  - Nifedipine

ACOG, 2003; Goldenberg, 2002; Cochrane Review 2003).
Contraindications to Tocolysis

- Intrauterine fetal demise
- Lethal fetal anomaly
- Nonreassuring fetal status
- Severe preeclampsia or eclampsia
- Maternal bleeding with hemodynamic instability
- Chorioamnionitis
- Preterm premature rupture of membranes*
- Maternal contraindications to tocolysis (agent specific)
- If no s/s maternal infection, consider tocolytics for time needed for transport, steroid administration, or both

ACOG, 2016
Magnesium Sulfate

• **Mechanism**
  – Calcium antagonist
  Inhibits voltage independent calcium channels at the myometrial cell surface

• **Efficacy**
  – *Not* confirmed – Cochrane review

• **Rationale**
  – Safe and familiar, neuroprotective

• **Safety and side effects**
  – Flushing, nausea, blurred vision, headache, pulmonary edema, cardiac arrest - caution if creat ≥ 1.0

• **Dose**
  – 4-6 g load, then 1-2 g/hr IV

ACOG Practice Bulletin. #43, 2003
Magnesium Sulfate for Neuroprotection

- Magnesium sulfate for neuroprotection: now or not yet?
- A debate conducted at 31st annual meeting of the Society for Maternal–Fetal Medicine (The Pregnancy Meeting), San Francisco, CA, Feb. 7-12, 2011.

Dwight J. Rouse, MD
Professor of OB/GYN Brown University

- Cited the evidence in favor (>6145 children)
- Reduced CP risk 32%
- Highlighted the costs of more trails (25 K)
- Further research may precisely quantify candidates
- MgSO4 may prevent 1,000 cases of CP /
- MgSO4 is inexpensive and safe (Ø deaths )
- In the US 2% of women deliver <32 wks

Baha M. Sibai, MD
Department of OB/GYN University of Cincinnati

- Cited the evidence as mixed
- Candidates, gestational age, dose is unclear
- Requires close nsg observation
- $$$ resources
- Results may be a false positive from random error
- Effects of MgSO4 remain unclear

Hospitals that elect to use magnesium sulfate for fetal neuroprotection should develop uniform and specific guidelines for their departments regarding inclusion criteria, treatment regimens, concurrent tocolysis, and monitoring in accordance with one of the larger trials. ACOG 2012
Calcium Channel Blocker

Nifedipine

- **Mechanism**
  - Inhibits calcium re-uptake on myometrial cell wall

- **Efficacy**
  - Confirmed

- **Rationale**
  - Efficacy appears favorable, rapid effect

- **Safety and side effects**
  - Hypotension, tachycardia, headache, dizziness
  - Contraindicated pt’s with L cardiac disfunction

- **Dose**
  - Load: 10-20 mg every 20 minutes (3 doses)
  - Continue with 10-20 mg orally every 4-6 hr
Beta-Mimetic
Terbutaline

• **Mechanism**
  – Beta-2 stimulation \(\rightarrow\) ↑ cyclic AMP, ↓ Calcium

• **Efficacy**
  – Delays delivery by 2 to 7 days

• **Rationale**
  – Effective short-term arrest of contractions

• **Safety and side effects – significant and frequent**
  – Maternal tachycardia, pulmonary edema, glucose intolerance – should only be given as inpatient
  – Not used as a 1\textsuperscript{st} line

• **Dose**
  – Terbutaline 0.25 mg **subcutaneously** only, every 2 hr x 2

ACOG Practice Bulletin. #43, 2003
Indomethacin
Guidelines for Use

Mechanism
Prostaglandin synthetase inhibition

Efficacy
Confirmed

Rationale
Efficacious

Dose
50 mg rectally or 50-100 mg orally, then 25-50 mg orally q 6 hr

- Second-line agent

- Before 32 weeks
  - Much less likely to cause ductal constriction

- Limit to 48 hours

- Avoid for
  - Asthma, coagulopathy, renal

ACOG Practice Bulletin. #43, 2003
Iams, J. Obstetrics: Normal and Problem
Pregnancies, 4th d., 2002; Preterm birth, Williams
When contractions persist, identify possible causes:

- Infection – antibiotics should not be used
- Abruption
- Fetal compromise
- Preterm labor diagnosis accurate?
  - Cervical ultrasound + fibronectin

ACOG Practice Bulletin. #127, 2012
Problems with Tocolysis

- **Multiple Tocolytics**
  - Avoid magnesium sulfate + calcium blocker
  - Avoid prolonged therapy

- **Fast + slow drug combination**

  - Initial dose of Terbutaline followed by magnesium sulfate \( \uparrow \) risk Pulmonary edema
    - Accumulation of fluid in lungs - especially twins, triplets
    - Can occur with most tocolytics
    - May occur after tocolytic drugs have been discontinued

  Avoid prolonged therapy - Assess for cough, dyspnea, strict I&O

Top 10 Nursing Care of Patient on Tocolytic Therapy

1. Assess woman’s understanding of situation
2. Explain and provide info on meds: purpose, administration, possible side effects
3. Assess BP, HR, R, oxygen saturation and lung sounds regularly according to institution policy and JCAHO patient safety standards
4. Notify medical team if systolic BP >140mm Hg or <90mmHg or per MD orders, or if diastolic BP >90mm Hg or <50mmHg or per MD orders
5. Notify medical team if maternal pulse >120 or per MD orders
6. Assess for signs/symptoms of pulmonary edema:
   - ↓ or coarse breath sounds, ↓ SaO2, chest pain, SOB, color change
7. Assess DTR’s
8. Assess urine output q 1 hour, notify provider if <30cc/hour.
9. Limit intake to 2500cc/day (90 ml/hour)
10. Consider ECG if administering betamimetics.
What about preterm induction of labor

- The decision to deliver requires balancing risks to mother and baby of continuing the pregnancy versus delivering.
- Maternal morbidity/mortality
- Fetal/neonatal morbidity/mortality
- Not all risk is equal
- We rarely (never) know gestational age to the day
## Gestational Age Groups of CA-PAMR Deaths, 2002 to 2004

<table>
<thead>
<tr>
<th>GESTATIONAL AGE GROUPS</th>
<th>CA-PAMR PREECLAMPSIA DEATHS</th>
<th>CA-PAMR NON-PREECLAMPSIA DEATHS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>&lt;24 weeks</td>
<td>0 (0)</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>24-31w6d</td>
<td>2 (8%)</td>
<td>13 (11%)</td>
</tr>
<tr>
<td>32-36w6d</td>
<td>12 (48%) -- 56%</td>
<td>29 (24%) -- 37%</td>
</tr>
<tr>
<td>≥37 weeks</td>
<td>11 (44%)</td>
<td>76 (63%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>25</td>
<td>120</td>
</tr>
</tbody>
</table>
Maternal Stabilization refers to:

- Seizure prophylaxis
- BP control
- Adequate maternal cardio-pulmonary function

AND

Consultation with:

- NICU
- MFM
- Anesthesia and/or
- Critical care services
Expectant Management in Pregnancies with Severe Preeclampsia < 34 Weeks Gestation

Expectant management recommendations:

With stable maternal/fetal conditions, continued pregnancy should be undertaken only at facilities with adequate maternal and neonatal intensive care resources.

Administer corticosteroids for fetal lung maturity benefit.

Management of Suspected Severe Preeclampsia < 34 Weeks Gestation

No contraindications to expectant management – Short Term

Initial 24-48 hours observation

- Initiate antenatal corticosteroids if not previously administered
- Initiate 24 hour urine monitoring as appropriate
- Ongoing assessment of maternal symptoms, BP, urine output
- Daily lab evaluation (minimum) for HELLP and renal function
- May observe on an antepartum ward after initial evaluation

Proceed to delivery for:
- Recurrent severe hypertension despite therapy
- Other contraindications to expectant management

Antenatal corticosteroid treatment completed:
- Expectant management not contraindicated
- Consider ongoing in-patient expectant management

### Expectant Management of Pregnancies < 34 Weeks Gestation

(From CMQCC Preeclampsia Toolkit, 2013)

#### Severe Preeclampsia and Management Options for Delayed Delivery

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Definition/Significance</th>
<th>Attempt to Delay Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal headache</td>
<td>Suggest central nervous system dysfunction</td>
<td></td>
</tr>
<tr>
<td>Blurred vision or Scotomata*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental status changes**</td>
<td>Suggest liver capsule distension or rupture</td>
<td>No</td>
</tr>
<tr>
<td>Persistent epigastric pain or right upper quadrant pain</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Eclampsia</td>
<td>Generalized tonic clonic seizure</td>
<td>No</td>
</tr>
<tr>
<td>Pulmonary edema or Hypoxia (O2 saturation &lt; 95%)</td>
<td>Excessive fluid accumulation in the lungs</td>
<td>No</td>
</tr>
<tr>
<td>Oliguria/Renal failure</td>
<td>Urine output of &lt;500/24 hours or Creatinine &gt;1.2</td>
<td>No</td>
</tr>
<tr>
<td>Hepatocellular Injury</td>
<td>Serum transaminases &gt;2x normal</td>
<td>No</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td><strong>Severe</strong> Preeclampsia &gt; 160/110 mm Hg BP criteria for</td>
<td>Yes, if responds to treatment</td>
</tr>
</tbody>
</table>

See notes for *,**, explanation.
Management of Suspected Severe Preeclampsia < 34 Weeks Gestation

Long Term Management

Consider ongoing, inpatient expectant management:

• Monitor vital signs frequently (at least each shift)

• At least daily maternal assessment for subjective symptoms of severe preeclampsia

• At least daily assessment of fetal well-being

• Serial evaluation for HELLP syndrome and of renal function

• Serial estimation of fetal growth and amniotic fluid volume

Management of Suspected Severe Preeclampsia < 34 Weeks Gestation

Long Term Management

- Proceed to delivery at 34 weeks gestation or earlier if any of the following are present:
  - New-onset contraindications to expectant management (see slide 32)
  - Recurrent symptoms of severe preeclampsia
  - Recurrent severe hypertension despite therapy
  - HELLP syndrome
  - Significant renal dysfunction
  - Abruptio placentae
  - Fetal growth restriction, oligohydramnios, or abnormal fetal testing

Factors determining success of IOL

- Parity
  - Multiparous
  - Nulliparous C/S rate $\uparrow$ to 65.4% if BS=3/10
- Cervical score
  - $\leq 5$ unfavorable
  - $\geq 6$ ripe
- Position of the vertex
  - Persistent OP
- Method of induction
Modified Bishop Scoring System

The most reliable and cost effective method of predicting the likelihood of successful induction

**Bishop score = 3**

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dilation</strong></td>
<td>Closed</td>
<td>1-2 cm</td>
<td>3-4 cm</td>
<td>5-6 cm</td>
</tr>
<tr>
<td><strong>Effacement</strong></td>
<td>0-30%</td>
<td>40-50%</td>
<td>60-70%</td>
<td>&gt;80%</td>
</tr>
<tr>
<td><strong>Station</strong></td>
<td>-3</td>
<td>-2</td>
<td>-1, 0</td>
<td>+1, +2</td>
</tr>
<tr>
<td><strong>Cervical</strong></td>
<td>Firm</td>
<td>Medium</td>
<td>Soft</td>
<td></td>
</tr>
<tr>
<td><strong>Position</strong></td>
<td>Posterior</td>
<td>Midposition</td>
<td>Anterior</td>
<td></td>
</tr>
</tbody>
</table>

*Cervical dilatation is the strongest factor associated with successful induction*
MISOPROSTOL (con’t)

Misoprostol Protocol

- Misoprostol PO
- 1st Dose 50mcg PO
- 2nd Dose 100mcg PO
  - 4-6 hours following 1st dose of 50mcg.
  - 100mcg PO every 4 hours to a maximum of 6 doses per 24 hours.

- Do NOT start oxytocin infusion until at least 4 hours after last dose to avoid tachysystole.

- UCSF recently reduced protocol dosage
  
  25mcg q 2 hours x 6 doses

Tenore, 2003; Goldberg & Wing, 2003
Misoprostol Stepwise Oral Guidelines

1. Dosing- initial: 50mcg PO

2. Dosing- subsequent: Patient reassessed 3-4 hours. If no adequate contraction pattern and FHR reassuring, give next dose.
   - May increase dose to 100mcg. Dose may be increased only if patient has received at least 2 doses 50mcg without achieving adequacy.
   - If pattern adequate at 3-4 hours, but subsequently becomes inadequate, another dose may be given at same mcg amount as last dose or lower
UCSF Comprehensive antepartum care services

- Family Resource room
- Therapeutic Pet Visits
- Materni- “Tea” Parties
- Music and Medicine
- Spiritual Care
- Volunteer Services
Family Resource Room

**Scrapbooking**

Child Life staff and materials available for beginners and experienced scrapbookers

**Knitting**

- Yarn, needles
- Instruction
- Hats
- Blankets

**Web Site Development**

- Lending Library
- Free toiletries
- Refreshments
Antepartum Care for women at UCSF

Therapeutic Pet Visits
SPCA Therapeutic Pet Therapy

- Every Tuesday a different dog comes to visit antepartum patients
- Hospital wide Policy/Procedure
  - Owner and Tina remain with patient at all times during pet visit
- Individuals who want to make a difference can contract with SPCA or similar external organizations
Antepartum Care for women at UCSF

- **Maternity “Tea” Party (1 hour)**
  - 2-6 women
  - Spanish Interpreter *when necessary*
  - Facilitator RN *and/or* Social Worker
  - Themes
    - Women’s topics
  - Women are pleasantly surprised
    - Private rooms ___ isolation, loneliness
    - Bad luck, abnormal
      - Reveals common feelings
      - Promotes understanding, humor, tears
  - Identify support systems/community resources
Antepartum care for women at UCSF

• Since these are Women’s topics
  ▪ Partners/children attendance is discouraged
• Fear of the known and unknown
  ▪ Anomalies
  ▪ Risks associated with prematurity
• Parenting Issues
  ▪ Separation from their other children
  ▪ Loss of control, guilt
  ▪ Skype
• Education
  ▪ Breastfeeding
  ▪ Mode of delivery
• Loss of income
Antepartum Women’s Feelings about their sudden hospitalization

- Shock
- Guilt that she “caused” the preterm labor, hypertension or bleeding
- Concern for the baby’s health
- Anxiety about the labor and birth
- Sadness over not completing the pregnancy
- Worry about her family, job, school

Spiritual Care

- Emotional support
- Blessings
- Meditations
- Religious beliefs
- Ethical concerns
UCSF: Seven steps to self care

7 Steps to self care

• Stay nourished & hydrated.
• Take five slow, deep breaths, inhaling through your nose and exhaling through your mouth.
• Reach out to others and feel free to ask for help when you need it.
• If you’re worried, bring yourself back to the present. When we feel anxious, we’re pre-occupied with the future.
• Lighten up. Let your sense of humor travel with you.
• Write down something that inspires you, that moves you, or that you’re grateful for.
• Talk with a chaplain—we’re always available.
Top 10 Nursing Care of Antepartum Patient

1. Assess woman’s understanding of diagnosis/prognosis
   • Maternal Fetal medicine specialist
2. Explain and provide info on meds
   • purpose, administration, possible side effects
3. Plan for patient centered care
   • patient chooses time for shower, fetal monitor, meals
4. Help patient get the right food and fluids to support her health
   • within hospital
   • from home
   • Take out restaurants, include menu or check on-line
5. Perform regular “prenatal visits”
   • weight once a week
   • teaching points checklist
Top 10 Nursing Care of Antepartum Patient

6. Review childbirth education needs and create plan
   - e.g. C-section pre-op teaching or pain management for VB
   - Breast feeding/ pumping – lactation support
   - Discussion over time

7. Inform patient about hospital’s offerings - relieve her boredom

8. Personal services - haircut, mani/pedi, massage
   - what can the hospital provide
   - cost and quality of independent contractors

9. Offer to take her outside to breathe fresh air, hear birds tweet

10. Ask her about her concerns/ worries
    - Baby’s health
    - Her own health
    - Emergency cesarean section
       - If birth is an emergency - Partner / family may not be present for her
    - Worried about home, or work, especially other children
More tips for antepartum patients

If long-term hospitalization is necessary

- Help organize her time
  - setting short-term goals, celebrate accomplishments
- Acknowledge importance of what she is doing
  - bringing the healthiest baby possible into the world
- Include, engage, and support partner
- Give the woman as much control as possible
- Provide muscle maintenance instruction
  - PT consult
- Educate women of physical changes postpartum
- Assess for serious maternal complication postpartum
  - CCD → uterine rupture, hemorrhage, infection, DVT, DIC, Death
Nurses CAN make a difference in AP lives

- Assignment continuity is VERY important for AP patients

- Dry erase board behind nurses station
  - Sign-up if you “know” and want to care for Ms. Smith
  - This helps the Charge RN to make assignments based on continuity of care

- If you are working 2-3 shifts in a row, make your request known to the oncoming Charge RN
Summary

- **Recognize** the impact of preterm birth on the family and society
- **Educate** Women about pregnancy, PTL and birth
- **Focus** on prevention and early identification
  - Folic acid, 17P, lifestyle adjustments
- **Use diagnostics** to screen/test for PTL risks
- **Intervene** in a timely and effective manner
- **Support** women with PTL and their family
  - *Comprehensive* interdisciplinary care
- **Utilize all resources**
  - March of Dimes
  - Sidelines [www.sidelines.org](http://www.sidelines.org)
  - Specialized support groups
Nurses are a valuable source of information and support for women and their families.

UCSF Benioff Children’s Hospitals

Thank You!

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