



UNC
SCHOOL OF MEDICINE

Labor and Delivery: Physiology, Normal, Abnormal

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Taleghani hospital

Images: [googleimage.com](https://www.google.com); [gabbeobstetrics.com](https://www.gabbeobstetrics.com)



Objectives

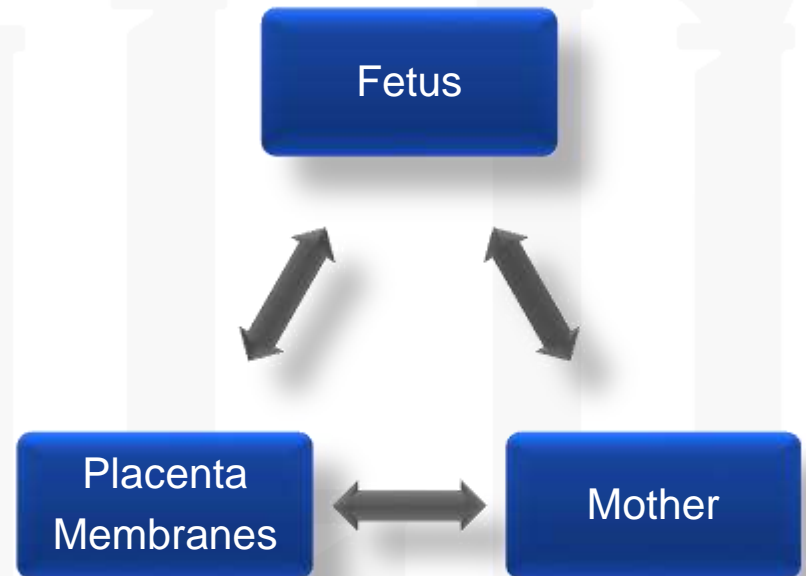
- Describe physiology of initiation of labor
- Define normal and abnormal labor
- Review the mechanics of labor
- Describe diagnosis and management of abnormal labor





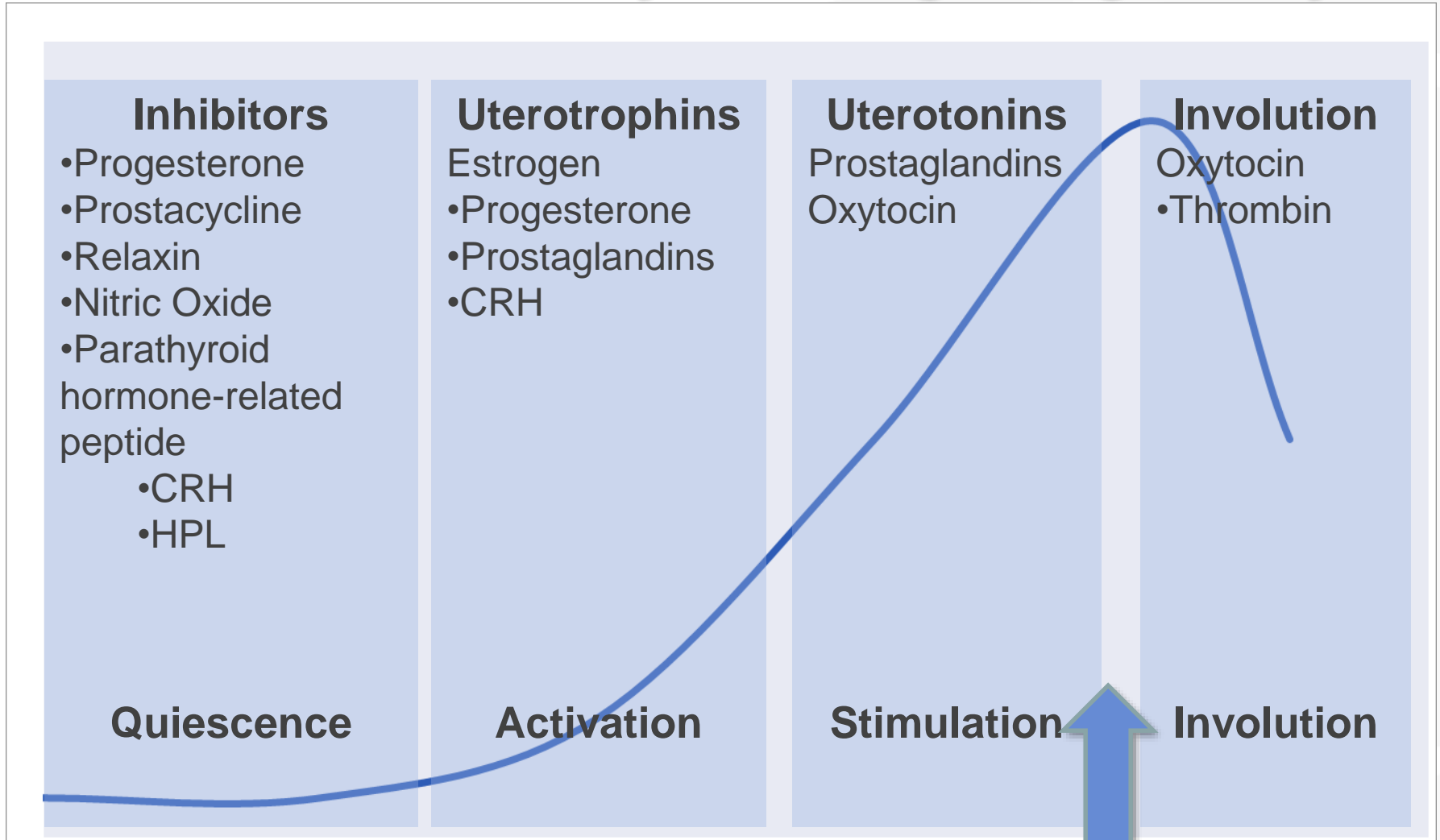
Parturition

- Normal Pregnancy
 - » Uterine quiescence
 - » Immature fetus
 - » Closed cervix
- Parturition
 - » Coordinated uterine activity
 - » Maturation of the fetus
 - » Maternal lactation
 - » Progressive cervical dilation





Uterine Activity During Pregnancy





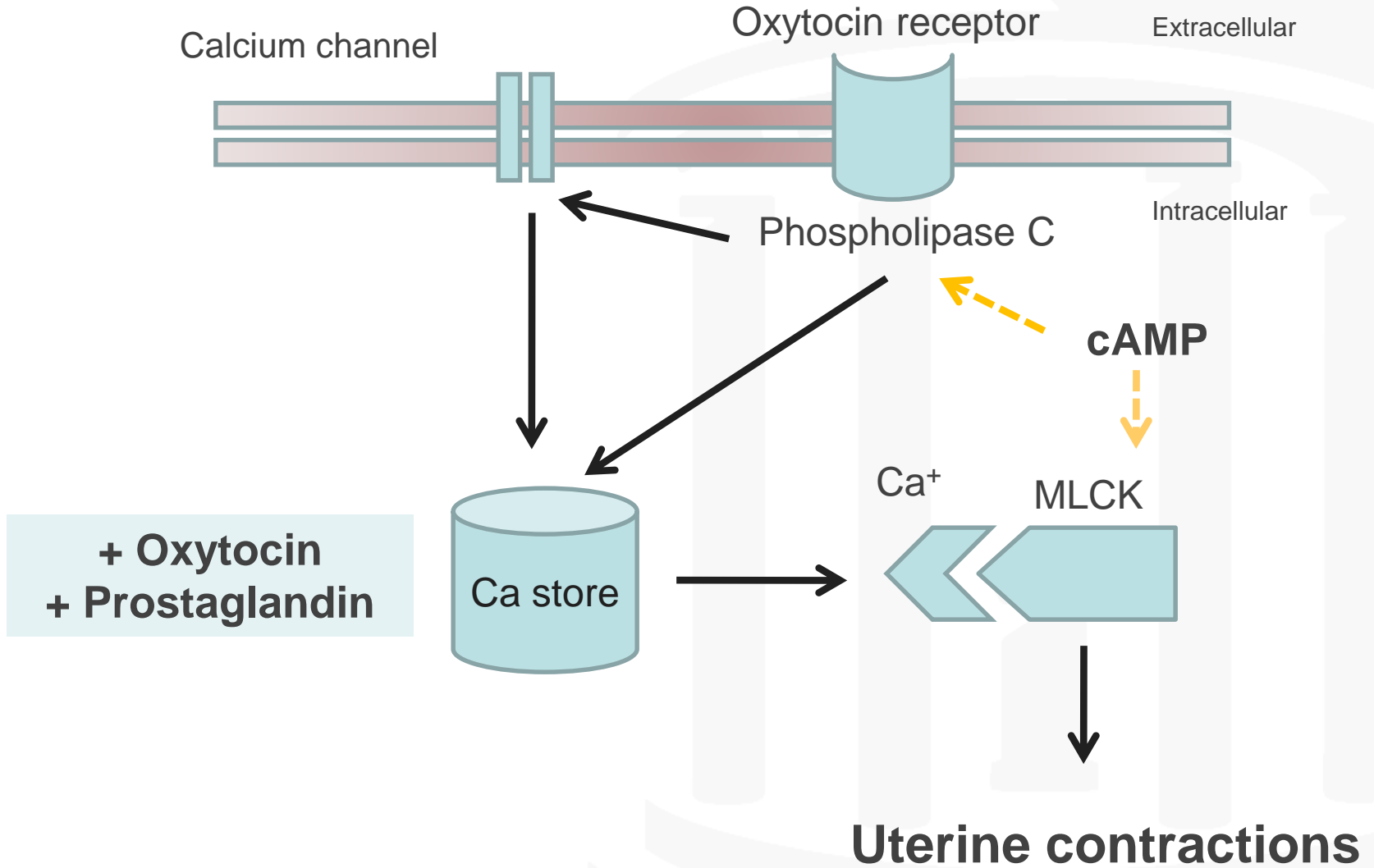
Initiation of Labor

- Fetus
 - » Sheep
 - Fetal ACTH and cortisol
 - » Placental 17 α hydroxylase
 - » \uparrow Estradiol
 - » \downarrow Progesterone
 - » Placental production of oxytocin, PGF₂ α
 - » Humans
 - Fetal increased DHEA
 - » Placental conversion to estradiol
 - » Increased decidual PGF₂ and gap junctions
 - » Increased oxytocin and PG receptors
 - » Decreased progesterone receptors



Initiation of labor

- Oxytocin
 - » Peptide hormone
 - » Hypothalamus-posterior pituitary
 - » Fetal production
 - Maternal serum increase in second stage of labor
 - » Oxytocin receptors
 - Fundal location
 - 100-200 x during pregnancy
 - » Actions
 - Stimulate uterine contractions
 - Stimulate PG production from amnion/decidua





Labor

Regular uterine contractions
(duration 30-60 seconds, every 5 minutes)
and
Progressive cervical dilatation



Management of labor

- Requirements
 - » Continued progress: Station and dilatation
 - » Continued reassuring fetal status

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"More hot water!"

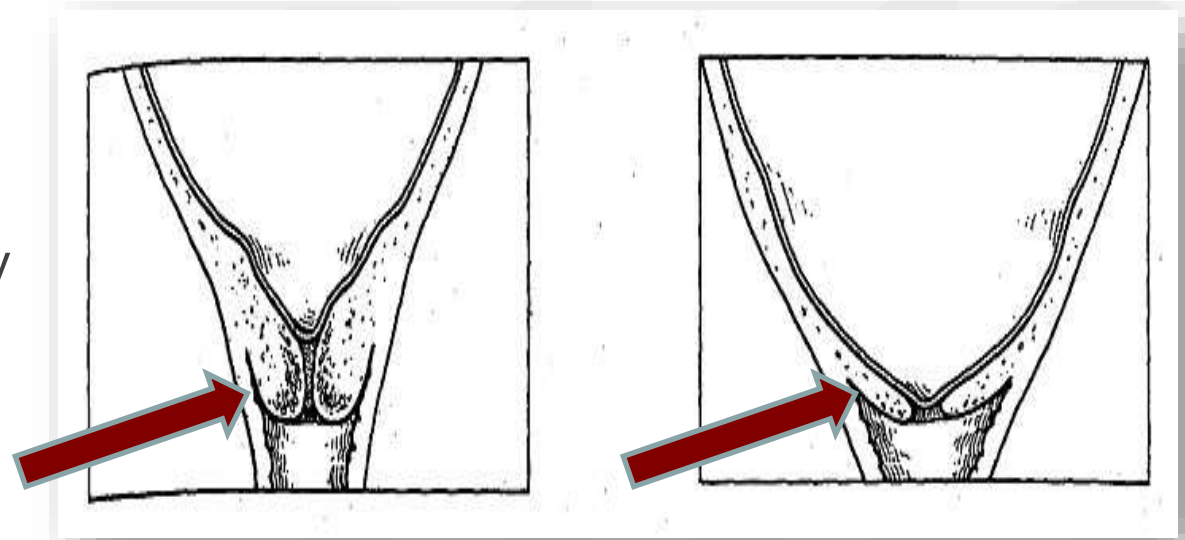


LABOR PROGRESS



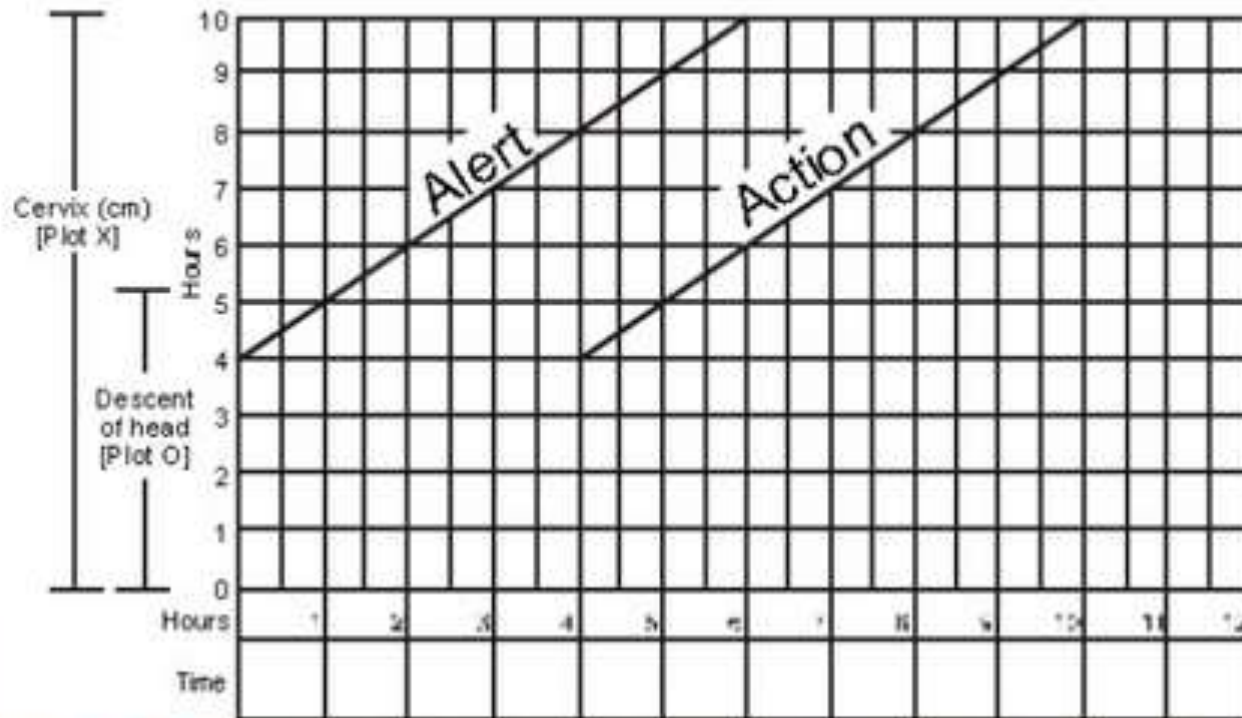
Mechanisms of labor

- Effacement
- Dilatation
- Three “P’s”
 - » Powers
 - Uterine activity
 - » Passage
 - » Passenger





Cervical dilatation





Powers

- Uterine contractions

- » Normal labor
- » Duration 30-60 seconds
- » Q 2-5 minutes

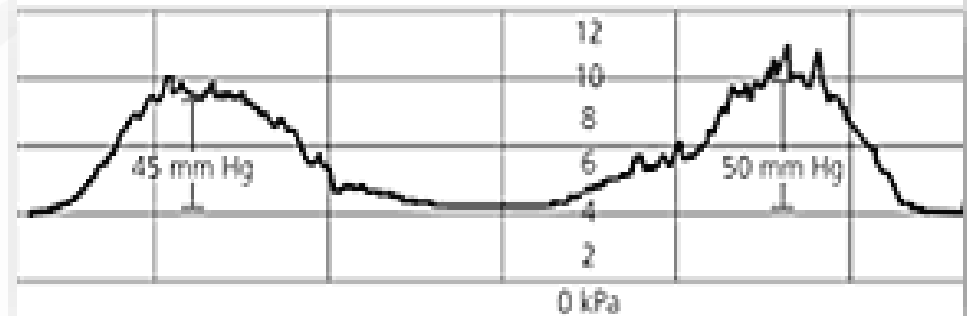
- 3-5 contractions / 10 minutes

- » Montevideo units (intrauterine catheter)

- Baseline to peak, sum of contractions in 10 minutes
- Adequate: >200-250 MVU





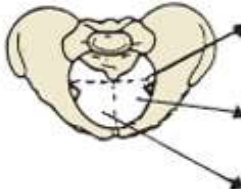
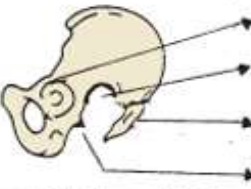
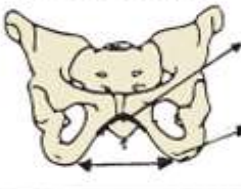
- Interventions

- » Induction
- » Augmentation
 - Oxytocin
 - AROM





Passage

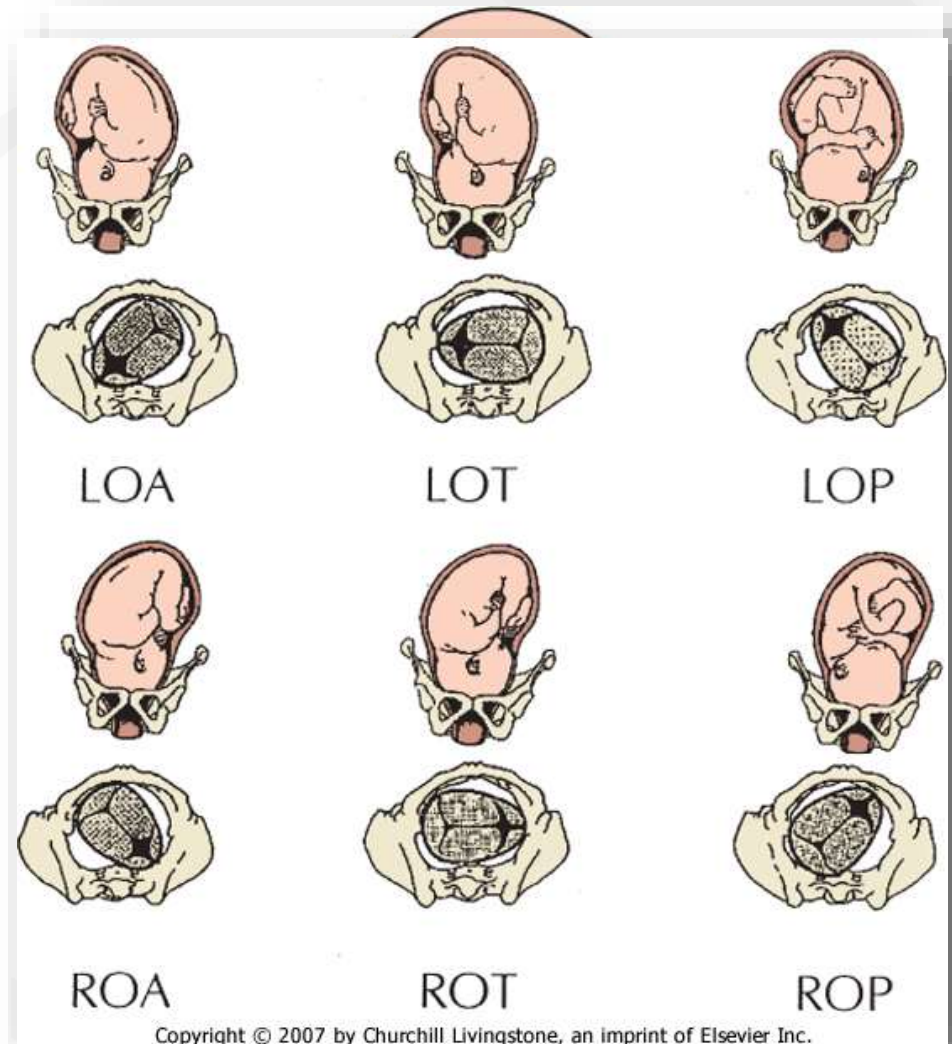
		 Gynecoid	 Anthropoid	 Android	 Platypelloid
Pelvic inlet 	Widest transverse diameter of inlet	12 cm	< 12 cm	12 cm	12 cm
	Anteroposterior diameter of inlet	11 cm	> 12 cm	11 cm	10 cm
	Forepelvis	Wide	Divergent	Narrow	Straight
Pelvic midcavity 	Side walls	Straight	Narrow	Convergent	Wide
	Sacrosciatic notch	Medium	Backward	Narrow	Forward
	Inclination of sacrum	Medium	Wide	Forward (lower third)	Narrow
	Ischial spines	Not prominent	Not prominent	Not prominent	Not prominent
Pelvic outlet 	Subpubic arch	Wide	Medium	Narrow	Wide
	Transverse diameter of outlet	10 cm	10 cm	< 10 cm	10 cm

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Passenger

- Size
 - » 4500gram = macrosomia
- Lie
- Presentation
 - » 5% not vertex
- Attitude
- Position
- Station
 - » Engagement
 - Widest diameter passes inlet
 - '0' station, vertex



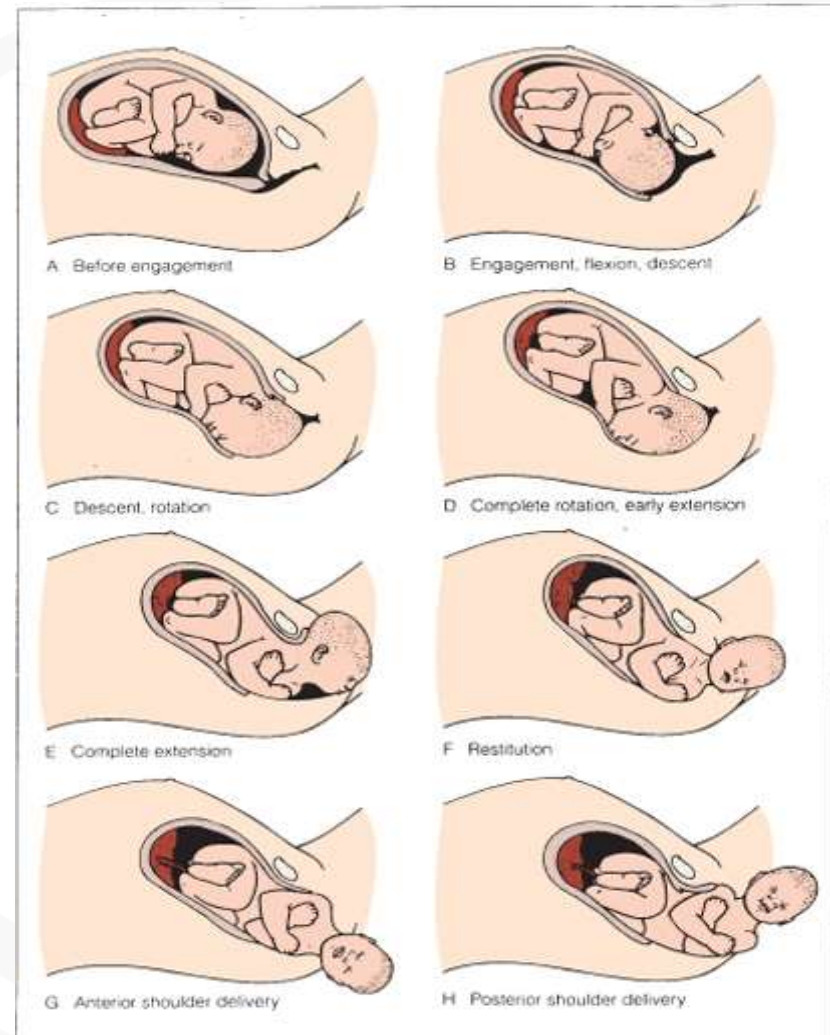
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Cardinal Movements of Labor

- Descent
- Flexion
- Internal rotation
- Extension
- External rotation
- Expulsion



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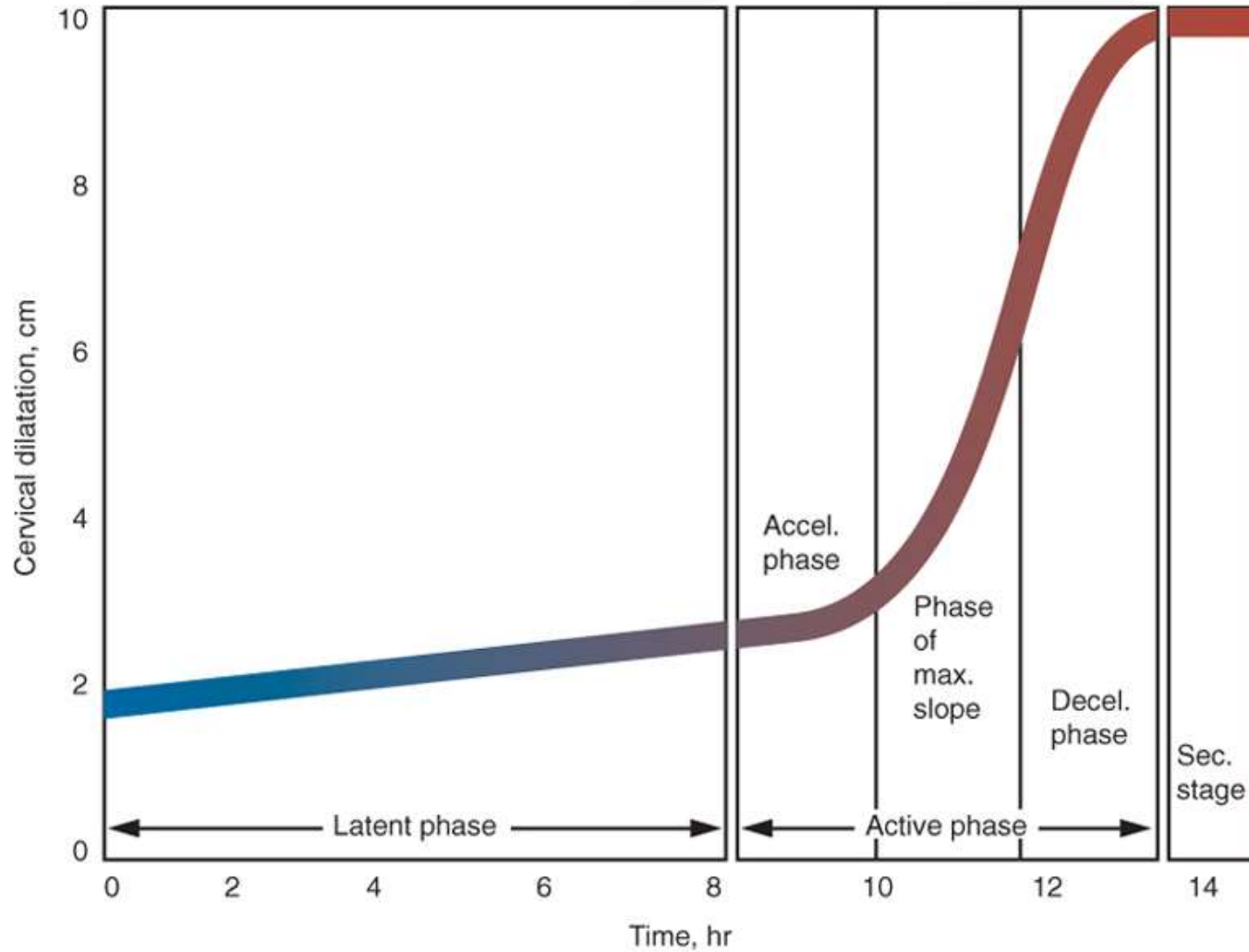
Labor stages

- First stage – onset of labor to complete dilatation
 - » Latent phase
 - » Active phase
- Second stage
- Third stage





Partogram



Labor stages

- First stage – onset of labor to complete dilatation
 - » Latent phase – onset to rapid cervical change
 - » Active phase – rapid cervical change to complete dilatation

• Second stage

• Third

• Fourth

	Nulliparous		Multiparous	
	Mean	95 th % tile	Mean	95 th %tile
Latent phase	7.3-8.6hr	17-21 hr	4.1-5.3hr	12-14 hr
Active phase		1.5cm/hr		1.2cm/hr



Labor stages

- First stage – onset of labor to complete dilatation
- Second stage – complete dilatation to delivery of neonate
- Third stage
- Fourth stage

	Nulliparous		Multiparous	
	Mean	95 th % tile	Mean	95 th %tile
No epidural	53-57 min	122-147 min	17-19 min	57-61 min
Epidural	79 min	185 min	45min	131min



Labor stages

- First stage – onset of labor to complete dilatation
- Second stage
- **Third stage**
 - » Delivery of the placenta
 - » Mean – 6 minute
 - » 97th tile 30 minutes
 - Prolonged
 - » EBL >500
 - » Need for D&C
 - » Drop in HCT by 10%

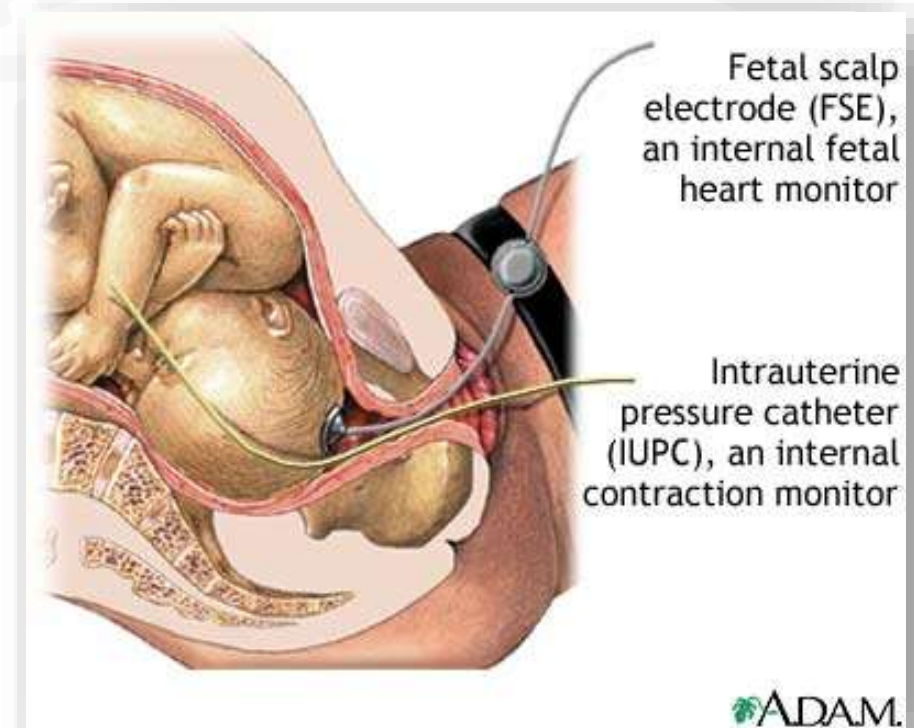


INTRAPARTUM FETAL ASSESSMENT: ENSURE REASSURING FETAL STATUS



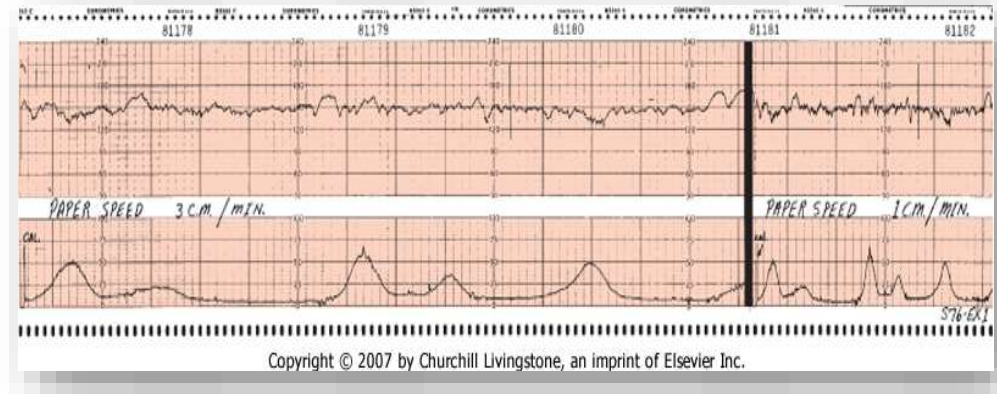
Fetal assessment in labor

- External monitoring
- Internal monitoring



Patterns of fetal heart rate monitoring

- Baseline
- Variability
- Periodic changes
 - » Accelerations
 - » Decelerations
 - Variable
 - Early
 - Late





Patterns of fetal heart rate monitoring

- **Baseline**
- Variability
- Periodic changes
 - » Accelerations
 - » Decelerations
 - Variable
 - Early
 - Late
- **Normal**
 - » 110-160
- **Tachycardia**
 - » >160
- **Bradycardia**
 - » <110

Patterns of fetal heart rate monitoring

- Baseline
- Variability
 - » Accelerations
 - » Decelerations
 - Variable
 - Early
 - Late
- Absent
 - » undetectable
- Minimal
 - » ≤ 5 bpm
- Moderate
 - » 5-25bpm
- Marked
 - » >25 bpm



Patterns of fetal heart rate monitoring

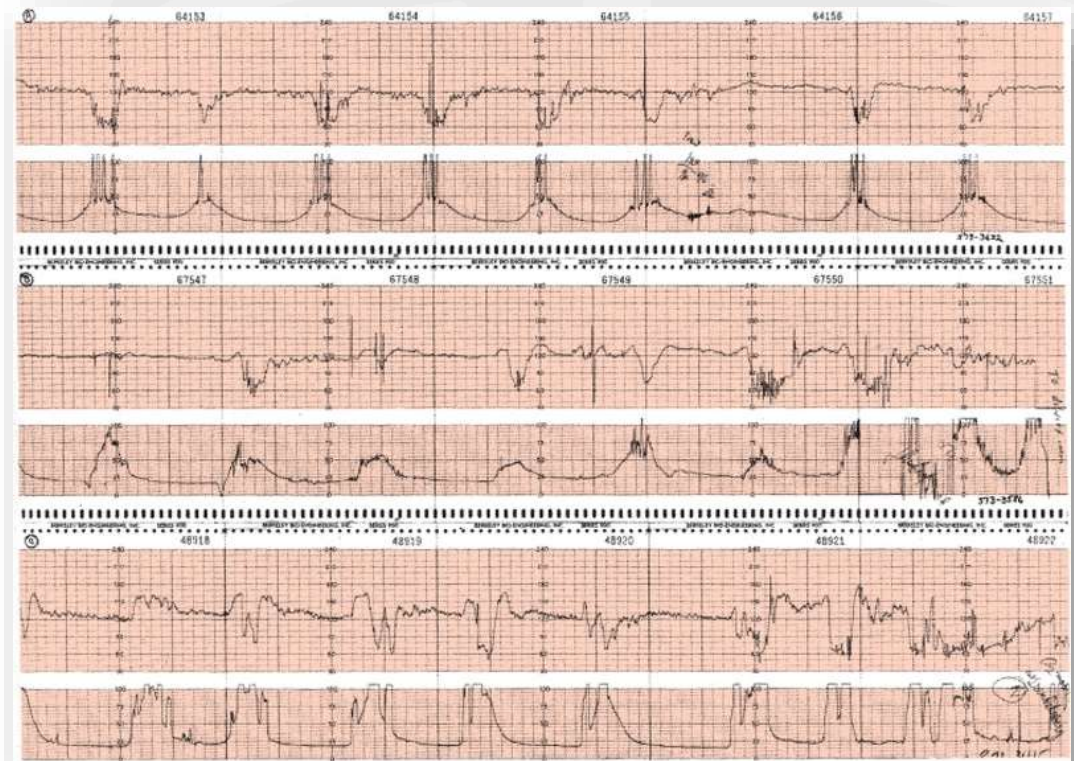
- Baseline
- Variability
- Periodic changes
 - » Accelerations
 - » Decelerations
 - Variable
 - Early
 - Late



<32 weeks 10bpm over baseline
>32 weeks 15bpm over baseline

Patterns of fetal heart rate monitoring

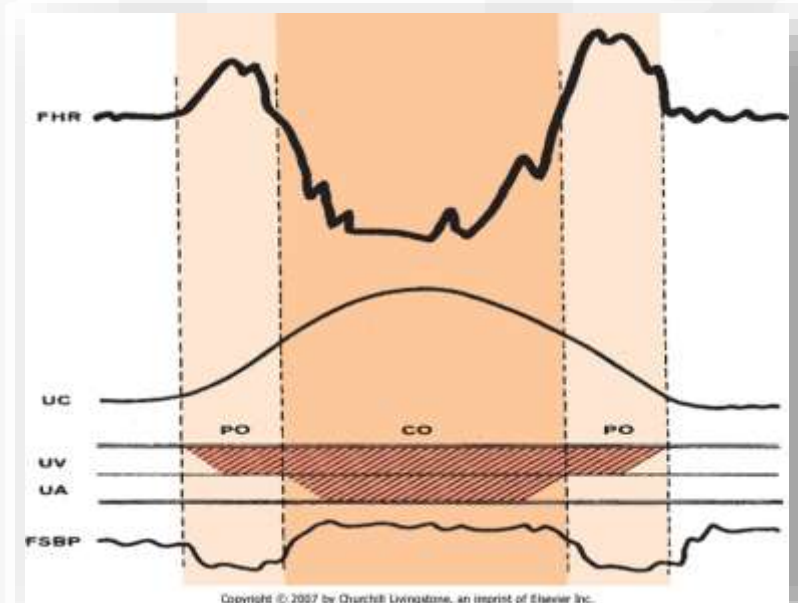
- Baseline
- Variability
- Periodic changes
 - » Accelerations
 - » Decelerations
 - Variable
 - Early
 - Late



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Patterns of fetal heart rate monitoring

- Variable decelerations
 - » Umbilical cord compression
 - » Variable in appearance
 - » Processes
 - UV compression
 - » Decreased cardiac return
 - » Fetal hypotension
 - » Fetal increased HR
 - UA compression
 - » Increased SVR
 - » Decreased fetal heart rate
 - protective



Patterns of fetal heart rate monitoring

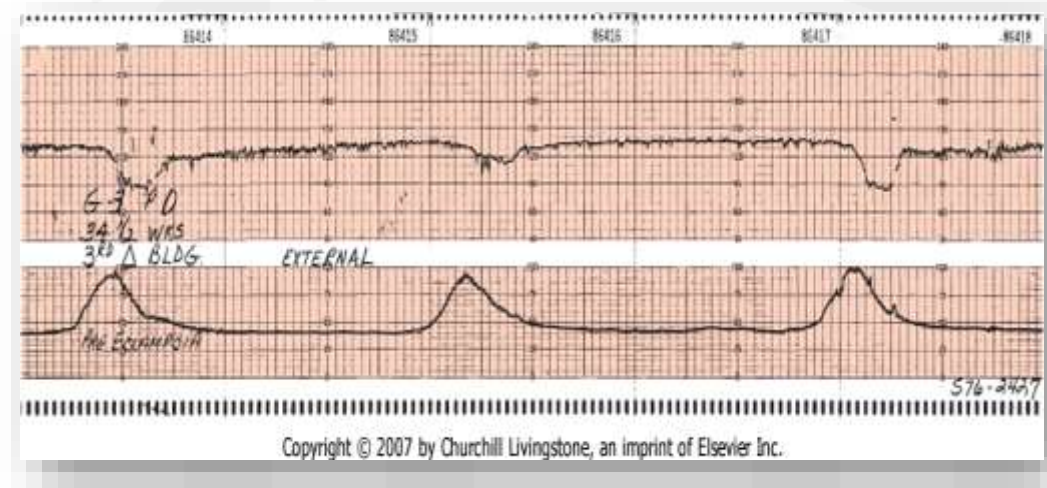
- Baseline
- Variability
- **Periodic changes**
 - » Accelerations
 - » Decelerations
 - Variable
 - Early
 - Late



- 5-10% of labors
- Vagal reflex
 - cervical compression on fetal head

Patterns of fetal heart rate monitoring

- Baseline
- Variability
- Periodic changes
 - » Accelerations
 - » Decelerations
 - Variable
 - Early
 - Late



- Uteroplacental insufficiency - hypoxia
- Reflex late
 - low O₂ in CNS, increased sympathetic tone, increased BP, baroreceptor mediated bradycardia
- Myocardial depression



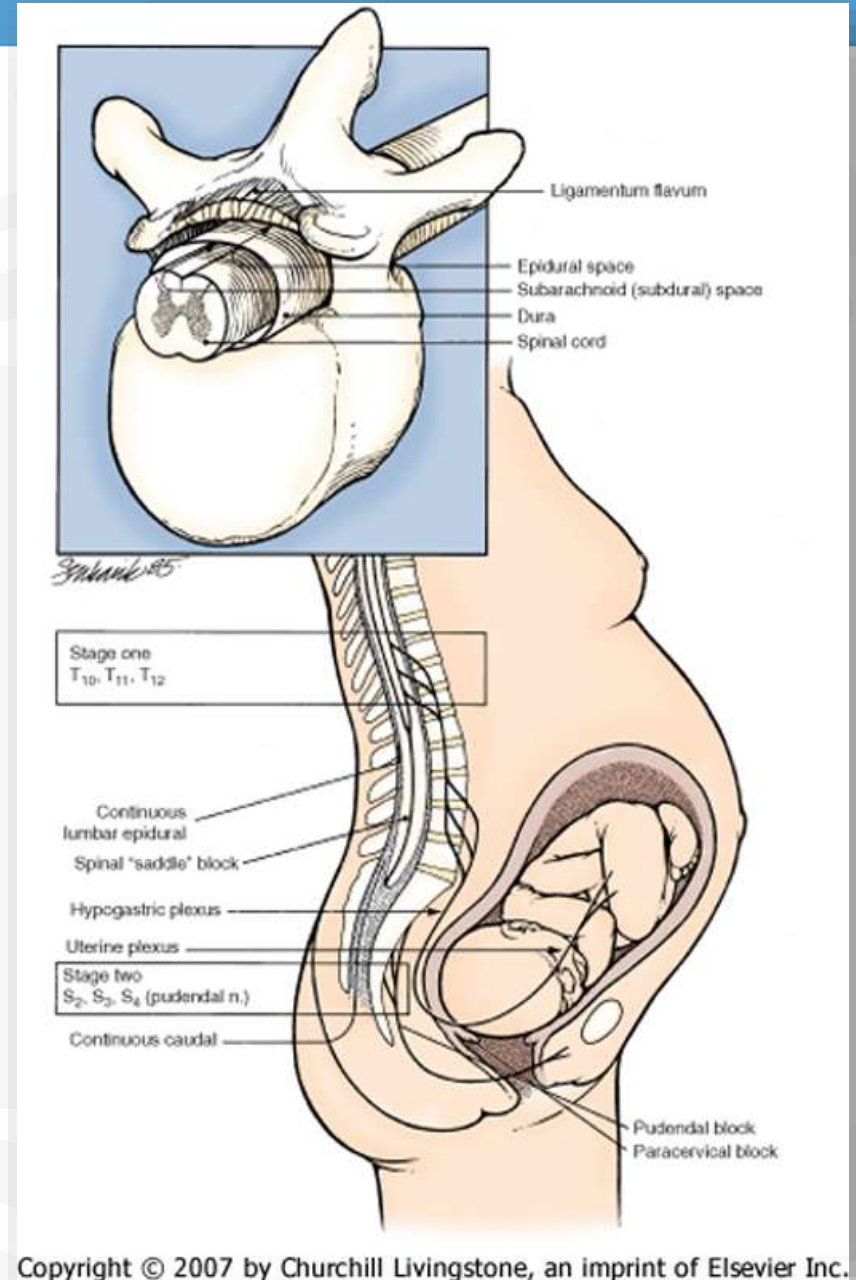
Management of abnormal fetal heart rate patterns

- Remove potential etiologies
 - » Hypotension
 - Maternal position – left lateral recumbent
 - IVF hydration, ephedrine
 - » Maternal O₂ administration
 - » Cessation of contractions
 - Discontinue oxytocin
 - Uterine relaxants – terbutaline
 - » Amnioinfusion
 - » Expedite delivery



Pain control in labor

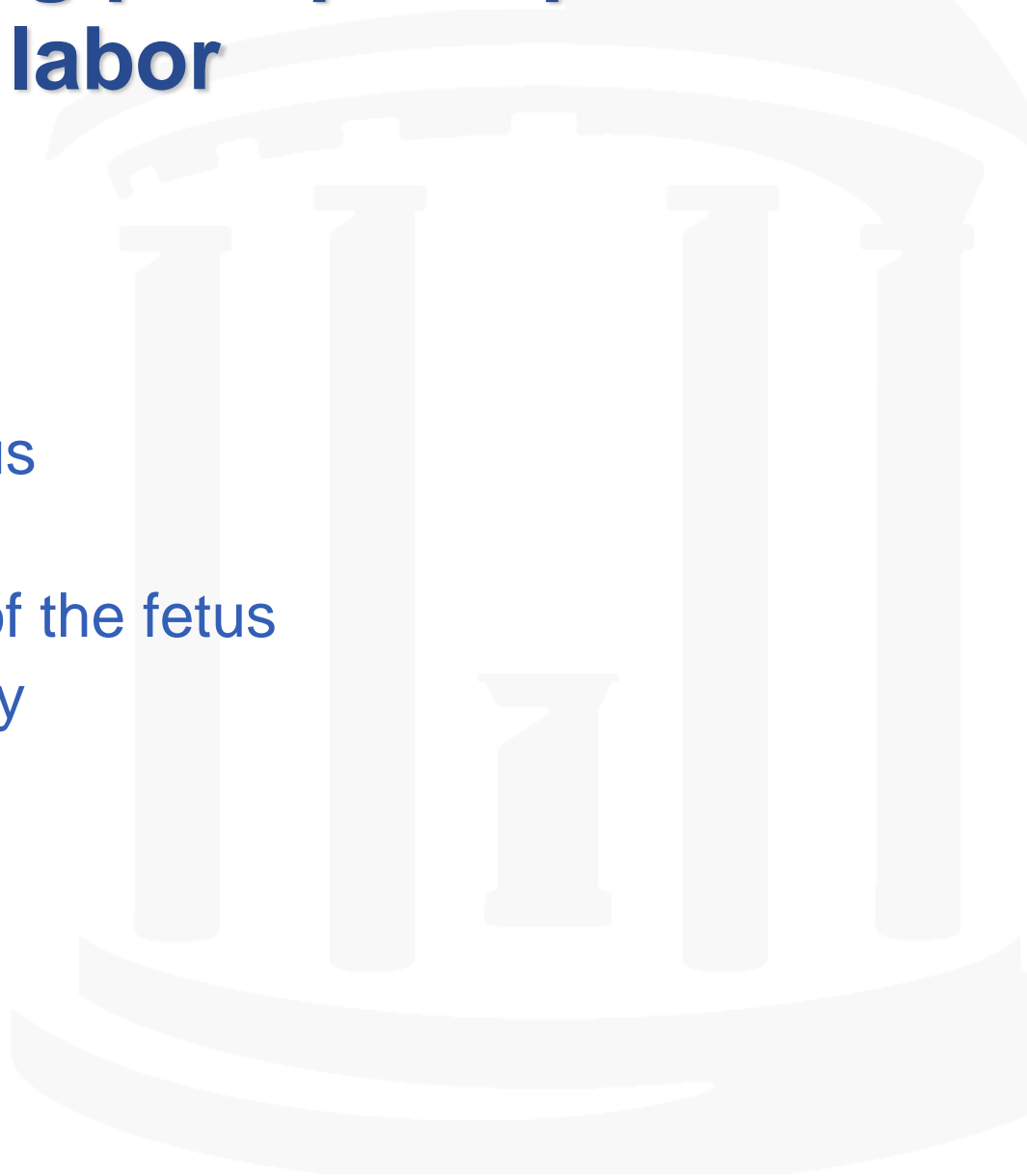
- Uterine pain
 - » T10-T12
- Delivery pain
 - » S2-4
- Cesarean
 - » T4
- Management
 - » Psychoprophylaxis
 - TENS
 - Acupuncture
 - Prenatal education
 - » Systemic opioid
 - » Regional analgesia/anesthesia





Factors affecting pain perception in labor

- Mental preparation
- Family support
- Medical support
- Cultural expectations
- Underlying mental status
- Parity
- Size and presentation of the fetus
- Maternal pelvic anatomy
- Duration of labor
- Medications





Is pain bad in labor?

Psychological stress can cause:

- increased levels of catecholamines
- hyperventilation

These may result in decreased uterine blood flow leading to hypoxia and acidosis in the fetus



Analgesia for labor and delivery

- Non-medication
- Inhalational
- Parenteral
- Regional





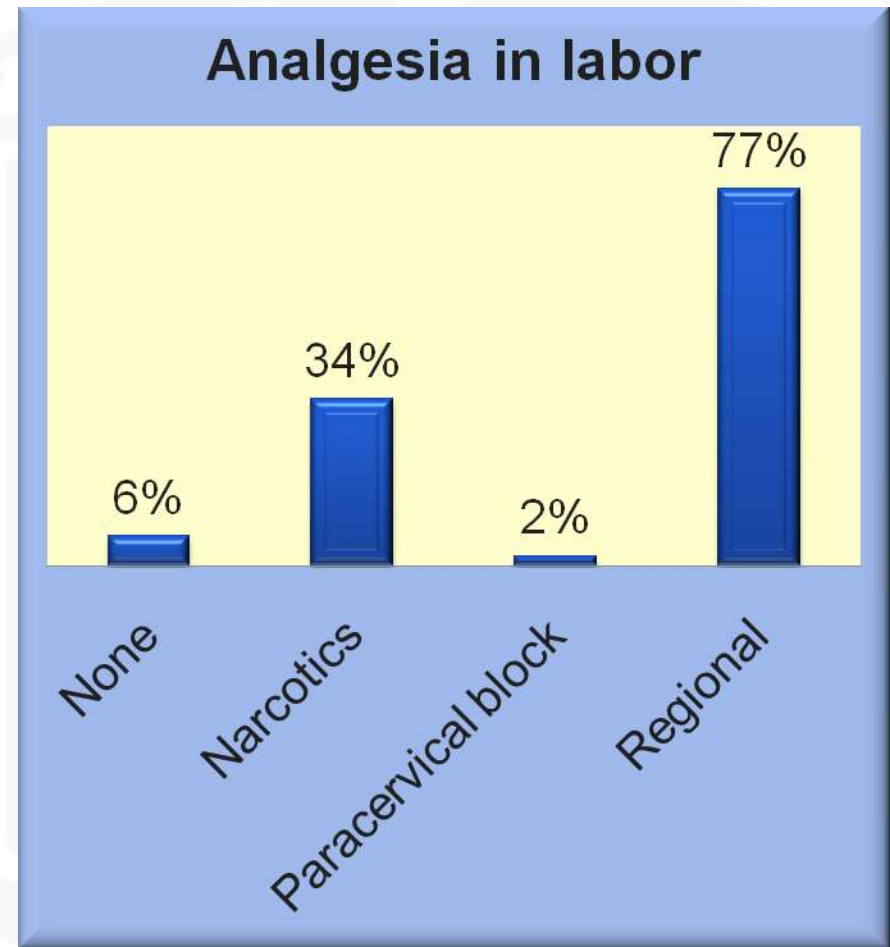
Analgesia- Non medication options

- Breathing exercises
- Autohypnosis
- Acupuncture
- White Noise/ Music
- Massage/ walking
- TENS
- Water bath



Pain control in labor

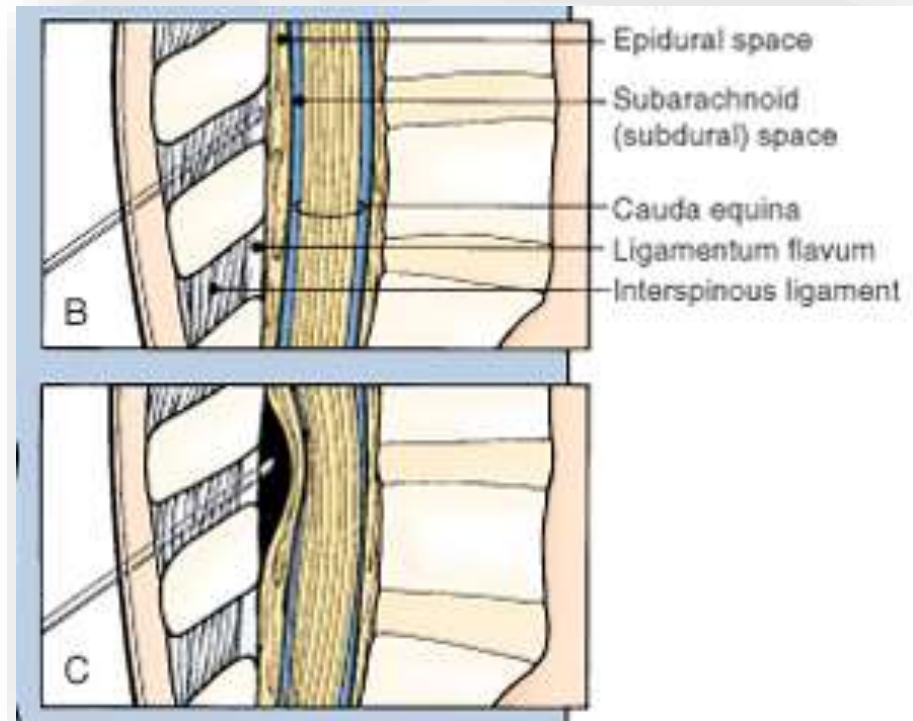
- Systemic opioids
 - » Analgesia
 - » Sedation
- Bolus/PCA
 - » Meperidine
 - » Nalbuphine
 - » Butorphanol
- Risks
 - » Neonatal depression
 - » Delayed gastric emptying



Bucklin BA. Anesthesiology 103:645, 2005

Pain control in labor

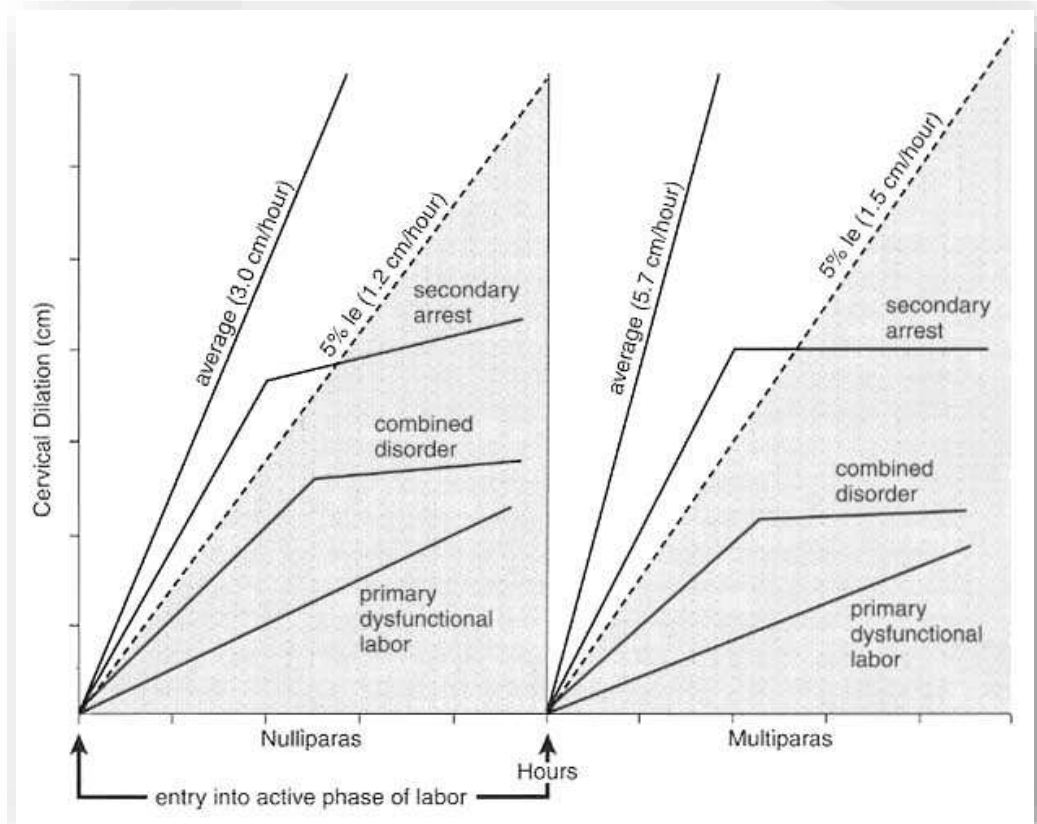
- Regional analgesia/anesthesia
 - » Epidural
 - L2-5
 - Local anesthetic
 - » Bupivacaine (0.25%)
 - » Spinal
 - CSE
 - » Intrathecal opioid
 - » Local anesthetic
 - » Local/pudendal





Abnormal labor

- Prolonged descent
- Prolonged dilatation
- Assess/correct “3 P’s”





Abnormal labor - interventions

- Augmentation
 - » Oxytocin
 - Achieve adequate uterine contractions
 - Requires reassuring fetal status
 - » AROM
- Therapeutic rest
- Operative vaginal delivery
- Cesarean delivery



Operative vaginal delivery

- Indications

- » Prolonged second stage
- » Fetal compromise
- » Aftercoming fetal head/breech
- » Maternal indications
 - Cardiac disease
 - CNS disease

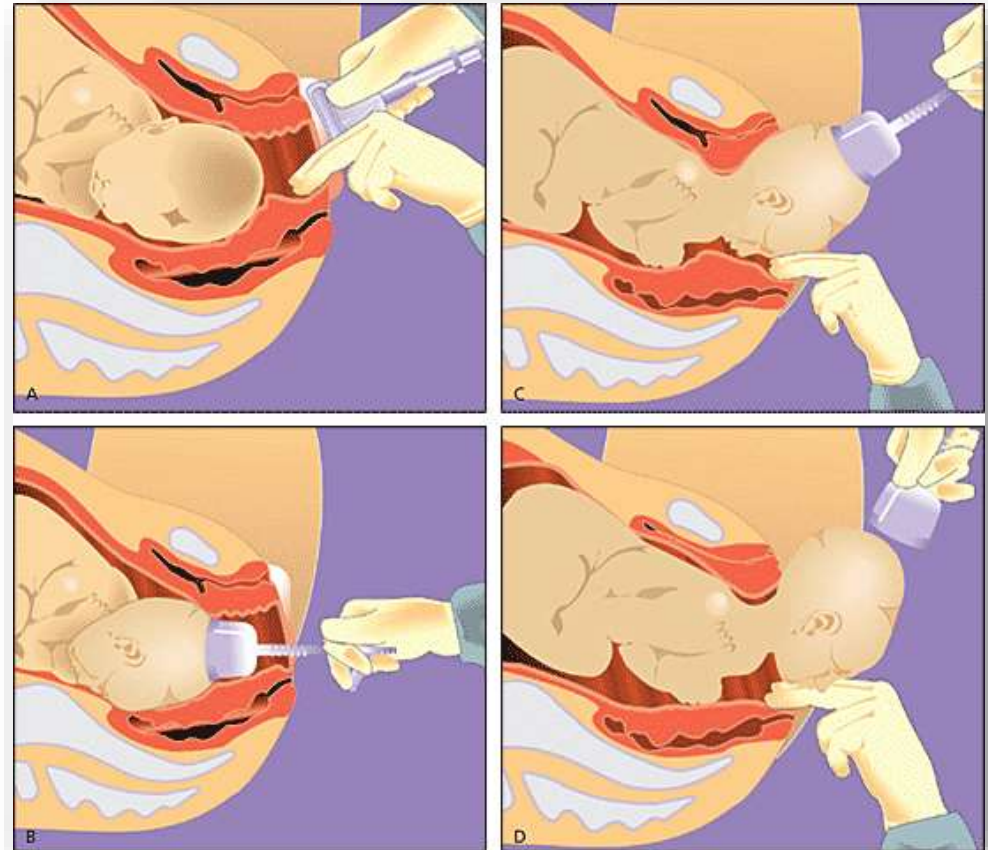
- Requirements

- » Consent
- » Completely dilated
- » Ruptured membranes
- » Adequate anesthesia
- » Empty bladder
- » Known fetal position



Operative vaginal delivery

- Vacuum
 - » Suction cup
 - » Sagittal suture
 - » Maintain flexion
- Lower success rate
- Lower maternal trauma
- Increased fetal trauma





Operative vaginal delivery

- Obstetrics forceps
 - » Higher success rate
 - » Increased maternal trauma
 - » Allow rotational maneuvers





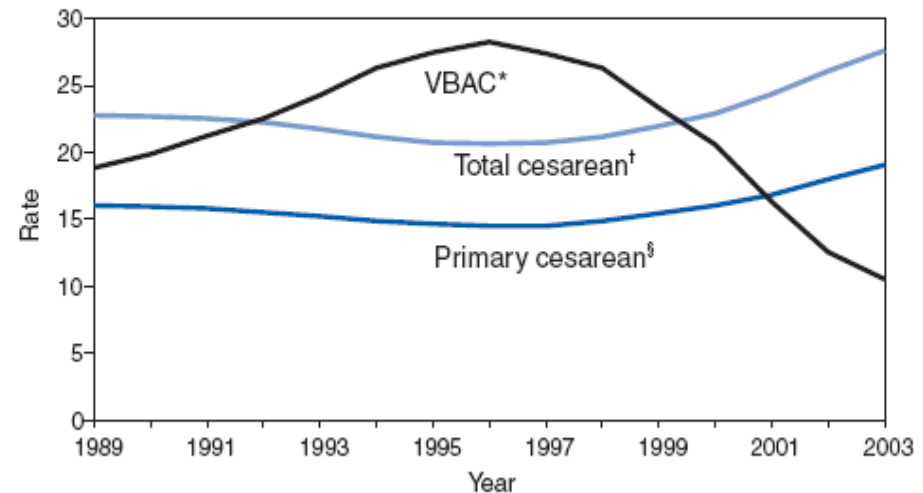
Cesarean Delivery

- 2006 cesarean rate (US)
 - » 31.1% 2005

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Total and Primary Cesarean Rate and Vaginal Birth After Previous Cesarean (VBAC) Rate — United States, 1989–2003



* Per 100 births to women with a previous cesarean delivery.

† Per 100 births.

‡ Per 100 births to women with no previous cesarean delivery.

Cesarean delivery

- **Indications**

- » **Maternal**

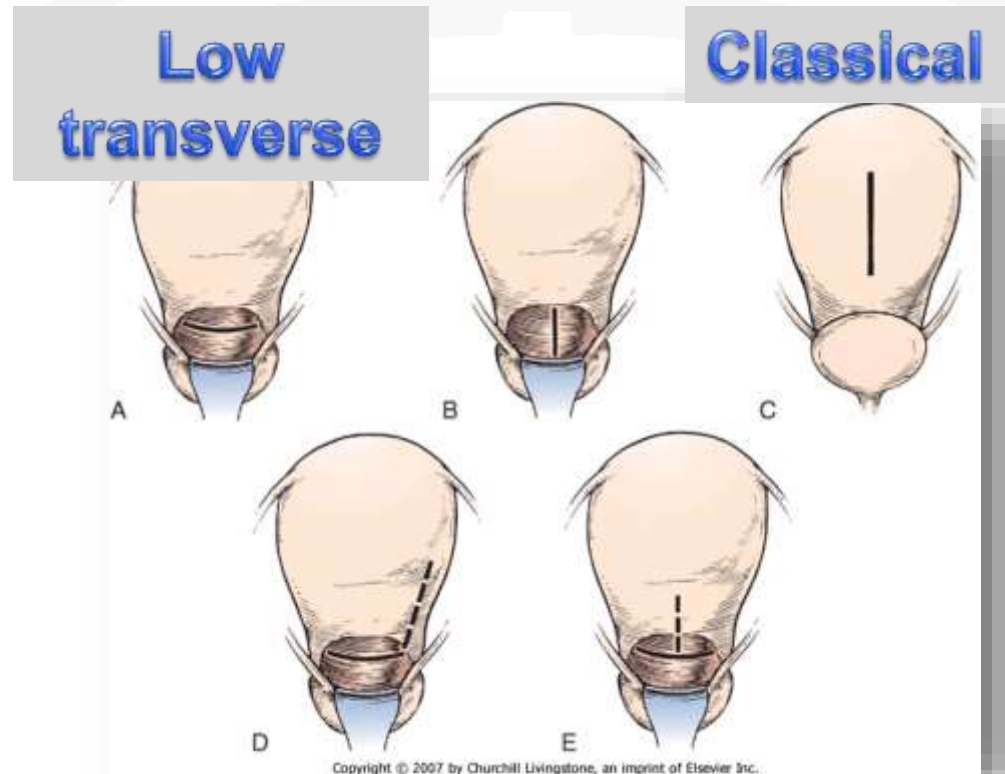
- CNS/cardiac disease

- » **Fetal**

- NR fetal status
- Malpresentation
- HSV

- » **Maternal-fetal**

- Arrest of labor
- Abruption
- Placenta previa





Vaginal Birth Following Cesarean

- Success rates

- » 60-80%
- » Higher success
 - Prior vaginal birth
 - Prior malpresentation
 - Spontaneous labor

- Risks

- » Uterine rupture
 - LTCS: 0.5-1.0%
 - LVCS: 0.8-1.1%
 - Classical: 4-9%

- Candidates

- » ACOG
 - One prior LTCS
 - No prior rupture/ut scars
 - Immediate cesarean available
- » Others possible



Summary

- **Initiation of labor**
 - » Maternal-fetal-placental interactions
- **Optimal maternal-fetal outcome**
 - » Normal labor progress
 - » Reassuring fetal testing
- **Preterm labor/PPROM**
 - » 10-12% incidence/ 50-70% perinatal morbidity
 - TVCL and FFN best predictors of absence or PTB
 - » Effective strategies
 - Antenatal corticosteroids
 - PPRM abx
 - 17P in prior PTB

