

★ True labour pain = regular rhythmic progressive contractions of uterus that lead to cervical dilatation

stage = 1. Latent = 0-4 cm
2. Active = 5-10 cm
(cervical dilatation)

2 delivery of baby → 3 delivery of placenta (30 min max) → 4 observation (1-2 hr)

★ How to monitor the mother

- Cool
- So
- Not bitter

★ Spotting

- 1st trimester

- m - molar pregnancy ($n < 6w$)
- m - miscarriage
- e - Ectopic
- normal pregnancy

- 2nd trimester

- 3rd trimester

- placental previa → Risks 1. Previous surgeries 2. multifertility 3. Multi Gestation
- Placental Abruption
- Uteral Abruption → Risks 1. Smoker 2. IVF
- Local Laceration

① - missed = Cervix Spotting? Findings on US
- closed - yes - No fetal heart (diff b/w GA Age and size)

② - septic = - closed - yes - yes
+ Vaginal discharge
+ foul smelling

③ - Threatened = - No dilatation + bleeding = Abortion or ^{misc} normal
+ fetal heart yes

④ - Inevitable = - open - bleeding - Present fetal heart

⑤ - Complete = - closed - minimal - no fetus no placental tissue

⑥ - Incomplete = - open - yes - no fetus but Placenta present

① Acreta = Adhesion reaches myometrium

② Increta = Invasion

③ Pericreta = Penetrating

★ All CS

★ Risk factors:

1. Multiple CS
2. Evacuation/DNC
↳ Endometrium tissue Removal ↳ Endometrium tissue biopsy

★ Primary Amenorrhea with no Breast = Classical
Type 1 Turner

↳ main investigation = Karyotyping

PGE1 = stronger = Misoprostol = used to induce Abortion (Early weeks)

PGE2 = weaker = Prostelin = used to induce labour (late weeks)

- Anti-D

- Indirect comb test

RhoPhylac (Anti-D)

- -ve ✓
- $n < 16$ ✓
- $n > 16$ Immunized

-PGE1 = Stronger = Misoprostol:

1. Cervical Ripening
2. Induce Abortion (stronger)

-PGE2 = Weaker = Dinoprostol

1. Cervical Ripening
2. Induce Labor (weaker)

HTN =

1. Chronic HTN → . Stop old medication
↳ Methyl dopa
2. gestational HTN → $x > 24w$
3. PET (mild, moderate, severe)

- 1st choice
1. Labetalol
 2. CCB
 3. Methyl dopa / IV Hydralazine
 4. MgSO₄
- last choice
- ↳ loading dose
 - ↳ maintenance
 - ↳ side effects
 - ↳ How to monitor toxicity
 - ↳ Anti-dote

Loading Dose:	
•	4-6 grams IV over 20-30 minutes, typically used for eclampsia or preeclampsia management.
Maintenance Dose:	
•	1-2 grams/hour IV as a continuous infusion to maintain therapeutic levels.
Side Effects:	
•	Common: Flushing, nausea, headache, muscle weakness, and hypotension.
•	Serious: Respiratory depression, cardiac arrest, and hyporeflexia.
How to Monitor Toxicity:	
•	Clinical signs: Loss of deep tendon reflexes is an early sign of toxicity.
•	Serum magnesium levels:
•	Therapeutic range: 4-7 mEq/L.
•	Toxicity typically occurs when levels exceed 8 mEq/L.
Antidote:	
•	Calcium gluconate (1 gram IV) is the antidote for magnesium toxicity.

* Convulsing pt

- * PET mother ^{induced} =
1. Artificially rupture membrane
 2. oxytocin
 3. MgSO₄ (prevent + Tx for PET) (neuroprotective)
 4. Dexamethasone (protective for premature lung collapse)

* steps of P/E =

1. Thyroid → . Hyperthyroidism = Amenorrhea
. Hypothyroidism = oligomenorrhea
2. Breast (if relevant)
3. Abdominal → (+ obs findings and maneuvers)
4. Gynecological Examination =

1. vitals
2. Inspection of Vulva → . Hymen
. Pubic Hair
3. Speculum
4. bimanual
5. High neck uterine swab
6. Pap smear

* Investigations:

— Labs:

1. CBC → Anemia, Coagulopathies
2. CRP → Intra. Inflammation
3. ESR → multiple myeloma (lytic lesion) (Radiolucent)
4. Thyroid levels → Hypo/Hyper
5. CTG/Non-stress test → fetal
6. Vaginal pH → Acidic = Candida Alkali = ? + ?
7. Vaginal culture → type of micro organism

— Imaging:

1. US
2. MRI

* 32w Preterm Labour:

* Vitals + general then:

1. give Tocolytics (Anti-uterine contractions)
↳ e.g: progesterone
2. dexamethasone

— If * labour doesn't stop

- * =
1. Artificial membrane rupture
 2. oxytocin (if cervix dilation > 5cm)
 3. Prostaglandins (if cervix < 5cm)
 4. Vacuum → Forceps → if all fails = CS

* Vaginal bleeding dx:

— Vaginal:

1. Laceration
2. Endometrial hyperplasia
3. Polyps

— Anus:

1. Hemorrhoid
2. Fissure
3. Tear

* Pt water broke =

1. warm? odorless? clear color?
2. POX =

3. Physical tests:

1. +ve cough
2. +ve pooling
3. PH
↳ Alkali
4. US = low liquor = oligohydramnios

1. PMMR (Premature membrane rupture)

2. Urinary Incontinence →

1. stress

2. urgency

3. overflow

4. mixed

3. vaginal discharge

↳ . ↑ Abdominal pressure
(coughing, laughing, coughing)

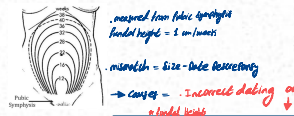
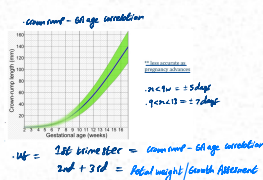
↳ . frequency
. urgency

↳ . Incontinence dripping

↳ . stress + . urgency

4. Semen discharge

. but control present



1. Larger than Expected	2. Smaller than Expected
- Multiple gestation (twins, triplets) - Macrosomia (fetal weight > 4kg) - Polyhydramnios (excess amniotic fluid) - Molar pregnancy	- Fetal growth restriction - Oligohydramnios (low amniotic fluid) - Fetal demise

* Macrosomia = Fetal weight > 4kg
- Fetal Macrosomia -> 4kg
- Fetal Macrosomia > 4kg
Maternal Risk Factors:
1. Maternal DM (Pre-pregnancy or Gestational)
2. Excess weight gain during pregnancy
3. History of previous macrosomic deliveries
4. Pregnancy extending beyond 38 weeks (Post delivery date)
5. Male infants (M-F)
Maternal Risks:
1. Increased likelihood of cesarean delivery
2. Prolonged labor
3. Postpartum hemorrhage (PPH)
4. Cesarean rupture
Newborn Risks:
1. Increased risk of Hypoglycemia
2. Childhood obesity and metabolic syndrome (e.g., NAFLD - Non-alcoholic fatty liver disease)

1st Trimester -> 1-12w
2nd Trimester -> 12-27w
3rd Trimester -> 28w-37w
Term -> 37-42w
Post-Term -> >42w

Obstetrics
OB-GYN

Normal Pregnancy

* 28 weeks = Full term

Basic Terminology of Pregnancy

- (Gravida) **Gravidity**: Number of times a woman has been pregnant
(Para) **Parity**: Number of completed pregnancies
Term birth - **T**: Number of pregnancies leading to birth > 37 weeks gestational age
Preterm birth - **P**: Preterm 20 < w < 37w
Abortion/miscarriage - **A**: Abortion < 20w
Living children - **L**: Living children
* e.g.: 631114 = 6 = 3 pregnancies, T = 1 full term > 37, P = 1 pre term < 37, A = 1 abortion, L = 4 living children = the term or pre-term where 2 bins or 1 + binlet

Developmental age: The number of weeks/days since fertilization -> days since fertilization (time day 0/fertilization)
Gestational age: The number of weeks/days since the last menstrual period -> days since last menstrual period (LMP) (time day 0/bleeding)

Trimesters: (These ranges are defined slightly differently depending on source)

1st: Weeks 1-12 weeks GA 2nd: Weeks 13-27 week GA 3rd: Weeks 28- birth

Diagnosis of Pregnancy

1. **β-hCG**
- Most common. Either urine or serum (more sensitive).
- Generally positive by the time of expected period (ie ~ 2 weeks after ovulation and conception)
- β-hCG doubles ~ 48 hours during early pregnancy and peaks around 100,000 mIU/mL by 10 weeks GA, declining slowly after this point, to around 12,000 mIU at 20w (Term)

2. **Ultrasound**
- Most often used to confirm intrauterine pregnancy *rule out ectopic pregnancy
- Gestational sac visible on transvaginal US at ~5 weeks GA (β-hCG ~ 1,500 mIU/mL)
- Yolk sac visible at ~ 5-6 weeks 2. Fetal pole ~ 5.5-6w
- Fetal heart motion measurable ~ 6 weeks GA (β-hCG ~ 5,000 mIU/mL)

Dating of Pregnancy

Naegle Rule: Estimated date of delivery is three months minus date of last menses, plus 7 days

$$EDD = LMP + 7d - 3m$$

e.g. LMP = 4/2/2024
EDD = 11/11/2024

Ultrasound (if LMP is uncertain):

Test	Timing	Accuracy
Crown-Rump Length for GA age	< 13 weeks 1st trimester	+/- 5 Days (early) to +/- 7 Days (later) Most accurate at 7-10 weeks 2 < 9w = ± 5 days 9 < 13 = ± 7 days
1. Biparietal Diameter 2. Head Circumference 3. Femur Length	> 13 weeks 2nd + 3rd trimester	+/- 7 days (during early 2nd trimester) to +/- 3-4 weeks (by end of 3rd trimester)

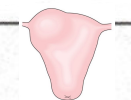
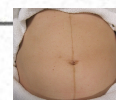
4. **Abdominal Circumference** -> Fetal weight
Notes: for Fetal weight/Growth Assessment -> Compare Fetal weight to GA age = growth Assessment = normal/Restricted/Accelerated

- 1- If assisted reproduction, can simply add 266 days to date of conception * IVF EDD = date of conception + 266 days
2- If discrepancy between LMP and ultrasound: Can redate (ie use US date) if the patients LMP falls outside the above confidence interval for the US test
3- **Fundal height** should be ~ 1 cm/week pregnant
4- **Fetal heart tones** appear ~ 10-12 weeks
5- **Fetal movements** ("quickening") occurs ~ 17-18 weeks

Clinical Signs of Pregnancy

Clinical Symptoms	Examination Findings
1. Amenorrhea -> Pregnancy = No. 1 cause of secondary Amenorrhea 2. Nausea +/- vomiting -> due to β-HCG spike of 100,000 or low 3. General fatigue 4. Breast enlargement 5. Mild uterine cramping	1. Telangiectasias, palmar erythema, linea nigra, Breast Enlargement 2. Softening of cervix (Goodell sign) 3. Softening of uterus (Ladin sign) 4. Blue discoloration of vagina/cervix (Chadwick sign)

* In Pregnancy + Liver Cirrhosis = ↑ Estrogen = "Red"
= 1. Telangiectasia
2. Palmar Erythema
3. Gynecomastia



1. Ante/Pre partum → Before Birth
2. Intra/peri partum → During Birth
3. Postpartum/Puerperium → After Birth

Obstetrics OB-GYN

- Physiologic Changes During Pregnancy - CVS: 1. SVR = Afterload + I.B.P 2. Blood Volume + HR = Preload 3. Preload + Afterload = CO (Stronger Forward Flow) 4. Vascular Heart Disease = Regurgitation (Aortic/Mitral) = Well tolerated (Since 1 Forward Flow) Respiratory: 1. Minute Ventilation (volume passing through the lungs per min) = TV x RR 2. TV: 1.5x while RR remains same 3. Tidal Ventilation = PCO2 = Respiratory Alkalosis (Metabolic Compensation: HCO3) 4. Renal Compensation = HCO3 GI: 1. Progesterone = Relax Smooth Muscles = Peristalsis + Sphincter Tone 2. Peristalsis = Delayed Gastric Emptying + Constipation 3. Sphincter Tone + Fetus Abdominal Pressure = GERD 4. Gallbladder Stasis = Gallstones Renal: 1. Blood Volume since: A. Blood fills placenta = divert from maternal circulation B. RAAS = Na+ and H2O Retention 2. GFR = BUN + Cr	Red Cell Mass: 1. RBC Mass/Number (due to 1 maternal EPO) 2. Blood Volume + RBC Number = Hematocrit = Dilutional Anemia "Must treat anemia early since Dilutional Anemia will worsen the underlying anemia" "Peak Blood Volume = 32w" Supine Hypotension: 1. In later stages of pregnancy, lying flat = Baby compress IVC = Venous Return = Preload = CO 2. Fainting when lying flat 3. CO = Hypotension + Reflex Tachycardia = 1. Palpitation Pregnancy = Hypercoagulable State (most Jordanian pregnant ladies are on Aspirin) 1. (f)ibrinogen and 1. Protein S 2. Fetus compress IVC + Stress = DVT (Virchow's Triad = "SHE") 3. Stasis 4. Hypercoagulability 5. Endothelial Damage Thyroid Gland: 1. TSH (Thyroid Stimulating Hormone) = Stim T4 mainly and some T3 2. Total T4/T3 (although 1 Free T4/T3) 3. (o)ncoids = Resemble TSH = Stimulate Thyroid = 1 T4/T3 and 1 TSH 4. (o)ncoids = 10 weeks then decreases = after 10 weeks T4/T3 return to normal Drugs to avoid during pregnancy: 1. NSAIDs: - After 20w = 1. Impair Fetal Uterine = 1. Amniotic Fluid = Oligohydramnios
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Physiologic Changes of Pregnancy

Cardiovascular	- ↑ HR, CO, SV; ↓ BP, systemic vascular resistance			
Pulmonary	- ↑ TV, Minute/Alveolar Ventilation; ↓ CO ₂			
Renal	- ↑ GFR			
Gastrointestinal	- ↓ Sphincter tone			
Heme	- ↑ Plasma volume, ↓ Hematocrit			
Endocrine	- ↑ TBG (increases total T3, T4)			
Weight Gain (BMI)	< 18.5:	1 lb/wk (28-40 lbs total)	18.5-25:	0.75 lb/wk (25-35 lbs total)
	25-30:	0.5 lb/wk (15-25 lbs total)	> 30:	0.25 lb/wk (10-20 lbs total)

Common (Benign) Problems During Pregnancy

Back Pain	- Most common in 3rd trimester, as enlarged uterus exaggerates lordosis and changes center of gravity - Tx: Supportive (stretch, heat, massage, Acetaminophen)
Constipation	- Tx: Increased PO fluids, bulking agents, laxatives
Edema	- Lower extremity edema from IVC compression - Tx: Positional change (avoid IVC compression), elevated LE
GER	- Increased relaxation of sphincters - Tx: Antacids
Hemorrhoids	- From venous congestion/IVC compression - Tx: Topical anesthetics/steroids
Round Ligament Pain	- Adnexal pain from stretching of uterus/ligament attachments - Tx: Self-limited
Urinary Frequency	- From increased circulating volume/GFR - Tx: Rule-out UTI

Routine Prenatal Care

First Trimester (start care by 10 weeks gestation)	- Lab Tests: CBC, blood type, Rh screen, UA and culture. Rubella, Varicella antibody screen. RPR/VDRL, chlamydia, HIV, HBsAg, PPD. Consider Hgb A1C, TSH if risk factors or symptoms. - If MCV low AND suspicion for possible hemoglobinopathy: - Hemoglobin analysis (via HPLC or IEF) of mom. Test dad if mom carries concerning gene. - If concern over family history of genetic condition (Cystic Fibrosis, Tay-Sachs): - Genetically test mom. Test dad if mom carries concerning gene.
Second Trimester	- Aneuploidy screening (either late first or early second trimester) - Neural tube defect screen (US + AFP) - Fetal anatomic US (18-22 weeks) - Diabetes screen (24-28 weeks): 1 hour glucose challenge
Third Trimester	- RhoGAM for Rh- women (at 28 weeks), H/H, GBS Culture (35-37 weeks)
Note: Visits q4 week (up to 28 wk), q2 week (28 - 36 wk), q1 week (36 wk - birth)	

Vaccinations	- Give all Tdap and influenza - Give (if not immunized) HepA, HepB, PCV, HFlu, Meningococcus - Contraindicated: HPV, MMR, live flu, Varicella
Nutrition	- Require additional ~300 kCal/day (normal woman is ~2000) - Note: Should avoid undercooked meats, unpasteurized dairy, excessive seafood consumption, deli meats/soft cheeses, limit excessive caffeine intake - Supplements: - Iron supplementation, Calcium (1000 mg), Folate (0.4-0.8 mg/day, with 4 mg if risk for NT defect)
Exercise	- 20-30 minutes of moderate intensity exercise daily. Avoid high impact sports. - Contraindicated if amniotic fluid leak, cervical incompetence, placental issues, severe preeclampsia

Prenatal Testing

Obstetrics
OB-GYN

Prenatal Aneuploidy Screening				
Test	Timing	Features		
First-Trimester Combined	9-13 weeks	- Uses PAPP-A, β -hCG, US for nuchal translucency		
			NT	PAPP-A
		T21	$\uparrow$	$\downarrow$
		T18	$\uparrow$	$\downarrow$
Second-Trimester Quad	15-22 weeks	- AFP, β -hCG, estriol, inhibin		
			AFP	β -hCG
		T21	$\downarrow$	$\uparrow$
		T18	$\downarrow$	$\downarrow$
Cell Free DNA	> 10 weeks	- Recommended as primary screening test, but also used as secondary screening test to avoid invasive procedure after (+) 1st/2nd trimester screen		
		- Has high sensitivity (and high NPV), but is not diagnostic		
		- Must have adequate amount of DNA (must be > 10 weeks, $\uparrow$ risk for inadequate sample if obese)		

AFP Interpretation

Reduced AFP (< 0.5 MoM)	Increased AFP (> 2.5 MoM)
- Trisomy 21 and 18 - Fetal demise - Incorrect gestational dating	- Open-neural tube defects: Anencephaly, spina bifida - Abdominal wall defects: Gastroschisis, omphalocele - Multiple gestation - Incorrect gestational dating

Invasive Diagnostic Tests		
	CVS	Amniocentesis
Age	10-13 weeks	15-20 weeks
Gen	Transcervical or transabdominal aspiration of chorionic tissue	Transabdominal aspiration of amniotic fluid (using US guidance)
Cons	- Risk of fetal loss ~1:100 - Risk for bleed/fetomaternal bleed, infection - Limb defects associated with early CVS	- Risk of fetal loss ~1:300-500 - Rarely causes leakage of amniotic fluid or direct fetal injury - Note: Discolored (brown) samples are a sign of $\uparrow$ risk of fetal demise

Prenatal Testing

Obstetrics
OB-GYN

Antepartum Fetal Surveillance	
Test	Features
Nonstress Test	- Continuous FHR monitoring Reactive NST (for ≥ 32 weeks) - Two accelerations > 15 bpm above baseline HR lasting > 15 sec over a 20 minute period Nonreactive NST - Insufficient (< 2) accelerations over a 40 minute period - Need to perform further tests (ie biophysical profile) or go out over longer period of time - Lack of FHR accelerations may occur with fetal sleeping (most commonly), fetal CNS anomalies, maternal sedatives * Can perform vibroacoustic stimulation to try to wake up baby
Contraction Stress Test	- Continuous FHR monitoring with contractions from oxytocin or natural labor (test rarely performed now) - Observe for late or significantly variable decelerations in FHR occurring with contractions (sign of fetal stress)
Biophysical Profile	- Uses 5 parameters to score 2 (normal) or 0 (abnormal) (1) Tone (≥ 1 flexion/extension movement of spine or limb) (2) Breathing (breathing episode for > 30 seconds) (3) Fetal movement (≥ 3 limb movements) (4) Amniotic fluid volume (single deepest vertical pocket ≥ 2cm) (5) Nonstress test (reactive) - Score: 8-10 $\rightarrow$ Reassuring for fetal well being 6 $\rightarrow$ Equivocal (repeat test soon) 0-4 $\rightarrow$ Worrisome for asphyxia. Delivery (usually) indicated.
Modified Bio-physical Profile	- Combination of NST and AF measurement
Amniotic Fluid Index	- Can measure depth of pocket in all 4 quadrants and add them together (> 25 polyhydramnios, < 5 oligohydramnios)
Other Tests (used to monitor certain high risk conditions)	
Umbilical Artery Velocimetry	- Used to assess IUGR/placental insufficiency - Flow can be halted or even reversed during diastole with IUGR
Transcranial Doppler	- US monitoring of cerebral artery flow velocity - Evaluates for fetal anemia (high rates of flow found in anemic fetuses)

Teratogenesis

Obstetrics
OB-GYN, Pediatrics

Select Teratogenic Drugs/Exposures	
Drug	Fetal Findings
ACEi	- Renal abnormalities, ↓ fetal GFR, oligohydramnios
Aminoglycoside	- Neurosensory hearing loss
Androgens	- Virilization (females)
Anticonvulsants	Carbamazepine - Neural tube defects, facial dysmorphism, CV defects Phenytoin - "Fetal Hydantoin Syndrome" (facial dysmorphism, cleft palate, VSD, intellectual disability) Valproate - Risk for neural tube defects, facial dysmorphism, cleft palate, CV defects (ASD), polydactyly/other limb abnormalities
Caffeine	- Possible ↑ risk for abortion at > 300 mg/day levels
DES	- Genital issues (ie abnormal uterine shapes, vaginal septa) - Clear cell adenocarcinoma of vagina in adolescents
Fluoroquinolone	- Fetal cartilage damage
Folate Antagonist (ie MTX, TMP)	- Risk for neural tube defects - MTX also linked to spontaneous abortion, growth restriction, microcephaly, intellectual disability
Lead	- Increased spontaneous abortion rate (at high levels)
Lithium	- Ebstein's anomaly, other congenital heart defects
Mercury	- Unclear risk, but recommended to limit possible exposure
Methimazole	- Aplasia cutis
Radiation	- Risk for microcephaly, growth or mental retardation
Statins	- Limb abnormalities, congenital heart malformations
Tetracycline	- Bone/teeth staining
Thalidomide	- Bilateral limb malformations (ie phocomelia), microtia, other cardiac/GI malformations
Tobacco	- Placental insufficiency (↑ risk for placental abruption/previa, low birth weight, PPROM, ectopic pregnancy)
Vitamin A/ Retinoids	- CNS, cardioaortic, ear, and clefting defects
Warfarin	- Nasal hypoplasia, stippling of bone epiphysis, IUGR

Teratogenesis

Obstetrics
OB-GYN

Fetal Alcohol Spectrum Disorder

General: Fetal alcohol exposure can result in a highly variable degree of impact on the developing fetus, with a variety of clinical phenotypes possible

Clinical:

- Facial abnormalities (short palpebral fissures, thin vermilion border, smooth philtrum)
- Growth retardation ($\downarrow$ height/weight percentiles)
- CNS
 - Structural: Microcephaly, focal neurologic defects, other structural abnormalities
 - Neurobehavioral impairment: Developmental delay, intellectual disability, behavioral abnormalities

Diagnosis:

Fetal Alcohol Syndrome	- Characteristic facial features, growth retardation, CNS involvement, and neurobehavioral impairment
Alcohol-related Neurodevelopmental Disorder	- Neurobehavioral impairment with documented EtOH exposure - Other features may or may not be present
Alcohol-Related Birth Defects	- Specific malformation with documented EtOH exposure

Other Drugs

Marijuana	- Use discouraged during pregnancy (evidence is controversial and lacking, but concern about potential neurodevelopmental impact)
Amphetamines	- Increased risk of fetal demise, IUGR, preeclampsia, and placental abruption
Cocaine	- Risk for placental insufficiency, leading to placental abruptions, spontaneous abortion, premature births

Neonatal Abstinence Syndrome

General: Neonatal withdrawal from maternal heroin (or other opiate abuse) during pregnancy

Clinical:

- Presents within a few days of life with irritability, high-pitched cry, poor sleep, feeding difficulty, poor tone, tremors, GI disturbances, failure to thrive

Management:

- Supportive: Adequate nutrition, decreasing sensory stimulation, swaddling
- If supportive care fails, small doses of methadone or morphine are used

Teratogenesis

Obstetrics
OB-GYN

	General	Clinical	Management/PPX
Toxoplasma	- Due to protozoan <i>Toxoplasma gondii</i> - Usually acquired by fecal-oral transmission of sporozoite on contaminated food/water - Transplacental transmission - Mothers are asymptomatic	- Often subclinical at birth, but can present with fever, maculopapular rash, HSM, seizures, jaundice - Classic Triad: Hydrocephalus, intracranial calcifications, chorioretinitis - If untreated: Intellectual disability, seizures, motor deficits, hearing/vision loss - Dx: Serology (Toxo IgM/IgG)	Tx: Pyrimethamine + Sulfadiazine (plus Leucovorin) for neonatal infection Spiramycin, (or the above combo), for confirmed maternal infection PPX: Avoid undercooked meats, wash fruit/veg, avoid raw shell-fish, do not change cat's litter box
Other			
Rubella	- Due to rubivirus that causes "German Measles" - Transplacental transmission - Presents in mom as mild, self-limited febrile illness with classic rash	- Associated with fetal demise/abortion and IUGR - Classic signs include cataracts, hearing loss, and congenital heart disease (PDA, pulm artery stenosis) - Other signs include microcephaly, HSM, jaundice, purpuric rash, radiolucent bone disease - Dx: Rubella IgM/IgG or viral culture	Tx: Supportive PPX: MMR vaccine (before preg)
CMV	- Most common TORCH infection - Transplacental transmission - Presents as self-limited febrile illness in mom	- Usually asymptomatic, but can present at birth with small size, microcephaly, jaundice, ↑ LFTs, petechiae, thrombocytopenia, chorioretinitis - Periventricular intracranial calcifications - Can cause long term disability (sensorineural hearing loss, intellectual disability, vision loss) - Dx: PCR or viral culture	Tx: Ganciclovir or Valganciclovir (for any symptomatic baby) PPX: No medical intervention (just general good hand hygiene and avoidance of close contact with young children)
HSV	- Most commonly acquired at birth from actively infected maternal genital tract - Can rarely be passed in utero if mom has primary HSV infection	- Presents in three different possible ways (normal at birth, but then subsequently developing): (1) Local: Vesicular skin, oral, and eye lesions (2) CNS: Irritability, seizures, lethargy, poor feeding (3) Disseminated: Neonatal sepsis - Dx: HSV culture or serum/CSF PCR	Tx: Acyclovir (for any type of neonatal infection) PPX: Acyclovir at 36 weeks until birth if genital HSV lesion during pregnancy * C-Section: If active lesion or prodrome
Syphilis	- Transplacental transmission of the spirochete <i>T. pallidum</i> - Most commonly occurs in pregnant women with untreated primary and secondary syphilis (not latent)	- Associated with ↑ risk of stillbirth, IUGR, prematurity - Early Features: Fever, HSM, jaundice, LA, failure to thrive, rhinitis ("snuffles"), maculopapular rash, condyloma lata, cytopenias - Later Features (> 2 y/o): Frontal bossing, saddle nose, Hutchinson teeth (pegged shaped incisors), Mulberry molars, gummas, saber shins (anterior bowing), CNS disease (intellectual disability, seizures) - Dx: RPR/VDRL, with confirmation via FTA-ABS	Tx: - Penicillin (maternal infection) Note: If allergy, check skin allergy test, and if positive → Desensitize - Penicillin (neonatal infection)
Parvovirus	- DNA virus, causes mild febrile illness in mom (Erythema infectiosum) - Transplacental transfer	- Associated with first trimester spontaneous abortions - Infection during 2nd-3rd trimester can cause fetal hydrops - Dx: Serology (+ maternal IgM)	Tx: Monitor fetal MCA velocity for signs of severe anemia. If severe, give intrauterine RBC transfusion.
VZV	- Rare, primary varicella infection - Transplacental transmission during late 1st-2nd trimester (Shingles has no impact on baby)	- Intrauterine growth retardation, dermatologic scarring - CNS (microcephaly, intellectual disability), ocular (cataracts, chorioretinitis, etc), limb hypoplasia - Dx: Clinical	Tx: Acyclovir (for neonatal and maternal infections), VariZIG (for babies exposed at birth) PPX: - VZV vaccine PRIOR to pregnancy if mom seronegative - If mom is seronegative and exposed to Varicella: VariZ Ig
Zika	- Due to mosquito transmitted Zika virus - Transplacental transmission, most dangerous in the 1st trimester	- Causes microcephaly, facial abnormalities, vision/hearing issues, hypertonia, and seizures - CNS findings (calcifications, ventriculomegaly, structural abnormalities)	Tx: Supportive PPX: Avoid Zika affected areas (Central America, South America, parts of Asia/Africa)

Other Perinatal Infections

Obstetrics
OB-GYN

Management of Maternal HIV During Pregnancy

General: HIV can be transmitted transplacentally, at the time of delivery, and via breast milk

Prenatal	Initiate all HIV + women on ART therapy: - Dual NRTI Backbone (ie Abacavir/Lamivudine or Tenofovir/Emtricitabine) PLUS - Protease inhibitor (Atazanavir or Darunavir) OR - Integrase inhibitor (Raltegravir) (Note: The above agents are all considered safe during pregnancy)
Intrapartum	- Continue ART throughout pregnancy/delivery - If viral load > 1000 copies/mL: Schedule C-section at 38 weeks plus IV Zidovudine
Postnatal	- Moms: Continue ART therapy - Infants: Zidovudine (4-6 weeks). Note: If mom was not on ART therapy or had high viral load (ie > 1000 copies/mL), baby gets combined ART therapy.

Other Infectious Disease During Pregnancy

Hepatitis B	- Transplacental transmission occurs with active hepatitis B infection (Note: HBeAg + moms have ~90% transmission rates) - Newborns of HBsAg-positive mothers should receive HBIG and hepatitis B vaccine within 12 hours of delivery - Mothers with active hepatitis B can receive tenofovir
Hepatitis C	- Transplacental transmission in ~5-10% of HCV infected women (exclusively if HCV RNA (+)) - Babies are usually asymptomatic at birth, and should check anti-HCV antibody at ~ 18 months to see if infected
Chlamydia	- Causes conjunctivitis (< 2 weeks) and pneumonia (~4-12 weeks) in newborns - Maternal infection associated with preterm, PPRM, low birth weight - Tx: Azithromycin (for mother). Erythromycin (for neonate).
Gonorrhea	- Associated with miscarriage, PPRM, prematurity - Causes ophthalmia neonatorum (conjunctivitis) - Rarely can disseminate in newborn - Tx: Ceftriaxone + Azithromycin

--TORCH Infx--

T-->Toxoplasmosis

1. Chorioretinitis
2. Intracranial Calcifications
3. Hydrocephalus

O-->Other

1. Parvovirus (3 P's)
 - Pulmonary Hypoplasia
 - Pleural Effusion
 - Puffy Baby (Hydrops Fetalis)
2. Syphilis
 1. Snuffles
 2. Yellow skin (Desquamating Rash)
 3. Pulmonary Hypoplasia
 4. Hutchinsonian Teeth
 5. Impaired Hearing (Sensorineural)
 6. Screening (VDLR/RPR) (False +ve in APL due to Anti-Cardiolipin)

R-->Rubella (I ♥ Ruby Earrings)

1. I-->Eye Cataracts
2. ♥-->PDA (Patent Ductus Arteriosus)
3. Earrings-->Deafness (Sensorineural)

C-->CMV

1. Chorioretinitis
2. Microcephaly
3. Periventricular Calcifications

H-->HSV-2

1. Head (meningoencephalitis) (Temporal Lobe Association)
2. Sacral ganglion (Latent)
3. Vesicular Eruption
4. 2 (Mom-->Fetus) (Vertical Transmission during Vaginal Childbirth)

D&C vs D&E
 D&C =
 -1st trimester abortion
 -Removal of Endometrial Tissue after (Incomplete Miscarriage) or (Molar Pregnancy)
 -Endometrial Biopsy for Dx of Endometrial Hyperplasia/Cancer
 D&E = 2nd Trimester Abortion (13-27w)
 If D&C not done risks for:
 1. Incomplete Miscarriage
 2. Bleeding
 3. Infection
 4. Asherman Syndrome
 2. Molar
 1. Trophoblastic Disease (Invasive Mole) or (Choriocarcinoma)
 Persistent ↑ β-HCG levels = Persistent Molar Tissue

-Tocolytic = ↓ Utrine contractions e.g: Progesterone, Terbutaline, Nifedipine
 -Oxytocic = ↑ Utrine contractions e.g: Oxytocin, Prostaglandins

Think:
 1. Mifepristone = "prison" = prevent you = progesterone = Prevent shedding (but Mifepristone = antagonist = cause microshedding)
 2. Misoprostol = "prostol" = prostaglandin E1 = ↑ Uterine contractions

Management for: Inevitable, Incomplete, Missed:

1. Surgical: D/C 1st Trimester, D/E 2nd Trimester

2. Medical:

1. Mifepristone: Progesterone Antagonist = Microshedding + Abortion
 *only in limited facilities (may induce abortion)
2. Misoprostol = Prostaglandin E1 Agonist = Oxytocic = ↑ Utrine Contractions
3. Expectant: Allow natural passage of POC

Obstetrics
 OB-GYN

Abortion

1 Elective Abortion

General: ~50% of pregnancies are unintended, and ~20% are terminated electively. Legalized nationwide in 1973 as part of Roe vs Wade. Can be performed up until viability (~24 weeks), unless medical indication to terminate later. Procedure:

Type	Timing	Features
Medical	< 10 weeks GA	- Mifepristone, followed by Misoprostol in 24-48 hr
Aspiration	< 14 weeks GA	- Mechanical cervical dilatation and aspiration of uterine contents
Surgical	14-24 weeks GA	- ^{A D/E} Dilation and evacuation (osmotic or pharm dilators, followed by extraction/curettage)
Induction	14-24 weeks GA	- Misoprostol + mifepristone (Note: Usually use feticidal injection to ensure no live birth)

Management: RhoGAM if Rh (-). Antibiotic prophylaxis (usually given, but controversial).

↳ Anti-D

-Elective Abortion = x<24w
 -If before x<10w = Mifepristone + Misoprostol

2 Spontaneous Abortion (Miscarriage)

General: The loss of products of conception prior to the 20th week of pregnancy. Most common in first trimester, and most commonly due to chromosomal abnormalities.

Risk: ↑ Maternal age, smoking/EtOH use, history of spontaneous abortion

Maternal Age > 35y

Etiology:

Fetal	- Chromosomal abnormalities (ie aneuploidy [Trisomy 16]) *mcc - Trauma - Congenital abnormalities (from teratogens, etc)
Maternal	- Maternal uterine structural abnormalities - Systemic maternal disease (infection, endocrinopathy, hypercoagulable state, etc)

SBA workup:
 1. Pelvic Exam:
 -Confirm Bleeding from cervix
 -Assess cervical os, if open = miscarriage
 2. Transvaginal US:
 -Assess POC (products of conception)
 -Assess Fetal Beat
 3. Labs:
 ↓ β-HCG or ↓ Progesteron = non-viable pregnancy
 (↑ 60% within 48 hr)

Diagnosis: Pelvic exam and US. US can confirm fetal viability if POC still in utero (ie lack of cardiac activity).

POC = Product of Conception

Management: See below for specifics depending on classification of abortion. RhoGAM if Rh (-).

RhoGAM (Anti-D) If Rh(-ve)
 In Both Elective and Spontaneous Abortions

Complications: Endometritis, septic abortion, hemorrhage

	1 Symptoms (1st)	2 Findings (2nd)	3 Management (3rd)
1 Threatened 1. Alive Fetus 2. Bleeding 3. Closed OS	- Uterine bleeding +/- abdominal pain - No POC expulsion	- Closed OS - Intact Membranes - Live fetus	- Supportive care (until symptoms resolve or progress to complete abortion) - Associated w/ ↑ risk for preterm/PPROM, but can still proceed to viable birth
2 Inevitable 1. Alive Fetus 2. Bleeding 3. Open OS *Failure is Inevitable	- Vaginal bleeding + cramping	- Open OS - POC present on US (at level or above os) - Fetus may still have heartbeat	- Can be managed one of three ways, based on preference: (1) Surgery (dilation and curettage) (2) Medically (Mifepristone/Misoprostol) (3) Expectant Management (allow natural passage. Can monitor β-hCG to measure completeness. If spontaneous passage does not occur, can then proceed to surgical or medical intervention)
3 Incomplete 1. Dead Fetus 2. Open OS 3. Incomplete POC Passage (partial retention)	- Vaginal bleeding + cramping - Passage of large clots/tissue	- Open OS - POC present on US (within/being expelled from cervical canal)	
4 Missed 1. Dead Fetus 2. Closed OS 3. No POC Passage (full retention) *mcc = Partial Mole	- Fetal death without passage of POC - Variable presentation (asymptomatic to vaginal bleeding) - Often presents as failure of pregnancy to progress	- Closed OS - US shows nonviable conceptus with no fetal cardiac activity	
5 Complete 1. Dead Fetus 2. Closed OS 3. Complete POC Passage (empty)	- Vaginal bleeding + cramping ① Complete passage of POC, followed by ② resolution of symptoms	- Closed OS - US shows no conceptus	- Supportive 1. Antibiotics (↓ Infx risk) 2. Methylergonovine (↓ Utrine Contractions): ① - ↓ Bleeding ② - Help expell retained products
6 Septic 1. Dead Fetus (Heart beat on 6 week US) 2. Bleeding 3. Fever + Foul Smelling Discharge *Inevitable Failure *Tx: Suction Curettage	- Foul-smelling vaginal discharge - Most often occurs after elective abortion, but can occur with spontaneous abortion (especially if retained POC)	- Sepsis (fever, hypotension) - Enlarged, tender uterus/cervix	- IV Antibiotics (same as PID) - Suction D&C

until bleeding resolve:
 1. weekly US
 2. serial hCG

-Suction D/C = D/C via suction
 -Typical D/C via sharp Curettage

*Septic Abortion = ↑ Risk of Uterine Perforation

Abortion

Visit AfraTafreeh.com for more

- Abortion-
- General Info:
 - mcc In 1st Trimester (1-12w)
 - dx via ↓ β-HCG levels and ↓ Fetal Heart Movement on US
 - present as Vaginal Bleeding and Pelvic Cramping
- Etiology of SBA (spontaneous abortion)
 - Maternal:
 1. Maternal Anatomic Abnormalities
 - Uterine polyps/fibroids (Abnormal implantation)
 - Cervical Insufficiency
 2. Corpus Luteum Failure
 - Fetal:
 1. Fetal Chromosomal Abnormality (mcc)
 2. Torch Infx
 3. Trauma

Obstetrics
OB-GYN

Recurrent Spontaneous Abortion

General: Defined as **three or more consecutive pregnancy losses**

Risk:

Uterine	- Polyps/fibroids/adhesions = Problematic Implantation - Cervical insufficiency
Genetic	- Aneuploidy - Parents with balanced or Robertsonian translocations
Endocrine	- Uncontrolled diabetes - Hypothyroidism
Hematologic	- Inherited or acquired hypercoagulable states - Antiphospholipid syndrome

Diagnosis:

- Uterine hysterosalpingogram (workup for structure)
- Karyotypes of mom/dad, and abortus if available (for genetic)
- Anticardiolipin IgM/IgG, lupus anticoagulant titers, TSH

Management: Treat underlying (surgical correction of structural abnormalities, manage endocrinopathy, etc)

Cervical Insufficiency

General: The inability of the uterine cervix to retain a pregnancy in the 2nd trimester due to painless dilation of the cervix

Etiology:

- Cervical Trauma: Repeated D&C, cervical cone, loop electrocautery excision procedure (LEEP), prior labor/delivery
- Congenital cervical abnormalities

Clinical: History of 2nd trimester pregnancy loss, cervical dilation and effacement on physical exam

- Can be asymptomatic or present with mild cramping/contractions

Diagnosis: Transvaginal US (< 25 mm long before 24 weeks)

Management:

- ① - Cerclage (suture stabilization of the cervical os)
- ② - Hydroxyprogesterone
- ③ - Avoid exercise during pregnancy

- Cervical Insufficiency
 1. x>20w (Second Trimester)
 2. No Bleeding or Cramping
 3. Painless

- Dx: 1 of the following
1. x>2 or more consecutive 2nd Trimester losses
 2. 2nd Trimester cervical length x<25mm + 1 prior loss
 3. Dilated and Effaced cervix in early pregnancy

- Spontaneous Abortion:
 1. x<20w
 2. Bleeding+Cramping
 3. Painful

- Tx:
1. Cerclage (sewing the cervix)
 2. Vaginal Progesterone (↑ cervical strength)

Intrauterine Fetal Demise

General: Absence of fetal cardiac activity > 20 weeks GA

Risk: ↑ Age, obesity, multiple gestation, smoking, underlying medical conditions, Drugs (Crack Cocaine)

Etiology: Perinatal infection, placental injury (ie abruption), maternal systemic disease, uterine abnormalities, hydrops/allo-immune disease, fetal cord accident (diagnosis of exclusion)

Clinical: Uterus small for GA, reported lack of movement

Diagnosis: US (without fetal heart activity) confirmed by 2 MDs

Management:

- GA 20-24 weeks: Dilation and evacuation → oxytocic uterine contractions (Even If Breech Position)
- GA > 24 weeks: Prostaglandins and Oxytocin for induction and delivery
- Note: If not delivered within a few weeks, risk for maternal DIC. If intrauterine Fetal Demise is not evacuated = Maternal DIC

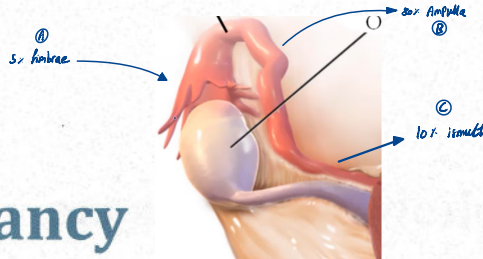
Workup: Autopsy, placental analysis, fetal karyotype, maternal labs (for antiphospholipid, fetomaternal hemorrhage)

- APS:
- Clinical Criteria:
 1. recent Arterial or Venous Thrombosis
 2. 3 still births before 10w
 3. 1 still births after 10w
 - Laboratory Criteria: 1 of the biomarkers:
 1. Lupus Anti-coagulant
 2. AntiCardiolipin
 3. Anti-β2glycoprotein

- FMH (FetoMaternal Hemorrhage):
- Breach in placental barrier = Fetal Blood → Maternal Blood
 - Fetal Anemia = Death

- Dx:
1. Kleihauer-Bauitke (KB Stain) (looking for HbF)
 2. Flow Cytometry (looking for HbF)

• β -hCG = 1500 for TSVN
 • β -hCG = 6000 for Abdominal U/S



Ectopic Pregnancy

Obstetrics
OB-GYN

Ectopic Pregnancy

General: Implantation at a site other than the endometrium. Locations include:

- ① - **Tube ampulla** (~80%), **tube isthmus** (~10%), **fimbriae** (~5%)
- Abdominal, ovarian, cervical, cesarean scar (all rare)

Risk: History of ectopic, PID, IVF, endometriosis, pelvic surgery, smoking
 - IUD (lower risk for pregnancy, but elevated risk for ectopic if failure)

- basically anything that causes any Trauma/Obstruction In fallopian tubes

Clinical: Abdominal pain and vaginal bleeding

- Abdominal pain of ectopic pregnancy mimics appendicitis (LRQ Pain)
 * must consider ectopic pregnancy in every female with LRQ pain

Diagnosis: Serial β -hCG and Transvaginal US (see algorithm below)

- Note: β -hCG should rise by at least **35% in 48 hours** (normally it doubles)

Management:

- β -hCG rise is slower ($x < 35\%$) when normally it's ($x > 60\%$) every 48 hr

1 Surgical Salpingectomy OR Salpingostomy Indications: - Hemodynamically Unstable - Tubal Rupture	Indicated if: - Hemodynamically unstable or tubal rupture - β -hCG > 5,000 OR fetal cardiac activity present on US - Contraindications to MTX (ie coexisting intrauterine pregnancy, immunodeficiency, hematologic/hepatic/renal disease) - Patient not reliable/able to comply with medical follow up
2 Medical Methotrexate Stable (no rupture)	- 50 mg/m ² dose of MTX given <u>day 1</u> → IM - β -hCG checked on <u>days 4, 7</u> - If inadequate decline (ie < 15%), second dose of MTX given - Follow β -hCG until undetectable

• **Heberson pregnancy = Ectopic + IUP**

• otherwise surgery due to MTX failure

Complications: Tubal Rupture

- Presents as diffuse abdominal pain (peritonitis), cervical motion tenderness
- ± **Severe vaginal bleeding**
- Possible hypovolemic shock
- Dx: **FAST US** → for internal bleeding
- Tx: **Stabilize in ED** (ie ABCs, blood transfusions), **emergent laparotomy**

- Leucovorin given with MTX (Leucovorin Folate Rescue) to ↓ B9 Def
 (↓ MTX toxic effect on ↓ B9)

Dx: period missed for 2 weeks = LMP before 6 weeks, cramping + Abdominal Pain:

1. TVUS + β -hCG → TVUS = no IUP or Adnex, β -hCG = $x < 1500$, Mx = repeat tests after 48 hr

2. TVUS + β -hCG → TVUS = no IUP or Adnex, β -hCG = rise less than $x < 63\%$
 = Extra-Uterine pregnancy until proven otherwise

Mx:

1. Medical = MTX IM (50 mg/ml)

*Indications:

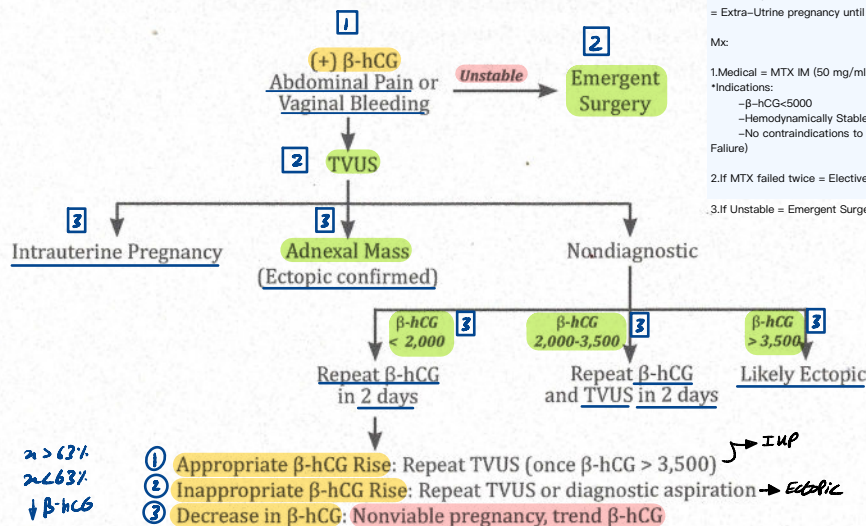
- β -hCG < 5000

- Hemodynamically Stable

- No contraindications to MTX (Breast Feeding, Conceiving within 3 months, Renal Failure)

2. If MTX failed twice = Elective Surgery (Laparoscopy) (Salpingectomy)

3. If Unstable = Emergent Surgery (Laprotomy) (Salpingectomy)



$x > 63\%$
 $x < 63\%$
 $\downarrow \beta$ -hCG

- ① **Appropriate β -hCG Rise:** Repeat TVUS (once β -hCG > 3,500)
- ② **Inappropriate β -hCG Rise:** Repeat TVUS or diagnostic aspiration → **Ectopic**
- ③ **Decrease in β -hCG:** **Nonviable pregnancy, trend β -hCG**

-Trophoblasts form outlayer of blastocyst during development

-Trophoblast: (Cytotrophoblasts)+(Syncytiotrophoblasts)

-Trophoblast Fx:

1. **Implant** Blastocyst into endometrium

2. **Form Placenta**

-Cytotrophoblasts = Inner (Towards Fetus)

-Syncytiotrophoblasts = Outer (Invade Endometrium) and (Secrete β -hCG)

-Paternal Chromosomes = Important for **Placental/Trophoblastic** Development

-Maternal Chromosomes = Important for **Embryonic** Development

Obstetrics
OB-GYN

Gestational Trophoblastic Disease

* No - Anti-D + *

Hydatidiform Mole		
	1 Complete Mole (~90%)	2 Partial Mole (~10%)
Mxn	- Sperm fertilizes empty ovum - 1 sperm duplicate or 2 sperm = 100% paternal	- Normal ovum fertilized by 2 sperm - 2 paternal + 1 maternal (Extra paternal)
Karyo	- 46 XX; 46 XY (all paternal) p57 gene is maternally imprinted - p57 negative - $2n = 1 \text{ sperm duplicate} - 2y = 2 \text{ sperm}$	- 69 XXY; 69 XYY; 69 XXX (extra paternal set) - p57 positive p57 gene is maternally imprinted
Histo	- Diffuse villi swelling/hyperplasia - No fetal tissue	- Focal villi swelling/hyperplasia - Fetal tissue present (RBC, body parts)
Clin	- Presents as abnormal vaginal bleed - Uterus enlarged for date - β-hCG high (> 100,000) - Signs of high β-hCG (hyperemesis, preeclampsia, hyperthyroid, theca lutein cyst) Classic Presentation: 1. Painless Bleeding 2. Date/Size Discrepancy (↑ Too Big)	- Presents as missed abortion - Uterus expected size for date - β-hCG mildly elevated
US	- "Snow-storm" pattern, grape-like clusters	- Variable
Prog	- Up to 25% chance of malignancy - 4% chance of metastatic disease	- Up to 4% chance of malignancy - 0% chance of metastatic disease

General: Moles are considered **benign trophoblastic disease** (while **invasive moles**, **placental site trophoblastic tumors**, and **choriocarcinoma** are considered **gestational trophoblastic neoplasia**)

Risk: History of gestational trophoblastic disease, age > 35 or < 20

Clinical: See above

Diagnosis: Based on **US features**, **symptoms**, and **β -hCG**. Confirmed with histology.

Management: Dilation and **Suction Curettage (D&C)**

Suction D/C = ↓ risk of perforation

- **Follow β -hCG until normalized** (+ 6 month period after normalized)
- Usually **14 weeks** for complete, **8 weeks** partial
- **Ensure good contraception** during this period of time

--Molar--

Classical Findings:

1. Karyotype 46XX/46XY
2. No Fetal Tissue
3. P57 -ve (maternally imprinted)

Classic Presentation:

1. Painless Bleeding
2. Date/Size Discrepancy (↑ Too Big)

*Leading to Investigations:

1. β -hCG > 100,000
2. US = Snowstorm Sperence

- ↑ β -hCG symptoms: (HHOP) → 1. Hyperemesis + 2. Theca Lutein Cysts + 3. Preeclampsia + 4. Hyperthyroidism

1. **Hyperemesis Gravidarum** → Severe Nausea+Vomiting leading to Dehydration
2. **Hyperthyroidism** → β -hCG mimic TSH structure = (↓ TSH + ↑ T3/T4)
3. **Ovarian Theca Lutein Cyst** → Ovarian cysts, occur due to ↑ β -hCG, usually Bilateral
4. **Preeclampsia** → Early Preeclampsia x < 20w (usually preeclampsia occur in 3rd Trimester)

Tx:

1. Suction D/C
2. Incase of high-risk pts for Choriocarcinoma: single chemoagent (MTX or Actinomycin D)

Mx:

- we must follow the β -hCG levels for a 6-months until they drop
- If β -hCG plateaus = **Invasive Mole** or **Choriocarcinoma**
- Thus pregnancy for a year is contraindicated (IUD must be used) since new pregnancy will ↑ β -hCG levels = unable to determine if Molar pregnancy has resolved

--Partial Mole--

Classical Findings:

1. Karyotype 69 XXX/XXY/YYY
2. Fetal Tissue Present
3. P57 +ve (maternally imprinted)
4. Normal or small urine size (unlike molar with Date/Size Discrepancy)

- Trophoblastic Neoplasms = 1. **Invasive Mole**, 2. **Choriocarcinoma**, 3. **Placental Site Trophoblastic Tumor**
- General Characteristic of them all:
 - Presentation → (Vaginal Bleeding) + (↑ β -hCG)
 - Dx → Pelvic US
 - Mets to Lungs (key workup = CXR)
 - Tx = Single Chemo (MTX or Actinomycin D)
- 1. **Invasive Mole** = Swollen chorionic villi invading the myometrium (mcc after Complete Mole)
 - Dx: via β -hCG Plateauing after Molar Pregnancy
 - Tx: Single Chemo (MTX or Actinomycin D) or Hysterectomy
- 2. **Choriocarcinoma** = Cytotrophoblast + Syncytiotrophoblast neoplasm (No Villi) (mcc after Complete Mole)
 - 80% mets to Lungs (Hematogenously) → CXR is a must
 - Clinical Features:
 1. **Vaginal Bleeding**
 2. Lung Mets → **Hemoptysis**
 3. ↑ β -hCG = (HHOP) = (Hyperemesis/Hyperthyroidism/Theca Lutein Cyst/
- Preeclampsia
 - Dx: via β -hCG Plateauing after Molar Pregnancy
 - Tx: Low-risk → Single agent chemo (MTX or Actinomycin D) (>90% cured via chemo)
 - rare type (Non-Gestational Choriocarcinoma):
 - Arise in ovaries or testes (Germ cells differentiate into Trophoblasts) (↑ β -hCG)
 - Difficult to treat, Lethal

Gestational Trophoblast

3 Gestational Trophoblastic Neoplasia (Overview)

General: Refers to group of malignant trophoblastic neoplasms associated with either a **hydatidiform mole** or **normal pregnancy**. Types include:

- 1 - **Invasive mole**
- 2 - **Placental site trophoblastic tumor**
- 3 - **Choriocarcinoma**

Risk: History of molar pregnancy, ↑ maternal age (ie > 40), Asian ancestry
~ 20y

Clinical:

- Variable depending on subtype of disease ① ② ③ ④
- Can include symptoms from ↑ β -hCG (hyperthyroidism, theca lutein cysts, pelvic pain, abnormal uterine bleeding)

Diagnosis: Clinical (Tissue not required for diagnosis. Based on ↑ β -hCG, uterine enlargement, metastatic disease)
- **Workup** (if suspicious) should include **CXR** (common metastatic site)

Management:

- 1 - **Low Risk: Single Agent Chemo** (Methotrexate or Actinomycin D)
 - Generally defined as local disease without significant mets
- 2 - **High Risk: Multi-Agent Chemo**
 - Generally defined as highly metastatic disease
- 3 - **Always trend β -hCG and provide good contraception**
- 4 - **Placental site trophoblastic tumor** should be treated with **hysterectomy**

Gestational Trophoblastic Neoplasia (Subtypes)

1	Invasive Mole	- Hydropic villi invading into myometrium - Rarely metastasize, and can spontaneously regress → *classical Presentation - Presents as ↑ β-hCG after treatment of molar pregnancy. Can also present with persistent vaginal bleeding. - Tx: Single Agent Chemo (Methotrexate or Actinomycin D). - Note: Hysterectomy is alternative if no desire for fertility.
2	Placental Site Trophoblastic Tumor	- Proliferation of intermediate trophoblasts (ie no villi) → *classical Presentation - Presents as irregular vaginal bleeding and enlarged uterus - Note: β-hCG not significantly elevated (because no syncytiotrophoblast, but hPL is ↑) - Tx: Hysterectomy (poor chemotherapy sensitivity)
3	Chorio-carcinoma	- Can occur with molar pregnancy (50%), abortion, or normal pregnancy - Proliferation of cytotrophoblast and syncytiotrophoblast without chorionic villi - Common metastasis to vagina and lungs - Tx: Chemotherapy 1 - Single-agent used if local (Methotrexate or Actinomycin D) 2 - Multi-agent used for high risk, metastatic disease

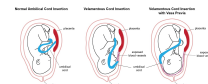
3. Placental Site Trophoblastic Tumor =

- Cytotrophoblasts proliferation (no Syncytiotrophoblasts)
- ↓ **Low β -hCG** + ↑ **High hPL** (Human Placental Lactogen)
- originates from Non-Molar (Pregnancy or Abortion)
- Clinical Presentation: Vaginal Bleeding + ↑ hPL
- Dx: **Pelvic US** → Intrauterine mass + Cystic and Solid regions
- Tx: **Hysterectomy** (poor response to chemo)

--General Management Principles--
 This applies for (PPROM, Preterm Labor, Vasa previa, Placenta Previa)
 1. Betamethasone/Steroids always indicated until fetus reaches 34 w
 2. Antibiotics not indicated unless PPROM (x<34 w = Membrane will be exposed 18 Hr+)
 3. MgSO4 is generally only to be given in case of birth before 34w
 4. Tocolytics are generally only to be given in case of Preterm Labors (x<34 w)
 *once we reach 34w (PPROM, Preterm Labor, Vasa previa, Placenta Previa Ect...) we go for C-Section or Vaginal Delivery is sufficient bishop score

--Placental Abruption--
 -Placental Abruption= Bleeding
 -Blood stimulates Uterine Contractions = Preterm Delivery
 -Strongest risk factor = Previous Abruption Hx
 -Clinical Presentation:
 -Abrupt onset of Painful Vaginal Bleeding
 -Uterine Contractions
 -Dx:
 -Clinically diagnosed
 -US= Retroplacental Hematoma (US not reliable)
 -Top 4 Complications:
 1. Maternal Hypovolemic Shock
 2. Fetal Distress/Demise
 3. DIC
 4. Cortical Necrosis
 -Mx:
 1st step= Fetal HR monitoring (CTG)
 2nd step= Maternal IV Access (blood transfusion)
 Then if:
 -Unstable: C/S (Unstable = Hypotension/Coagulopathy)
 -Stable: Vaginal or C/S
 -Cortical Necrosis:
 -Rare cause of Acute Renal Failure
 -Cortical Necrosis = (DIC) + (Ischemia/Shock) = Placental Abruption
 -Clinical Presentation:
 1. Acute RE = 2. Anuria + 3. Hematuria + 4. Flank Pain

--Concealed Placental Abruption--
 *20% of Placental Abruption
 *Decidua = Specialized part of the endometrium that forms the Placental Bed
 Clinical Presentation:
 1. No Bleeding (blood trapped b/w Membrane and Decidua)
 2. Preterm Labour presentation (Blood stimulate contractions)
 3. Severe Pain at site of Placenta
 4. Tender and Rigid Uterus
 --Vasa Previa--
 *Placenta Previa = Mother losing blood
 *Vasa Previa = Fetus losing blood
 -Fetal vessels within 2cm of OS
 -Velamentous Cord Insertion: Fetal Blood Vessels travel unprotected by Wharton's Jelly
 Presentation:
 1. Painless Bleeding with Membrane Rupture (since blood doesn't irritate the uterus, no contractions, no pain)
 2. Fetal Distress (Fetus is losing blood)
 3. Detection of Fetal Blood via APT or Kleihauer-Betke Test (Detect presence of fetal HgF in the painless bleeding)
 -Classic Question:
 -No Prenatal/Antenatal care/US, with Painless Bloody ROM and Fetal Demise
 -Mx:
 -If Detected Early via prenatal care:
 1. Betamethasone
 2. C-Section planned at 34w
 -If Not Detected prior to Labor, and painless bleeding starts with ROM:
 1. Emergent C-Section



Placental Pathol

Placental Abruption

General: Separation of the placenta prior to delivery of fetus. Usually due to: Underlying chronic placental disease (see risk factors below), acute traumatic event (blunt trauma, deceleration injury), rapid uterine decompression (ie delivery of twin, relief of polyhydramnios)

Chorioamnionitis: Ascending Infx from genitourinary tract (just like pyelonephritis)

Risk: History of placental abruption, hypertension/eclampsia, tobacco/cocaine use, chorioamnionitis, abnormal uterus

HTN → ↓ blood flow

tobacco+cocain = vasoconstrictors = ↓ blood flow to placenta

-Top 3 complications

Clinical: Severe vaginal bleeding, abdominal pain/contractions, uterine rigidity/tenderness, fetal distress, high risk for DIC, hemorrhagic shock

Diagnosis: US (retroplacental clot). Note: US findings not consistent, so diagnosis may be based on clinical findings.

Management: Initial: FHR monitoring, IV access, other supportive care. Delivery (choice depends on stability of mom/baby)

- ① - If both are stable (and > 36 weeks): Vaginal delivery
- ② - If either is unstable: C-section (unless vaginal delivery imminent)

Uterine Rupture

General: Complete disruption of all uterine layers

Etiology:

- ① - Prior C-section (especially history of rupture, vertical hysterotomy)
- ② - Uterine myomectomy with cavity entry. Rarely seen in those without history of scarred uterus.
- ③ - Increased risk with prolonged labor, excess uterine contractions, multiple gestation, ↑ maternal age

→ AKA oxytocin drug

Clinical: Sudden worsening of abdominal pain, possible vaginal bleeding, fetal distress.

- ④ - Classic signs: Loss of fetal station, or palpation of fetal parts outside uterus
- Can be complicated by urinary tract injury, hemorrhagic shock
- Symptoms brought on or exacerbated by oxytocin

Diagnosis: Clinical + US confirmation (of disruption of all uterine layers)

Management: Crash C-section. Hysterectomy. Occasionally uterine repair may be possible.

Buzzwords:

1. Loss of station
2. Loss of uterine contractions

Placental Abruption → Blood stimulates uterine contractions = painful

Placenta Previa and Vasa Previa → Blood is near cervical OS = doesn't stimulate uterine contractions = painless

Note:

- Anterior wall expands more than posterior wall during pregnancy, thus Anterior Placenta Previa are more likely to resolve spontaneously
- US must be done before Digital exam in 2nd/3rd Trimester, because Digital/Manual exam due to risk of bleeding

Other Placental Complications

	General/Risk	Clinical/Diagnosis	Management
1	Placenta Previa - Placenta Previa is strongly associated with Placenta Accreta - Placenta Previa = Main diff from Placental Abruption: 1. Painless vaginal bleeding 2. No Cramps/Preterm Labor - Placenta can move, 90% of Placenta Previa resolve spontaneously - Mx: 1. Bleeding Risk (Avoid intercourse, Strenuous Activity, Prolonged Standing) 2. If Placenta Previa persists, C/S must be scheduled at 37w *Vaginal Delivery is Contraindicated Subtypes: ① - Complete: Placenta covers the cervical os ② - Partial: Partially covers cervical os ③ - Marginal: Extends to the margin of the os ④ - Low lying: In close proximity to os - Risk: History of placenta previa or cesarean delivery, history of D&C or myomectomy, multiple gestation	- Painless vaginal bleeding - Rarely causes uterine contractions/cramps - Associated with placenta accreta, preterm labor, PROM, vasa previa - Dx: Ultrasound (before digital exam due to risk for hemorrhage) Note: Once placenta is > 2 cm from cervical os, vaginal delivery is considered safe Note: Vaginal Delivery Is Contraindicated	① If asymptomatic: Follow with US (most previa resolve on own) ② Counsel patients to reduce bleeding risk by avoiding sexual activity, strenuous exercise, or prolonged standing - Supportive care/blood transfusions for ② acute episodes of bleeding ③ Delivery (at 36-37 weeks) by C-section ④ C-section also indicated if patient goes into labor, has life-threatening bleed, or severe fetal distress
2	Vasa Previa - Presence of fetal blood vessels in membranes covering the cervical os - Commonly associated with velamentous umbilical cord or succenturiate lobe - Risk: Velamentous cord insertion, low-lying placenta/previa, IVF, multiple gestation	- Presents as painless bleeding at time of rupture of membranes - Fetal HR may show signs of distress (bradycardia, decelerations, sinusoidal pattern, etc) - Apt test can be used to confirm fetal blood (mix NaOH with blood → Turns pink if fetal) - Dx: Transvaginal US (w/ doppler)	- Emergent C-section (indicated if acute bleeding, labor, or PROM) ① Antepartum: Weekly nonstress testing, ② betamethasone at 28-32 weeks, ③ schedule C-section at 34-35 weeks
3	Placenta Accreta ① Accreta = Adhesion reaches myometrium ② Invasive = Invasion ③ Percreta = Penetration - Risk: Hx of myomectomy, C-section, D&C	- Generally asymptomatic prior to delivery (but may be identified via US) - At delivery: Lack of placenta delivery - Retained parts, possible cord avulsion, and severe hemorrhage - Dx: US (shows irregularity or absence of placental myometrial interface). MRI if diagnosis uncertain.	- Planned C-section/Hysterectomy at 34-35 weeks - If diagnosed due to hemorrhage at the time of vaginal delivery, emergent hysterectomy is indicated

Imp: Dx via TVUS not Abdominal US

--Multiple Gestation--

-More Fetuses = Shorter Pregnancy
Single→40w
Twins→37w
Triplets→33w
-Higher β -hCG Level

--Abnormal Placental Attachment--
*Placental Bed = Decidua, normally placenta attaches to Decidua
-Three Forms:
1.Placenta Accreta→Attaches to endometrium (mcc)
2.Placenta Increta→Invade endometrium
3.Placenta Percreta→Penetrate endometrium to Myometrium/Bladder
-Risk Factors: Anything that causes (Defective Decidua)
1.Prior C-Section + Placenta Previa (most Imp)
2.Prior C-Section
3.Prior D&C or Uterine Surgery
-Dx via TVUS (Transvaginal US)
-If Undetected: present as RPOC (Remaining Product of Conception)
-If RPOC aren't removed:
1.DIC
2.Hemorrhagic Shock
3.ARDS (Acute RDS)
4.Maternal Hemorrhage
Tx: D/C
-Delivered via C/S
-mx:
-we try to remove abnormally placed placenta
-If not = Hysterectomy (mcc outcome)

--Uterine Rupture--
-Associated with Prior Uterine Surgery (i.e C/S)
-mcc occur during labor
-Present as:
1.Sudden Worsening of abdominal pain during Labor
2.Regular Contractions→Irregular Contractions with ↓Intensity and Loss of Fetal Station
3.Vaginal Bleeding
4.Abdominal Bleeding→ Hypovolemic Shock
5.Fetal parts may Protrude Into abdomen
-CTG: Bradycardia or Late/Variable Decelerations
-Tx: Emergency C/S

Obstetrics
OB-GYN

Multiple Ge

Overview of Multiple Gestation

General: ~3% rate of multiple gestation pregnancies in US

Risk: ↑ Maternal Age, IVF

Clinical:

- Moms can experience rapid weight gain, excessive uterus size for age
- ↑ β -hCG, AFP, hPL for expected age

Diagnosis: Most commonly picked up on US

- Can see two amniotic sacs or "twin-peaks" sign (fused membranes)

Management:

1 - Twin Delivery:

- Cephalic/Cephalic: Vaginal Delivery
- Cephalic/Non-cephalic: C-section or trial of vaginal delivery
- Non-cephalic/Non-cephalic: C-section

2 - Triplets: Almost always require C-section

Twin A→(Presenting Twin)→Closest to the cervix

Twin B→(Non-Presenting Twin)→Furthest from cervix

- 1.Cephalic/Cephalic→Vaginal Delivery
- 2.Cephalic/Non-Cephalic→Vaginal Delivery Trial or C/S
- 3.Non-Cephalic/Non-Cephalic→C/S

*In any case if Twin A is Non-Cephalic = C/S

Maternal Complications:

- Moms are more likely to require hospitalization, have placental abnormalities (ie previa), and require C-section

Fetal Complications:

- 1 Prematurity and low birth weight (common, risk ↑ with fetal number)
- 2 Fetal Growth Restriction (from crowding or uteroplacental insufficiency)
- Increased risk of congenital malformations
- 5 Twin-twin Transfusion
- Unbalanced vascular flow to two monochorionic twins
- 1 - "Donor twin" (hypovolemic, growth restriction, oligohydramnios)
- 2 - "Recipient twin" (hypervolemia, organomegaly, polyhydramnios)
- Rarely, there can be a significant intertwin hemoglobin difference
- Called twin anemia polycythemia sequence
- Management:
 - Fetal laser coagulation (tries to correct flow difference)
 - Amnioreduction (helps prevent preterm contractions)

Twin Pregnancies ↑ risk of all complications except Macrosomia

Dx:

Prenatal US→ Fluid Pockets $x < 2\text{cm}$ or $x > 8\text{cm}$ = Twin-Twin Transfusion
* oligohydramnios * polyhydramnios

Tx:

- Mild Cases: Expectant Management
- Sever cases: Fetal Laser Coagulation→
 - 1.Eliminate Twin-Twin Anastomoses
 - 2.Split Placenta*carries significant risk

*complete opposite

Multiple Gestation (Subtypes)

Class	Features
Dizygotic (fraternal twins)	
Dichorionic Diamniotic Di/Di	- Implantation of two separate fertilized ovum ("fraternal twins") - Can be different sexes - Separate placenta/amniotic sacs -Most common type of twins -Common in IVF
Monozygotic (Identical twins)	
Dichorionic Diamniotic Di/Di	- One fertilized ovum, which splits (~days 1-3) and implant separately - Separate placenta/amniotic sacs
Monochorionic Diamniotic Mo/Di	- One fertilized ovum, which splits after blastocyst forms (~days 4-8), and implant separately - Share placenta, separate amniotic sac ↑ Risk of Twin-Twin Transfusion
Monochorionic Monoamniotic Mo/Mo	- One fertilized ovum, which implants, and then later splits (~days 8-13) - Same placenta, same amniotic sac split after implantation - Highest risk for fetal mortality
Conjoined Mo/Mo (conjoined)	- Same as monochorionic-monoamniotic above, except split occurs at ~14 days after embryonic disk has formed

CTG (Cardiotocography) → Routine Fetal Monitoring

- Fetal Heart Rate and Uterine Contractions
- Routine Monitoring

NST (Non-Stress Test) → Subtype of CTG but without Uterine Contractions (only Fetal Heart Rate)

CST (Contraction Stress Test) → Assessment of Fetal Response to Uterine Contractions

- Fetal Heart without Uterine Contractions
- Ensures absence of late decelerations, indicating no placental-uterine compromise during induced vaginal delivery
- If compromise occurs, switch to emergent cesarean section (C/S)

--Labor--

-Labour = Rhythmic Increasing In Strength and Frequency Contractions + Cervical Changes

(Cervical changes are a must)

-Braxton-Hicks contractions = No Cervical Changes

-often felt in 3rd trimester

-Irregular, don't ↑ In Strength and Freq

-Investigation if you can't tell:

1. Ultrasound

2. Cervix Check (Speculum)

3. CTG (Cardiotocography) aka (Non-Stress Test)

-Reactive CTG = Healthy = Discharge Home (False Labor)

OB-GYN

Protracted 1st Active = Cervical Dilatation <1cm/hr

Overview and Definition of Labor

General: Labor is defined as **painful contractions** PLUS **cervical change** + **Rhythmic and ↑ increasing rate + severity**

Stage	Definition	Nulliparous	Multiparous
First (Latent)	Onset of labor until 4-6 cm dilation <i>onset - 6cm</i>	< 20 hours (average 10-12)	< 14 hours (average 6-8)
First (Active)	4-6 cm until complete 10 cm cervical dilation <i>6-10 cm</i>	4-6 hr (> 1-1.2 cm/hr)	2-3 hr (> 1.2-1.5 cm/hr)
Second	Complete cervical dilation to delivery of infant <i>10 cm - delivery of infant</i> Note: Epidural Anesthesia prolongs 2nd stage	< 2 hours (3 hr if epidural)	< 1 hour (2 hr if epidural)
Third	From delivery of infant to delivery of placenta <i>delivery of infant - delivery of placenta</i>	< 30 minutes	< 30 minutes

Evaluation of Labor

1 - **Leopold Maneuvers:** Used to **determine fetal lie** (ie **longitudinal** or **transverse**, etc) →

2 - **Cervical Examination**

① - **Dilation** (measured at **internal os**) Until 10 cm

- Dilation can cause "bloody show" (small cervical bleed)

② - **Effacement** (thinning of cervix from normal length of 3-5 cm) *~<3cm*

③ - **Station:** Based on position relative to **imaginary line between ischial spines**

- Negative is inside of uterus, positive is outside of uterus

④ - **Cervical position and consistency**

"Bear Down" → Valsalva Maneuver → i.e. breathing out forcefully while your mouth is shut

3 - **Speculum Examination** (look for ROM)

- **Pooling of fluid** (after asking patient to **bear down**), nitrazine paper (amniotic fluid is alkaline), ferning (microscopically)

* ROM Signs →

- Other tests: Indigo-carmin dye injection, **amniotic fluid immunoassay** →

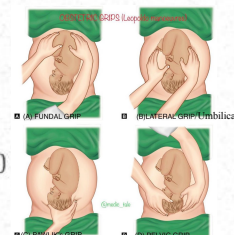
1. Insulin-like Growth Factor Binding Protein 1 (IGFBP-1)

2. Placental Alpha Microglobulin-1 (PAMG-1)

4 - **Ultrasound:** Can evaluate for **effacement** or new **oligohydramnios** (suggests ROM)

DVP (Deepest Vertical Pocket)
-x<2 cm = Oligohydramnios
-x>8 cm = Polyhydramnios

5 - **Bishop Score**



Cervical Status	Maximum Score = 13	For Induction x≥6	0	1	2	3
1 Dilatation			Closed	1-2 cm	3-4 cm	> 5 cm
2 Effacement <i>~<3cm (3-5cm) = normal cervical thickness</i>			< 30%	30-50%	50-80%	> 80%
3 Station			-3	-2	-1 or 0	≥ +1
4 Consistency			Firm	Intermediate	Soft	
5 Position			Posterior	Intermediate	Anterior	

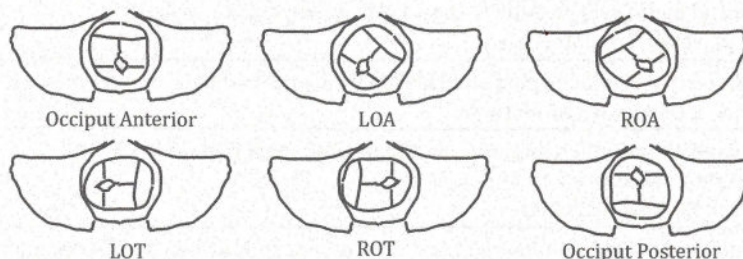
Cardinal Movements and Occiput Presentation

Cardinal Movements:

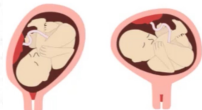
Engagement, descent & internal rotation, complete rotation, complete extension, external rotation, anterior shoulder delivery, posterior shoulder delivery

Occiput Presentation:

Vertex presentation with anterior occiput is ideal. Occiput posterior and transverse can lead to longer delivery time.



Frank Breech Complete Breech Footling Breech



OBLIQUE TRANSVERSE

--Presentations--

1. Cephalic: (Vertex/Brow/Face)

-Vertex = Cephalic-Head presentation = mcc and ideal

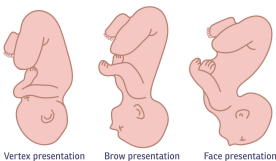
2. Breech: Frank (75%)/Complete (20%)/Footling (10%)

-Frank is mcc (Flexed Hip, Extended Knees)

-Complete (Flexed Hip, Flexed Knees)

3. Oblique

4. Transverse



Vertex presentation Brow presentation Face presentation

Normal Labor and Delivery

Obstetrics
OB-GYN

Fetal Heart Rate Monitoring

General: Fetal heart rate can be monitored via **external doppler monitor** or via **fetal scalp electrode**. Often combined with **tocometry**, which measures intrauterine pressure to help establish timing, length, and strength of contractions.

Component	Features
Rate	< 110 (bradycardia): Congenital heart defects, severe hypoxemia (uterine hyperstimulation, cord prolapse, rapid fetal descent) > 160 (tachycardia): Hypoxia, maternal fever, fetal anemia, drugs
Variability	- Absent: Indicates severe fetal distress - Minimal: < 6 bpm (indicates fetal hypoxia, drugs, or sleep) - Can attempt fetal scalp stimulation to induce variability - Normal: 6-25 bpm - Marked: > 25 bpm - Sinusoidal: Fetal anemia
Accelerations	- 15 bpm above baseline for 15 seconds (at least 2 in 20 minutes) Note: At < 32 weeks it is 10 bpm/10 sec, at least 2 in 20 min

Decelerations:

Type	Description	Cause	Tracing
Early Mirror Contractions	- Gradual (onset to nadir > 30 sec) ↓ in FHR that mirrors uterine contraction	- Head compression (vagal tone)	
Late After Contractions	- Gradual (onset to nadir > 30 sec) ↓ in FHR with onset after peak of contraction and recovery of FHR after contraction is over	- Uteroplacental insufficiency - Fetal hypoxemia	
Variable Not Correlated with Contractions	- Abrupt (onset to nadir < 30 sec) ↓ in FHR lasting no more than 2 minutes - Not correlated with contractions	- Umbilical cord compression	

VEAL-CHOP

- **V**ariable → **C**ord compression
- **E**arly → **H**ead compression
- **A**cceleration → **O**kay
- **L**ate → **P**lacental insufficiency

Normal Labor and Delivery

Obstetrics
OB-GYN

Induction and Augmentation of Labor

1 Induction:

1 - Indicated if:

- Postterm
- Preeclampsia, DM
- IUGR → Intrauterine Growth Restriction

- Induction is Not done in case of Fetal Distress

- Induction is done in case of:

1. Postterm ($x > 42w$)
2. PROM/ROM or Post-Amniotomy
3. IUGR (Intrauterine Growth Restriction)

- Minimum Bishop score to Induce Labor $x \geq 6$
otherwise uterine contractions are induced but the cervix isn't open thus the fetus can't make it out

- Induction of Labor → Oxytocin to initiate labor

- Augmentation of Labor → Oxytocin to help ongoing labor with inadequate contractions

Oxytocin Side Effects:

1. **Tachysystole**: (Too much uterine contraction)

- $\uparrow x > 5$ contraction per 10 min
- Lead to Fetal Hypoxemia + Acidemia
- Tx:

1. $\downarrow$ Decrease Dose/Stop Oxytocin
2. Terbutaline (β_2 -Agonist)

2. **Hyponatremia**:

- Oxytocin is an ADH Analogue
- $\uparrow$ Water Retention → Dilutional Hyponatremia

3. **Hypotension**: Oxytocin = Vasodilator

4. **Maternal Fatigue/Sleepiness**

2 - Techniques:

- May begin spontaneously after cervical ripening
- **Oxytocin**
- **Amniotomy** (ie artificial ROM)

2 Cervical Ripening:

1 - Indicated in those with poor Bishop's score (< 6) prior to induction

2 - Methods include:

- **Misoprostol (PGE1)**
- **PGE2 gel or vaginal inserts (Prepidil/Cervidil)**
- **Mechanical bulb dilator**

- PGE1 = Stronger = Misoprostol:

1. Cervical Ripening
2. Induce Abortion (stronger)
- *PGE1 = More Heavily Regulated

- PGE2 = Weaker = Dinoprostol

1. Cervical Ripening
2. Induce Labor (weaker)

3 Augmentation:

1 - Indications: Inadequate contractions or prolonged phase of labor

- **Oxytocin**: Stimulates uterus for stronger and more frequent contractions

- **Side Effects**: Tachysystole, ADH like effect (hyponatremia), hypotension, fetal distress

1

Analgesia and Pain Management

2

General: **Visceral pain** from uterine and cervical distension/cramping (Stage 1) and **somatic pain** from Stage 2 of labor as vagina and perineal structures are stretched

- Block must reach **T10** for visceral first stage pain, **S2-S4** for second stage

1. Visceral → Medial → Poorly Localized → Stage 1 → Uterine/Cervical Stretch

2. Somatic → Peripheral → Well Localized → Stage 2 → Vaginal/Perineal Stretch

Indications: **Maternal request** (sufficient to provide, assuming no contraindications)

Bupivacaine → Epidural
Lidocaine → Local + Subdural

Lamaze	- Coping/relaxation techniques taught in classes during pregnancy Breathing Techniques
Opiates	- Generally inferior to neuraxial block and avoided - If used, rapid acting agents used (ie Fentanyl) - Can cause fetal bradycardia and neonatal respiratory depression Typical Opioid OD symptoms
Neuraxial	- Options include epidural , combined spinal-epidural , or spinal - Generally given continuously via catheter (can be via "single-shot") - Continuous allows easy transition to operative delivery - Drug Choice: Local anesthetic (Bupivacaine) plus opiate (Fentanyl) - [See: Surgery] for discussion of complications
Nerve Block	- Pudendal nerve block : Used as adjunct if patient suffering from somatic vaginal/perineal pain Pudendal N → S2-S4 Used for Stage 2 (Vaginal/Perineal Stretch)
General Anesthesia	- Reserved for cases of emergent C-section when there is no time for neuraxial block

--Anesthesia Summary--

- Ideally go to **Neuroaxial**

- In Emergent C-Section **GA**

- Opiates aren't used due to OD symptoms (Fetal Bradycardia + RS Depression)

Operative Labor and Delivery

Obstetrics
OB-GYN

I Cesarean Delivery

Indications:

Maternal	Fetal
1 Failure to Progress , including: - Cephalopelvic disproportion - Failed labor induction 2 Structural: - Obstructive tumors, fibroids - Placental abruption, previa - Vasa previa or cord prolapse + <i>Placenta Previa</i> 3 Medical Conditions: - HIV infection (untreated) - Active HSV - Cervical cancer - Obstructive tumors, fibroids	1 General → - Fetal distress (ie on FHR monitoring) - Fetal malpresentation (<i>Breech</i>) - Multiple gestation (ie triplets or malpresenting first twin) * Twin A = Non-cephalic or non-cephalic/Non-cephalic 2 Fetal Anomalies: - Macrosomia (ie > 5000 g) <i>> 5kg</i>

1 Surgical Technique: *of C/S*

- ① - Neuraxial anesthesia is preferred (general anesthesia for emergencies)
- ② - Transverse Incision (Pfannenstiel)
 - Better cosmetics, less postoperative pain
 - Occasionally vertical incisions are used in severe emergencies
- ③ - Low transverse hysterotomy
- ④ - Delivery of fetus and placenta
- ⑤ - Ensure no retained parts/bleeding (uterine massage/oxytocin)
- ⑥ - Abdominal wall closure

C/S:

1. Skin Incision = Transverse
2. Uteral Incision = Low Transverse Incision

*"Classical Incision" = Vertical Incision = ↑Risk of Uterine Rupture

TOLAC (Trial Of Labor After Cesarean)
VBAC (Vaginal Birth After Cesarean)

-TOLAC + VBAC allowed only if:
1. x≤1 Cesarean
2. Vertical Classical Incision not used

2 Postoperative Issues:

- Pain, urinary retention, infection, bleeding

3 Long-Term Complications: Scarring (↑ risk for uterine rupture, placenta previa/accreta)

Trial of Labor After Cesarean (TOLAC)

General: Although primary C-section is often followed by C-section during future pregnancies, some women elect for trial of labor. Called TOLAC for labor trial, and VBAC for vaginal birth after cesarean.

Risk in these patients for uterine rupture at site of C-section scar

Uterine Rupture:
1. Loss of station
2. Loss of uterine contractions

Lower Risk	- Only 1 prior C-section, prior vaginal birth or VBAC
Higher Risk	- > 1 prior cesarean delivery, "classical" cesarean delivery - Prior C-section for cephalopelvic disproportion - Last cesarean within 18 months

Management:

- In general, TOLAC can be considered if 1 prior C-section with transverse incision. Otherwise, repeat deliveries should be via C-section.

Operative Labor and Delivery

Obstetrics
OB-GYN

Operative Vaginal Delivery AKA Instrumental Delivery

General: Refers to the use of **forceps or vacuum** to assist in the extraction of fetus from vagina

1 Indications:

(Generally)
*C/S preferred over Instruments

Instrumental:
-Prerequisite:

1. Engaged Head
2. Fully Dilated/Effaced
3. Membrane Ruptured

-Indications:

1. Prolonged 2nd stage
2. Fetal Compromise
3. Maternal Disorder

that contraindicates vaginal

- Generally indicated when normal labor needs to be terminated
- In general, **cesarean delivery is performed rather than forceps/vacuum**, but there are some situations where they are indicated:

- ① - **Prolonged 2nd stage of labor** (ie from maternal exhaustion)
- ② - **Fetal compromise**
- ③ - **Maternal disorder that contraindicates vaginal**

- Note: In all the above cases, operative delivery must be safe/possible. This means **baby has head engaged (with station > 0), full dilation/cervical effacement, membranes ruptured**, and adequate anesthesia.

Type	Features	Adverse Events
Forceps	- Forceps used to grasp the anterior occiput	- ↑ Risk of maternal genital trauma (ie vaginal lacerations, bladder injury , etc) - ↑ Risk of fetal CN VII injury
Vacuum	- Suction cup applied to fetal scalp	- ↑ Risk of cephalohematoma, retinal hemorrhage compared to forceps

* All operative vaginal deliveries have **rare risk of fetal CNS hemorrhage**

* Above adverse events can happen with either forceps or vacuum, but are classified with the operative technique that they are more highly associated with

Episiotomy/Lacerations

1 Episiotomy:

- **Surgical enlargement of the vagina** via **incision into the perineum**, in order to widen the birth canal and facilitate delivery
- **No specific indications for episiotomy** (occasionally used by some OB physicians when **rapid vaginal delivery** is needed or **shoulder dystocia**)
- Approach
 - ① - **Mediolateral** (↓ risk of sphincter injury, but **harder to repair**)
 - ② - **Medial** (Easiest to repair, but **painful** and ↑ risk of sphincter injury)
- Complications: **Sphincter injury, bleeding, infection, rectovaginal fistula**

2 Lacerations:

- **Vaginal lacerations** are **commonplace with vaginal delivery**
- Types:
 - Grade 1: Vaginal only
 - Grade 2: Perineal body
 - Grade 3: Into anal sphincter
 - Grade 4: Through anal mucosa
- Complications: **Wound abscess, sphincter injury, rectovaginal fistula**

- ROM--
 ROM--Rupture of Membrane:
 -Presentation: Clear Non-Odorless Voluminous Gush of vaginal fluid
 -If Green = Meconium (MSAF) (Meconium Stained Amniotic Fluid)
 -Investigations:
 1. Speculum-->+ve Pooling Sign
 2. US-->Deepest Vertical Pocket (DVP)
 -Oligohydramnios <2
 -Polyhydramnios >8
 3. Immune Essay
 -Insulin-like Growth Factor (IGF)
 -Placental Alpha-1 Microglobulin (PAMG-1)
1. SRM (Spontaneous ROM)
 2. PPROM (Preterm Pre-Labor ROM) x<37w
 3. PROM (Pre-Mature ROM) x>37w
 4. AROM (Artificial ROM) (Amniotomy)

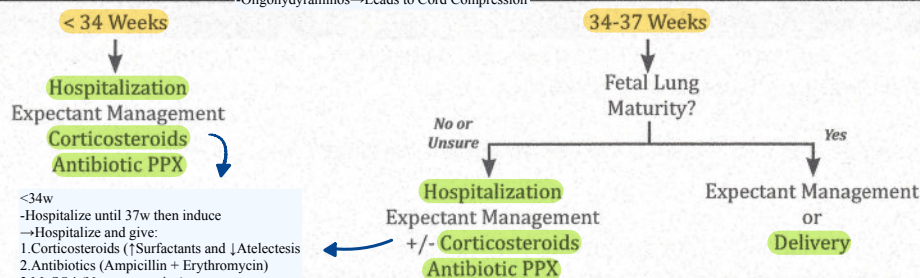
- More ROM Tests--
 1. Nitrazine Test:
 -Amniotic Fluid Ph (7-7.3)
 -(+ve) Amnion = Blue
 2. Fern Test:
 -Vaginal fluids mix with estrogen as they leave
 -"Fern-like" pattern under microscope
 3. Dye Test:
 -Dye injected into amniotic sac through abdomen
 -(+ve) if colored fluids appear in vagina

- NRDS-->Neonatal Respiratory Distress Syndrome
 -PDA (Patent Ductus Arteriosus) (Aorta to Pulmonary.A)
 -To Keep Open-->Prostaglandin E1-->Incise of
 1. ToF (Teratology of Fallot)
 2. Critical Coarctation of Aorta
 -To Close-->Indomethacin-->Incise Patent

Labor & Delivery

Obstetrics
 OB-GYN

	General/Clinical	Management
1 Spontaneous Rupture of Membranes (ROM) SRM	- Occurs after the onset of labor - Required for fetal head engagement - Can be confirmed via history of gush of fluid & speculum examination confirming leakage of amniotic fluid (presentation is similar for all the ROM conditions)	- Normal Delivery Management Note: Can confirm ROM with nitrazine paper test, fern testing, US (for oligohydramnios), indigo carmine dye injection <i>OWP < 2cm Deep vertical Pocket</i>
2 Premature ROM (PROM) Digital Exams should be avoided post ROM to ↓ Risk of Infx	- Rupture of the membranes prior to regular contractions Rupture before Labor, but >37w (Term) - Women at full term (vs PPROM) - ↑ Risk of maternal and fetal infections, Placental Abruption due to Rapid Decompression, Umbilical Cord Prolapse	- Induction of labor (Oxytocin) Strongest Risk Factor for PPROM: 1. Previous PPROM hx 2. Genitourinary Infx (even asymptomatic)-->↑Fragility of Membrane
3 Preterm Premature ROM (PPROM)	- Rupture of membranes prior to contractions at < 37 weeks GA - Risk for complications, including intrauterine infection/neonatal sepsis, oligohydramnios, umbilical cord prolapse or compression, fetal malpresentation - ↑Risk of GBS - Oligohydramnios-->Leads to Cord Compression	See Algorithms Below - Urgent delivery is indicated for any PPROM associated with intrauterine infection, placental abruption, fetal distress, or concern about cord prolapse



Premature Labor Preterm Labor not PROM

General: Birth prior to 37 weeks gestational age

Risk: History of premature labor, multiple gestation, smoking, history of cervical surgery (ie those with cervical insufficiency)

Risk factors continued: Short Cervix, Short Interpregnancy Interval (x<6 m), Infection (UTI, Asymptomatic Bacteriuria), Polyhydramnios

Etiology: Premature labor can be induced by infection, PROM, polyhydramnios, placental abruption

Clinical: Presents similarly to normal term labor (cramping, contractions, vaginal discharge of clear fluid/mucus/blood tinged)

Diagnosis: Painful Contractions (> 4 in 20 min or > 8 in 60 min) AND cervical change (ie dilation > 3 cm or effacement)
 - Fetal Fibronection (used between weeks 22-34) [High negative predictive value, positive level support preterm labor]

Management: All should receive full H&P, speculum exam (r/o PROM), and US Mx: 1. History+Physical 2. Speculum to rule out PROM 3. US (rule out Oligohydramnios)

≥ 34 Weeks	- Admit and deliver.
32-33 Weeks	✓ Betamethasone ✓ Tocolytic Drugs (48 hours for steroid effects). Drugs include: - β2-mimetics (Ritodrine or Terbutaline), MgSO₄, Ca-Channel Blockers (Nifedipine), PG Inhibitors ✓ (Indomethacin) ✓ GBS Antibiotic PPX (Penicillin G, Ampicillin, or Clindamycin) If GBS culture resistant to Clindamycin, use Vancomycin
< 32 Weeks	- Same as 32-33 weeks, but add MgSO ₄ (proven neuroprotection)

Fetal Complications: Intraventricular hemorrhage, NRDS, PDA, necrotizing enterocolitis, retinopathy, bronchopulmonary dysplasia

Prophylaxis: If history of spontaneous premature birth: Progesterone supplementation

- If Short Cervix (on TVUS 16-24 weeks):

- No history of prematurity: Give progesterone

- Plus history of prematurity: Progesterone plus cerclage

can be given up to 32w but most effective before 29w6

--Drugs to be given to premature baby in Preterm Labor--

If:
 x>34w = Admit and Deliver
 x<34w-->

1. Steroids--> ↑Surfactant and ↓Risk of RDS (Respiratory Distress Syndrome)

2. Antibiotics--> for GBS --> for pre-term births

3. MgSO₄--> Neuroprotection ↓Risk of Cerebral Palsy in preterm

4. Tocolytics--> Uterine Contractions = Delay Labor, giving time for other drugs to work
 e.g: Progesterone, Nifedipine, Indomethacin, Terbutaline (used post 32w only since it has side effects before that)

5. GBS PPX (Prophylaxis)-->

-Penicillin G or Ampicillin

-If Mild Penicillin Allergy (rash)-->Clindamycin

-If Severe Penicillin Allergy (anaphylactic shock)-->Vancomycin

↓ pre term labor notes

--Mx of Preterm Labor--
 -If Infx (Chorioamnionitis) or Fetal/Maternal Compromise (Maternal Fever/Fetal Tachy)→Deliver (Irregardless of GA)
 -If Stable: x>34w→Deliver
 -If Stable: x<34w→Hospitalize until 34w and give:
 1. Maternal Corticosteroids
 2. Prophylaxis (PPx) Antibiotics
 -Dx of Preterm Labor: 1. TVUS + 2. Fetal Fibronectin
 1. TVUS during week 16-23 to determine risk of Preterm Birth (risk of cervical insufficiency):
 Long Cervix = x≥30mm (Unlikely preterm birth)
 Short Cervix = x≤25mm (Cervlage or Progesteron Agonist)
 25<x<30 = undetermined, should be monitored
 2. Fetal Fibronectin→during week 22+
 -Fibronectin is found in Decidua-Chorionic Interface
 -Detected on Cervico-Vaginal Secretions
 -Before week 20, Fetal Fibronectin is always high (useless)
 -High Fetal Fibronectin = High risk of Preterm Labor

-common gynec drugs:
 1. Misoprostone (Prostaglandin E1) = Shorten/Efface Cervix
 2. Mifepristone (Progesteron antagonist) = Abortion
 3. Progesteron Agonist = Protective against Preterm Birth
 Tocolytic Guidelines:
 1st line→Indomethacin
 -only b/w 28-32w
 -post 32w→causes constriction of Ductus Arterioses
 2nd line→Nifedipine (dihydropyridine)
 -Smooth muscle relaxant, thus may cause:
 (Flushing/Hypotension)
 3rd line→Terbutaline (β2-Agonist)
 --PPX of Preterm Labor--
 -Prophylaxis is only used for High Risk Groups:
 1. Previous hx of Preterm Labor
 --Cervlage + Progesteron Agonist
 2. Short Cervix (x<25mm) at (x≤24w)
 →Progesteron Agonist only
 -Progesteron Agonist: Maintain Uteral Quiescence
 i.e.: Uterine Contractions and Prevent them (Prophylactic Tocolytic)

Obstetrics
OB-GYN

Postterm Pregnancy

General: Consider postterm at ≥ 42 weeks GA

Risk: History of postterm, obesity, fetal endocrinopathy, male fetus, nulliparity

Management:

- 1 - Induce labor if:
 - Non-reassuring fetal testing or oligohydramnios
 - ≥ 42 weeks
 - Consider at 41 weeks GA (especially if favorable cervix)
- 2 - If expectant management: Monitor with biophysical profile

Complications: ~5 kg

- 1 - Fetal: Macrosomia, oligohydramnios, meconium aspiration
 - Stayed long enough that meconium was passed
 - Green Amniotic Fluid
 - 1 - Dysmaturity syndrome (dry peeling nails, flaking skin, lots of hair)
- 2 - Maternal: Birth trauma, incretion, hemorrhage

GBS Infection

General: Organism that routinely colonizes GU tract in women. Can cause UTI (both cystitis and pyelonephritis), chorioamnionitis, endomyometritis, neonatal sepsis.

Diagnosis: Screened for at 35-37 weeks in pregnant women (vaginal/rectal swab)

- severe Penicillin G Allergy = Vancomycin
 - mild Penicillin G Allergy

Management:

- Antibiotic PPX: Penicillin G or Ampicillin (alt: Cefazolin, Clindamycin)
- Started at the onset of labor (but not C-section without labor)
- Indications include:
 - 1 - (+) Routine GBS screening at 35-37w
 - 2 - History of infant with early-onset GBS infection
 - 3 - GBS bacteriuria during current pregnancy
- Unknown status, plus:
 - 4 - Preterm labor, intrapartum fever, or prolonged ROM (> 18 hours)
 - 5
 - 6

Chorioamnionitis

General: Infection of the amniotic fluid, membranes, placenta, and/or decidua. Usually polymicrobial (from vaginal flora in women with rupture membranes), but can be due to iatrogenically introduced bacteria from procedures.

Clinical: Clinical diagnosis made with fever > 100.4°F PLUS ≥ 1 of the following:

- FHR > 160
- Maternal WBC count > 15,000
- Purulent vaginal/cervical discharge

Diagnosis: Confirmed with positive gram stain/culture of amniotic fluid

1

2

Management: Ampicillin + Gentamicin +/- Clindamycin or Metronidazole (if C-section).

- Prompt delivery is indicated (normal vaginal delivery is okay unless patient has some usual indication for C-section)

Mx of Chorioamnitis:
 -Normal Vaginal Delivery→1. Ampicillin 2. Gentamicin 3. Clindamycin
 -C-Section→1. MTX

Complications of Labor & Delivery

Obstetrics
OB-GYN

Failure to Progress	General	Management
First Stage (Latent)	- Normal: < 20 hrs (prima), < 14 hrs (multip) - Risk: Unfavorable cervix	- Therapeutic rest (ie Morphine and rest) - Oxytocin augmentation - Amniotomy - Most will eventually pass into active labor or will stop having contractions
First Stage (Active)	- Normal: > 6 cm, 1-2 cm/hr progression - Protracted: Dilating < 1 cm/hr - Arrest: No cervical change in 4 hours despite adequate contractions Causes include: - Lack of Power: Normal power is > 200 Montevideo units (MVUs) (defined as sum of the peak uterine pressure minus baseline uterine pressure for each contraction) - Passenger/Pelvis Issue: Cephalopelvic disproportion	- Initial: Oxytocin and amniotomy - If ineffective → C-section
Second Stage	- Normal: < 3 hours (nulli), < 2 hours (prima), plus longer for those with epidural anesthesia - Cause: Most often passenger/pelvis issue (including malpresentation, macrosomia, cephalopelvic disproportion)	- Trial of Oxytocin (if infrequent contractions > 3 mins) - Consideration for operative delivery OR C-section - Decision of operative vs C-section is highly based on experience and clinical judgement
Third Stage (Placental Delivery)	- Normal: < 30 minutes - Risk: Prior C-section, D&C, or fibroids	- Oxytocin, uterine massage [See: Postpartum Hemorrhage] - Retained Placenta: Manual extraction or D&C

Shoulder Dystocia

General: Failure of the shoulders to spontaneously deliver after the fetal head

-Occur during 6th Cardinal Movement (Restitution)/(External Rotation)/(Shoulder Rotation)

Risk: Maternal obesity, diabetes mellitus, macrosomia, post-date, history of shoulder dystocia. Note: > 50% of cases are idiopathic and have none of the above risk factors.

Clinical: Recoil of fetal head into the perineum ("turtle sign")



Shoulder Dystocia→

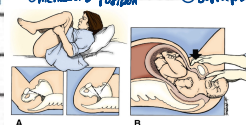
1. Erb's Palsy (C5-C6)
2. Klumpke (C8-T1)

Management: BE CALM

B	- Breathe	
E	- Elevate legs (McRoberts Position: Sharp flexion of the hips)	
C	- Call for help	
A	- Apply suprapubic pressure (downward to release anterior shoulder)	
L	- enLarge vaginal opening with episiotomy	
M	- Maneuvers	

McRoberts Position

Suprapubic pressure

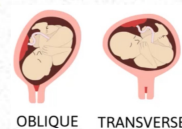
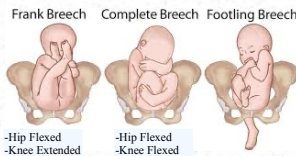
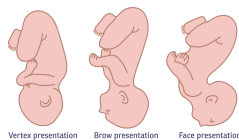


Complications of Shoulder Dystocia

1 Erb Palsy	- C5-C6 injury. Presents with decreased reflexes on affected side, as well as "Waiter's tip" (extended elbow, pronated forearm, flexed wrist) - Tx: 80% are self-limited and improve over following months. Massage and physical therapy.
2 Klumpke	- C8-T1 injury. Presents with "claw hand" (extended wrist, extended MCPs, and flexed IPs). - Possible Horner syndrome <i>*All lambrides are affected</i>
3 Clavicle Fx	- Presents with clavicular bony crepitus, deformity, and/or decreased Moro reflex on the affected side
4 Humeral Fx	- Presents with upper-arm bony crepitus, deformity, and/or decreased Moro reflex on the affected side
5 Asphyxia	- Can result in hypoxic-ischemic encephalopathy or death if severe

Asphyxia = Hypoxic Encephalopathy

- Presentations-
- 1.Cephalic: (Vertex/Brow/Face)
 - Vertex = Cephalic-Head presentation = mce and ideal
 - 2.Breech: Frank(75%)Complete(10%)Footling(20%)
 - Frank is mce (Flexed Hip, Extended Knees)
 - Complete (Flexed Hip, Flexed Knees)
 - 3.Oblique
 - 4.Transverse



TOLAC (Trial Of Labor After Cesarean)
VBAC (Vaginal Birth After Cesarean)

- TOLAC + VBAC allowed only if:
- 1.x≤1 Cesarean
 - 2.Vertical Classical Incision not used

-When Is Vertical Classical Incision indicated:

- 1.Large Low Utrine Fibroid
- 2.Placenta Previa
- 3.Breech/Transverse Presentation
- 4.Emergent C-Sections (Fetal Distress, Utrine Rupture, ect)

Complications of Labor & Delivery

Breech Presentation

Frank Breech (50-75%)	- Presents rear first, with flexed hips and extended knees
Footling Breech (20%)	- Presents with one or both legs presented first
Complete Breech (5-10%)	- Presents rear first, with flexed hips and flexed knees

Diagnosis: Leopold maneuvers or **ultrasound**

Management:

- **75%** spontaneously change to vertex by **week 38**
- 1 - **External cephalic version:** Performed **after week 37**
 - **Apply directed pressure to abdomen** to **turn infant to vertex**
 - **Risks:** **Placental abruption** and **cord compression** (must be **prepared for emergency C-section, give RhoGAM**) RhoGAM→IgG Anti-D→Prevent hemolytic Disease of Newborn (HDN)
 - **Contraindications:** **Ruptured membranes/oligohydramnios**, **extended head**, **non-reassuring tracing**, fetal/**uterine abnormalities**, **multiple gestation**
 - **Active labor** is **relative contraindication**
- 2 - **Trial of breech vaginal delivery:**
 - Attempt only if **delivery is imminent** with **favorable situation** (**flexed head**, low-to-**normal fetal weight**, **favorable pelvis**)
 - **Complications:** **Cord prolapse** or **head entrapment**
- 3 - **Elective C-section:** Recommended to be scheduled at **39-40 weeks** and **preferred to vaginal delivery** given lower risk of fetal morbidity
- 4 - **Internal Podalic Version** -Hand inserted into uterus to rotate second twin after first twin has been delivered
 - Performed to **flip around second twin** in **vaginal delivery** of **cephalic/non-cephalic twins**

Other Fetal Malpresentation

Face	- Fetal face (from forehead to chin) is leading in birth canal - Higher chance for arrested labor and may require C-section
Brow	- Fetal forehead (from anterior fontanelle to the brow) leading
Transverse	- Fetal longitudinal axis is perpendicular to long axis of uterus - Usually converts to cephalic or breech presentation prior to labor - If persists , perform external cephalic version at 37 weeks (like breech) - If converts to vertex , deliver vaginally like normal. If does not convert after 2x attempt at external cephalic version (at 37, 38 weeks), then C-section is indicated . - If in active labor and transverse: C-section indicated

Complications of Labor & Delivery

Obstetrics
OB-GYN

Fetal Distress	
Decelerations	- Late decelerations are always concerning and indicate need for rapid delivery In case of variable decelerations, attempt the following: - Face mask O₂ - Turn on left side to decrease IVC compression - Bolus IVF - Discontinue oxytocin - If prolonged contraction (hypertonus) or tachysystole (too many contractions): Can give one dose of <u>Terbutaline</u> (<i>Prodytic</i>) - Amnioinfusion (relieves cord compression)
Bradycardia	- Heart rate < 110 for at least 10 minutes <u>Causes:</u> - Pre-placental (due to maternal hypoxia, from seizure, AFE, PE, MI, resp failure, over-sedation) - Uteroplacental (abruption, infarction, hemorrhage) - Post-placental (cord prolapse, compression, or vasa previa) - Tx: See variable deceleration above (similar maneuvers)
Tachycardia	- Causes include: Anemia, drugs, infection, arrhythmia - Tx: Underlying cause

Cord Emergencies	
Nuchal Cord	- Umbilical cord wrapped around fetal neck - Tx: <u>Manually reduce</u>. If unable, but delivery is imminent, <u>clamp in two places and cut</u>.
Cord Prolapse	- <u>Cord protrusion</u> past the presenting part of the fetus and <u>into the cervical canal or vagina</u> - Presents most often with <u>fetal bradycardia/decelerations</u> <i>mcc</i> - Tx: <u>Urgent C-section</u>

Fetal Complications

Obstetrics
OB-GYN

Fetal Growth Restriction (FGR)

General: Defined as **< 10th percentile** or **2500 g**. Note: $\approx < 2.5g$

- ① - **Small for Gestational Age:** Includes **< 10th percentile** (including those that are simply constitutionally small due to parental factors)
- ② - **Fetal Growth Restriction** (or intrauterine growth restriction) refers to those with failure to reach **expected in-utero growth potential due to genetic or environmental factors**

① Symmetric FGR All Organs Affected	② Asymmetric FGR Head is preserved, aka "Head Sparing FGR"
- Reductions in size of all organs with the body, head, and height proportionally affected	- Disproportionate growth restriction with normal head size, but decreased length, and severely decreased weight
- Usually present before 20 weeks	- Usually presents after 20 weeks
- Chromosomal defects - Infection Intrinsic Factors: 1. Chromosomal Abnormality 2. Infection	- Uteroplacental insufficiency → Late Deceleration - Malnutrition

Management:

- ① - **Prenatal:** **Serial ultrasound**, monitoring:
 - Fetal growth
 - Biophysical profile **BPP**
 - Umbilical artery doppler (IUGR can result from **decreased, absent, or even reversed flow**)
- ② - **Delivery:** Try to **maximize growth by delaying delivery**
 - **Deliver at term** if no issues with BPP or umbilical doppler
 - **Deliver** if decreased flow and BPP becomes abnormal
 - **Deliver** if reverse flow (> 32 weeks) or absent flow (> 34 weeks)

Complications: Increased risk for prematurity, perinatal asphyxia, hypothermia, hypoglycemia, polycythemia

Large for Gestational Age

General: > 90 percentile or 4000 g $\approx > 4kg$

Risk: Maternal diabetes mellitus (both gestational and preexisting), excessive weight gain, fetal sex (male), ↑ gestational age, genetic disease (ie Beckwith-Wiedemann)

-EFW = Estimated Fetal Weight, done via US via AC (Abdominal Circumference)
-Planned Cesarean Delivery If:
EFW>4.5kg In women with DM
EFW>5kg In women without DM

Management: Planned cesarean delivery, if:

- EFW > 4500 g in women with diabetes. EFW > 5000 g in women without diabetes.

Complications: Hypothermia, hypoglycemia, hypocalcemia, polycythemia

- Birth injuries common (clavicle fracture, brachial plexus injury, facial nerve palsy, shoulder dystocia)

↳ - *one too big* = shoulder dystocia

Amniotic Fluid Disorders

	① Oligohydramnios	② Polyhydramnios
① Gen	- AFI < 5 on US	- AFI > 25 on US
② Etio	- Fetal urinary tract abnormalities: GU obstruction, renal agenesis - Chromosomal abnormalities - Uteroplacental insufficiency - Rupture of membranes 2nd Trimester → Fetal Urinary Abnormalities 3rd Trimester → (PI) PROM or Placental Insufficiency	- Maternal DM - Multiple gestation, twin-twin transfusion syndrome - Fetal anemia, isoimmunization - Pulmonary abnormalities - Fetal anomalies (Duodenal atresia, TE fistula, anencephaly) 1. Anything that causes ↓ Fetal Swallowing 2. Fetal Anemia → ↑ Cardiac Output → ↑ Urine Output
③ Dx	- AFI: The sum of the deepest amniotic fluid pocket in all four quadrants (< 5 cm oligohydramnios, > 25 cm polyhydramnios) - Single deepest pocket: Alternative, arguably better test (< 2 cm oligohydramnios, > 8 cm polyhydramnios)	
④ Tx	- Amnioinfusion (limited to use when increased volume is temporarily needed, such as fetal anatomic US) - Delivery (at 36-37 weeks) Amnioinfusion rarely used, limited to: 1. Temp volume ↑ to improve US Image 2. Cephaloversion during 3rd Trimester	- Consider workup for underlying condition (US for fetal anemia, karyotype) - If severe, amnioreduction +/- Indomethacin (at < 32 weeks) Polyhydramnios Intervention Tx only when (AFI>35) + (Symptomatic) Indomethacin post 32w = Ductus Arteriosus closure
⑤ Comp	- High risk of fetal mortality (especially if occurring earlier in pregnancy) - Cord compression → Due to insufficient amniotic fluid = Fetal Hypoxia - Potter sequence	- Prematurity/PROM - Fetal malpresentation - Cord prolapse --Oligohydramnios vs Polyhydramnios-- 1. AFI (Amniotic Fluid Index) 5<x<25 cm 2. DVP (Deepest Vertical Pocket) 2<x<8 cm *DVP is the most accurate

Fetal Complications

Obstetrics
OB-GYN

Rh(D) Alloimmunization

General: RhD (-) moms exposed to fetal Rh(+) blood in prior pregnancy can lead to maternal anti-Rh IgG that can cross the placenta and result in fetal hemolytic anemia. During first pregnancy, IgM builds (which does not pass placenta), but subsequent pregnancies can have IgG that crosses placenta.

-First Pregnancy→IgM (doesn't cross the placenta)
-Second Pregnancy→IgG (crosses the placenta)

Risk: Transplacental fetomaternal bleeding history (more likely if history of pregnancy without prenatal care or in third world country)

Clinical: Generally asymptomatic. If severe:

- Kernicterus/jaundice Kernicterus, or bilirubin encephalopathy, is bilirubin-induced neurological damage
- Hydrops fetalis

→ Hyperdynamic state with heart failure, diffuse edema, ascites, pericardial effusion

Diagnosis: anti-Rh(D) antibody in maternal serum (screen at first visit)

Management:

- 1 - Check father's Rh status (if Rh [-] in mom/dad then baby must Rh [-])

- If father not available, confirm fetal Rh typing with cell free DNA

- 2 - If fetus is Rh (+)

1 - Serial IgG Rh titers (Anything $\geq 1:16$ has high risk for fetal anemia) $\times 16$

2 - If high titers, transcranial MCA doppler (high flow → Anemia)

3 - If ↑ MCA doppler, check fetal H/H via umbilical cord sampling

- 3 - If severe fetal anemia:

1 - Deliver if ≥ 35 weeks

2 - Fetal transfusion < 35 weeks

--Mx generally--

1. Confirm blood group

-mother -ve

-father +ve

-father not available→Free Cell DNA

*given that possibility of +ve confirmed proceed

2. Confirm if Fetus is +ve

a. serial IgG D-Titters → $\times 16$ → Fetal Anemia Risk

b. If D-Titters ≥ 16 → MCA Doppler

c. Fetal H/H via umbilical cord sampling

3. If severe fetal anemia:

$\geq 35w$ → Deliver

$< 35w$ → Fetal Transfusion (till 35w)

★ **Prevention:** Applies to RhD (-) women plus possibility fetus can be RhD (+)

- RhoGAM at 28 Weeks

- Within 72 hours of Rh (+) birth (but can be given later if its forgotten)

- Also give RhoGAM in any situation of possible fetomaternal hemorrhage:

- Abortion

- Ectopic pregnancy, molar pregnancy

- CVS/amniocentesis

- Vaginal bleeding 2nd/3rd trimester

- Placenta previa/abruption

- External cephalic version

- Abdominal trauma 1

PPx generally:

-Anti-D at 28w PPx (Prophylactically) (given that mother -ve, father -ve)

-Anti-D within 72 hr of labor (if fetus is +ve)

--Post Fetomaternal Hemorrhage--

*Fetomaternal Hemorrhage (FMH)

-Post FMH 2 tests carried out to determine if additional RhoGAM Anti-D required

1. Rosette Test:

-Qualitative→(either +ve or -ve) for fetal blood

-If -ve = give standard 300ml IM RhoGAM

-If +ve = carry KB-Staining

2. KB-Staining (Kleihauer-Betke Staining)

-Quantitative→Determines exact percentage of Fetal HbF in maternal circulation

-Additional RhoGAM administered if % is ↑

2 KB-Staining

Note: If major bleeding suspected, Rosette test can confirm large bleed, with Kleihauer Betke test (measures fetal RBCs in maternal serum) to determine dose of RhoGAM

Other RBC Antigens

ABO Incompatibility	- O-type mothers have IgG against AB antigen
	- Causes mild hyperbilirubinemia within 24 hours of birth
Lewis	- Mild hemolysis
Duffy	- Moderate hemolysis
Kell	- Severe hemolysis
Rh (C)	- Similar to Rh (D)

-Usually ABO Antigens are IgM (can't cross the placenta)
-some O-mothers have IgG anti-AB

-other Rh that can cause hemolysis: Lewis (Mild), Duffy (Moderate), Kell (Severe)
-Think "Kell Kills, Duffy Dies, Lewis Lives"

--General Points--

-HDN causes→

1. Hydrops fetalis (Pleural, Pericardial Edema and Ascites)

2. Hemolytic Anemia→Neonatal Jaundice

-Many causes for Neonatal Jaundice, but Neonatal Jaundice within first 24hrs is usually due to Hemolytic Anemia (HDN)

Maternal Pregnancy Complications

Obstetrics
OB-GYN

Hyperemesis Gravidarum

General: Disorder of persistent vomiting during pregnancy

Risk: Nulliparity, multiple gestation, molar pregnancy, history of nausea with estrogen exposure

Anything that causes ↑β-hCG (Molar Pregnancy) or (Multiple Gestation)

Clinical:

- ① - Nausea and vomiting, beyond the degree expected from typical morning sickness
 - No clear definition, but the following suggest hyperemesis:
 - ① - Persistence of symptoms into second trimester
 - ② - Ketonuria Ketonuria→Indicated that the body is using Fat as it's main source of energy. Typically occurs In: DM Type I, Starvation
 - ③ - Starvation and weight loss (> 5% from prepregnancy weight)

Diagnosis: Clinical

Management:

- Pharm
 - Pyridoxine-Doxylamine
 - Diphenhydramine
 - Promethazine, Metoclopramide, Ondansetron (if severe)
- If present with hypovolemia:
 - IV fluids, IV antiemetics
 - Give thiamine (high risk for thiamine deficiency)

Hyperemesis Gravidarum--
 -Mild Vomiting (<5% body weight) = Morning Sickness
 -Severe Vomiting (>5% body weight) = Hyperemesis Gravidarum
 -Dx:
 1.ABGs→Severe Vomiting = Metabolic Alkalosis (due to vomiting of acid)
 2.Urinalysis→Ketonuria (Present incase of starvation, ↑Fat Metabolism)
 -Complications:
 1.Hypovolemia (Hypotension + Reflex Tachycardia)
 2.Thiamine Deficiency→(Wernicke's Korsakoff Encephalopathy) = (Confusion+Ataxia) + (Chronic Memory Impairment+Confabulation)
 -Tx:
 1.IV Fluids (for Hypovolemia)
 2.Thiamine Supplementation (for Wernicke's Korsakoff Encephalopathy) (very high yield)
 3.Drugs:
 -Lifestyle Changes (Eat, avoid empty stomach, avoid triggers e.g: lying down, odors)
 -1st Line: Doxylamine-Pyridoxine (Doxylamine→Anti-Histamine)(Pyridoxine→Vit B6)
 -2nd Line: Ondansetron

Thiamine Deficiency (B1) = Wernicke-Korsakoff Syndrome:
 *Occurs In Chronic Alcoholics, Hyperemesis Gravidarum/Chronic Vomiting
 1.Wernicke's Aphasia→Wernicke's Encephalopathy (Ataxia + Ophthalmoplegia)
 2.Korsakoff Syndrome→Chronic Memory Impairment + Confabulation

Fetal and Obstetric Complications with Diabetes

1 Fetal Complications: DM complications on fetus

Exposure	Potential Risks to Fetus
First Trimester	- Congenital heart defects - Congenital Heart Defects due to ↑Maternal DM 1.VSD (mcc) (ventricular Septal Defect) 2.TGA (Transposition of the Great Arteries) 3.Truncus Arteriosus 4.Tricuspid Atresia 5.PDA (Patent Ductus Arteriosus) - Neural tube defects - Risk for abortion - Small left colon syndrome - Caudal regression syndrome
Second / Third Trimester	- Macrosomia/Organomegaly - Neonatal hypoglycemia →After birth, fetus loses access to ↑Glucose-Blood from diabetic mother = Hypoglycemia - Increased risk for birth trauma (brachial plexus injury, shoulder dystocia, clavicle fracture, etc)

Caudal Regression Syndrome



Caudal Regression Syndrome:
 1.Sacral Agensis ± 2.Sirenomelia
 -mcc associated with A2-DM mothers (Insulin-Dependent)
 -Sacral Agensis = no sacrum
 -Sirenomelia = "Mermaid" = Fusion of Legs
 Fetal Anomalies due to GDM:
 -McC = VSD
 -Most Pathognomic = Caudal Regression (Sacral Agensis + Sirenomelia)

2 Obstetric Complications:

- Polyhydramnios → ↑Risk of Malpresentation
- Preeclampsia
- Miscarriage
- Infection
- Postpartum hemorrhage
- ↑ Risk for C-section

due to large baby

Erb's Palsy (waiter's Tip)
 Klumpke

Pregestational Diabetes

General: Pregnancy can worsen hyperglycemia in patients with pre-existing diabetes mellitus. Insulin requirements can go up significantly.

Management:

Mother	- Strict glucose control with insulin (if necessary) - Basal-bolus insulin dosing preferred (oral agents discontinued) - Ensure weight gain is consistent with expected (careful diet control) - Try to maintain A1C < 6%
Fetus	- Anatomic US at 18-20 weeks (for congenital abnormalities) - Weekly non-stress tests (starting at 32 weeks) - Twice weekly non-stress tests (starting at 36 weeks) - Deliver at 39-40 weeks (or earlier if another indication)

Pregestational DM (Mother has DM before pregnancy) Mx =

-Mother:
 1.Strict glucose control + Bolus Insuline (not oral)

-Fetus:
 1.US at 18w
 2.Weekly Non-Stress Test at x>32w
 3.Twice weekly non-stress test at x>36w
 4.Deliver at 39w

--DM in Pregnancy--
 -Pregnancy Physiological Changes:
 -Pregnancy is a natural (Insuline-Resistant State)
 -Glycosuria is normal in pregnancy (can't be sued for Dx)
 -Dx:
 -Hemoglobin 1Ac (not useful in pregnancy)
 -Screening via Serum Glucose

Maternal Pregnancy Complications

Obstetrics
OB-GYN

Gestational Diabetes

General: Glucose intolerance that newly develops during pregnancy, due to increased insulin resistance. Typically diagnosed in later 2nd to 3rd trimester.

1	Class A1	Gestational diabetes (diet controlled)
2	Class A2	Gestational diabetes (insulin controlled)
3	Class B-D	Pregestational diabetes (exact class dependent on <u>onset age</u> and <u>duration</u>)

Risk: ↑ BMI, previous history of gestational DM, prediabetes, Hispanic/Pacific Islander

Clinical: Typically asymptomatic, but can present due to diabetic complication (ie large for GA infant, polyhydramnios, etc)

Diagnosis:

- **Screening:** 1 hr 50g GTT. Performed at 24-28 weeks.
 - Glucose > 140 at 1 hr considered abnormal
- **Diagnostic:** 3 hr 100g GTT. Normal cutoffs in table.

Fasting	95 mg/dL
One Hour	180 mg/dL
Two Hour	155 mg/dL
Three Hour	140 mg/dL

Management:

- **Nonpharmacologic:** Exercise, careful diet, and strict glucose monitoring
 - ~ 2200 Calories, with 40% carbs, 40% fats, 20% protein
 - Glucose Targets:
 - Fasting < 95 mg/dL
 - 1 hr Postprandial < 140 mg/dL
 - 2 hr Postprandial < 120 mg/dL
- If poor control despite above, give insulin (alternative: Metformin)
- **Delivery:**
 - A1 (Diet Controlled): No special requirements
 - A2 (Insulin-Controlled): Deliver at 37-38 weeks
 - Offer C-section if > 4500 g
 - Nonstress tests weekly started at 32 weeks

Note: Mom at increased risk for type II DM after pregnancy, as well as gestational diabetes at future pregnancies. Should have 2-hour 75 gram oral glucose tolerance test between 6-12 weeks postpartum → *very High yield * 6w Post Partum = 2hr 75g GTT → screen for DM-II post Partum

Chronic and Gestational Hypertension

Chronic	- <u>Essential hypertension</u> (> 140/90) present <u>prior to pregnancy</u>
Gestational	- <u>Idiopathic hypertension</u> (> 140/90) <u>after 20 weeks</u> without proteinuria or organ dysfunction

Increases risk for prematurity, FGR, placental abruption, or preeclampsia

Management:

1. Monitor Blood Pressure
 1. BP not treated with pharm unless in severe range (> 160/110)
 2. If severe, drug choices include Methyldopa, Labetalol, Nifedipine
 1. Acute blood pressure control with Labetalol/Hydralazine
 2. Avoid ACEi/ARB in pregnancy * ACE + ARB = contraindicated in pregnancy
2. Careful screening for progression to eclampsia (ie urine protein, renal function, LFTs, etc)
3. Monitor with weekly biophysical profiles starting at 32 weeks
4. Delivery
 1. Early delivery (→ 39 weeks) if uncomplicated hypertension
 2. Delivery at → 36 weeks if poorly controlled severe hypertension

-Mx of HTN
 1. HTN Drugs:
 -If x<(160/110) = No Drugs
 -If x>(160/110) = Methyldopa, Labetalol, Nifedipine (non-dihydropyridine)
 *ACE + ARBs are contraindicated
 *Acute B.P Control = Labetalol/Hydralazine
 2. Screen for Progression to Eclampsia:
 (Signs of Eclampsia)
 1. Proteinuria
 2. RFTs (Renal Function Tests)
 3. LFTs
 3. Weekly biophysical profiles x≥2w
 4. Delivery:
 -If Uncomplicated HTN = Deliver at 39w
 -If Poorly controlled HTN = Deliver at 36w

Maternal Pregnancy Complications

Obstetrics
OB-GYN

Eclampsia and Preeclampsia

General: Clinical syndrome of **hypertension**, **edema**, and **proteinuria**. Believed to be due to **abnormal development of the utero-placental circulation**, but is overall not fully understood. The **resulting ischemic placenta** leads to **systemic vasoconstriction** and **ischemia of organs**, resulting in the symptoms seen.

Risk:

- History of preeclampsia in prior pregnancy
- Extreme ages (< 20, > 40), nulliparity
- Black race
- Chronic hypertension, renal disease, diabetes, or collagen vascular disease
- Multiple gestation

Clinical: Preeclampsia = HTN + Proteinuria + x>20w + Maternal/Fetal Complications

- Syndrome of **hypertension** and **proteinuria**
- Occurs **after 20 weeks** gestation
- **Maternal Complications**
 - Seizures, DIC, pulmonary edema, intracerebral hemorrhage
- **Obstetric Complications**
 - Uteroplacental insufficiency
 - Abruptio
 - Fetal growth restriction
 - Oligohydramnios

Management: Prophylaxis: **Low dose aspirin** (used if high risk)

	Clinical Criteria	Management
1 Preeclampsia	- Systolic BP ≥ 140 mmHg or diastolic BP ≥ 90 mmHg PLUS - Proteinuria (ie $\geq +1$ on dipstick or > 300 mg/24 hr) Mx: 1. Conservative until Term (37w) 2. Deliver at 37w, with MgSO₄ (PPx for Seizure/Eclampsia)	① Deliver if at term (≥ 37 weeks) ② Conservative management if preterm, then deliver at 37 weeks ③ IV Magnesium Sulfate (seizure ppx at time of delivery)
2 Preeclampsia with Severe Features	- Systolic BP ≥ 160 mmHg or diastolic BP ≥ 110 mmHg - OR - Systolic BP ≥ 140 mmHg or diastolic BP ≥ 90 mmHg PLUS end organ damage, such as: - Neuro: Blurred vision, new persistent headaches, or scotoma - Renal: Acute, progressive renal insufficiency - GI: Severe RUQ pain, elevations of AST/ALT - Pulmonary Edema - Thrombocytopenia ($< 100k$)	① Deliver if ≥ 34 weeks - Controversial prior to 34 weeks (may necessitate delivery, vs conservative management) ② Magnesium Sulfate (seizure ppx at time of delivery) ③ Antihypertensives (for control $< 160/110$) ④ Glucocorticoids (if < 34 weeks)
3 Eclampsia	- Seizures (generalized tonic-clonic) in women with preeclampsia → Transitory symptoms like Preeclampsia → Seizures - Often have prodromal symptoms (headache, visual changes, RUQ pain, etc) ① ② ③ - Can be complicated by abruptio, DIC, or cardiac arrest	- ABC's, supplemental O₂, place women in lateral position (for seizures) - Antihypertensives (for control $< 160/110$) - IV Mag Sulfate (Diazepam/Phenytoin if refractory) - Delivery (either trial of labor if baby is stable after seizure, versus emergent C-section if fetal distress)

Mg Ranges:

4-7 = Therapeutic Range for Seizure PPx
7-10 = Loss of Deep Tendon Reflexes (DTR's)
10-15 = Respiratory Paralysis + Arrhythmias
 > 25 = Cardiac Arrest

	Mg Level	Clinical
①	4-7 mEq/L	Therapeutic range for seizure prophylaxis
②	7-10 mEq/L	Loss of DTRs Deep Tendon Reflexes
③	10-15 mEq/L	Respiratory paralysis, altered cardiac conduction
④	> 25 mEq/L	Cardiac Arrest

Maternal Pregnancy Complications

Obstetrics
OB-GYN

Maternal GI Issues

	Clinical Criteria	Management
1 HELLP Syndrome	- Rare complication of pregnancy, associated with ① preeclampsia (MAHA) → MicroAngiopathic Hemolytic Anemia ② Microangiopathic hemolytic anemia (schistocytes, LDH, ↑ bilirubin, thrombocytopenia) ③ Elevated liver enzymes (with RUQ abdominal pain due to stretched Glisson capsule)	- ≥ 34 weeks: Deliver - < 34 weeks: Corticosteroids, deliver if fetal or maternal distress - Antihypertensives, IV MgSO₄ (similar to preeclampsia)
2 Acute Fatty Liver of Pregnancy	- Liver dysfunction and fatty infiltration of hepatocytes - Associated with abnormal long-chain fatty acid metabolism - Presents with acute hepatic failure (jaundice, encephalopathy, coagulopathy) - Elevated LFTs (AST/ALT, bilirubin, PT/INR) - Increased creatinine - Hypoglycemia	- Delivery (regardless of age) - Supportive care - May require liver transplantation in severe cases
3 Intrahepatic Cholestasis of Pregnancy	- Presents as diffuse pruritus (palms, soles, worst at night) - Elevated total serum bile acid levels - Mildly elevated bilirubin, AlkPhos, AST/ALT	- Delivery at term (≥ 37 weeks) - Ursodeoxycholic acid
4 Appendicitis	- Presents with nausea, vomiting, and RLQ abdominal pain - Fever and leukocytosis may be present - Can present with RUQ pain later in pregnancy (due to shifting of GI tract) - Dx: US	- Appendectomy (generally via laparoscopy) <i>(not via laparotomy)</i>

-Classical Presentation: Nausea + Vomiting during 3rd Trimester
-Nausea + Vomiting is normal during 1st Trimester not 3rd
-Immediate Delivery = Recover
-Delayed Delivery = Progress to Fulminant liver failure

-Classical Presentation: 1.Puritis/Itching + 2.↑Serum Total Bile Acid (In 2nd Trimester)
-most imp marker: ↑Serum Total Bile Acid
-Tx: Ursodeoxycholic Acid

-Dx via US
(CT typically done, but avoided due to pregnancy)

UTI/Pyelonephritis During Pregnancy

General: Women are at an **increased risk** for **urinary tract infections during pregnancy**, due to **relaxation of smooth muscle in the urinary tract**. **E. Coli** most common (others include *Staphylococcus saprophyticus*, GBS, *Enterococcus*).

Pregnancy = ↑Progesterone = Relaxation of smooth muscles = Urinary Stasis = UTI

Risk: **Increased risk** with **multiple gestation**, **gestational diabetes**

Clinical:

- ① **Asymptomatic Bacteriuria** (generally picked up on routine screening)
- ② **Acute Cystitis** (urgency, increased frequency, dysuria, suprapubic pain)
- ③ **Acute Pyelonephritis** (fever, flank pain, CVA tenderness)

Diagnosis: > 10⁵ Colony Forming Units on culture, plus the above clinical symptoms

Management:

--Asymptomatic Bacteriuria--
-Screen at first prenatal visit with urine culture
-High risk of pyelonephritis and preterm birth
-Tx:

1. Antibiotics for 7 days
2. Follow up culture

--Acute Cystitis--
-Classical Presentation: 1.Dysuria 2.Frequency
-Tx: (Just like Asymptomatic Bacteriuria)

--Pyelonephritis--
-very common cause of hospitalization

- Tx:
1. IV Fluid
 2. Parenteral/IV Antibiotics
 3. Suppressive Antibiotics used until delivery

	①	②	③
1 Asymptomatic Bacteriuria/UTI	① Antibiotics (Nitrofurantoin, Amoxicillin, Fosfomycin) for 7 day course	② Follow up cultures to confirm eradication. If repeat UTI, prophylactic antibiotics likely needed.	
2 Pyelonephritis	① Admission for fluids , parenteral antibiotics (Ceftriaxone, Cefepime, Ampicillin + Gentamicin, etc.)	② Suppressive antibiotics for the remainder of pregnancy	Parenteral = IV

Thyroid Abnormalities During Pregnancy

1 Hypothyroidism ①

-Estrogen = ↑TGB
-β-hCG = mimic TSH = ↑T4
-Pregnant women req 125% Levothyroxine

- **Estrogen** causes ↑ in TGB, while **hCG** causes increase in T4 due to TSH receptor stimulation
- If treated for hypothyroidism at baseline, may not have adequate increase in T4, and will become hypothyroid during pregnancy (typically women will **require increased doses [~25%] of Levothyroxine**)

2 Hyperthyroidism

- Similar symptoms and criteria as hyperthyroidism outside of pregnancy
- Usually due to **Graves** or **β-HCG induced** (↑β-hCG: Molar, Gestational Trophoblastic Diseases, Multiple Gestation)
- Treatment: **Beta-blocker**, **Propylthiouracil (PTU)** in 1st trimester, **Methimazole** in 2nd/3rd
- **Radioiodine therapy contraindicated in pregnancy** *Radio-iodine therapy contraindicated

--Thyroid--
-Routine screening not recommended (prevalence not high enough)
-Hyperemesis Gravidum → occurs due to ↑β-hCG (β-hCG mimics TSH)
-So Hyperemesis Gravidum Pts = ↓TSH + ↑T4

Postpartum

Obstetrics
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Postpartum Hemorrhage			
	Risk	Clinical/Diagnosis	Management
1 Postpartum Hemorrhage	- Defined as loss of > 500 mL of blood during vaginal delivery, or 1000 mL during C-section - Generally managed with two large bore IVs, fluids, RBC transfusions - If severe, may require uterine artery embolization or ligation, or hysterectomy - Can be complicated by hypovolemic shock and Sheehan syndrome		
2 Uterine Atony	- Exhausted myometrium - Rapid or prolonged labor - Operative deliveries - ↑↑↑ Oxytocin stimulation - Tocolytics - Conditions interfering with contractions (anesthesia, myomas, MgSO₄) - Macrosomic fetus - Multiparity	- Soft, enlarged, "boggy" uterus - Most common cause of postpartum bleed	- Uterine massage - Oxytocin - Methylergonovine (Cxl if ↑ BP) - Carboprost (Cxl if asthma) - Cxl = Contraindicated - Bakri Balloon Dr. Younes Bakri (Lebanese OBS/GYNE) - Uterine artery embolization - Hysterectomy
3 GU Tract Trauma	- Precipitous labor (Sudden Labor) - Operative vaginal delivery - Macrosomia	- Normal uterus - Visualize bleeding laceration	- Hold pressure over defect - Surgically repair defect
4 Retained Placenta	- Placenta accreta - Placenta previa - Uterine fibroids - History of C-section, other uterine surgery	- Firm uterus	- Manual removal of retained tissue - Curettage - Hysterectomy

Uterine Inversion

General: Uterus "births" itself through the cervix. Occurs with **too much power, traction** (ie pulling on placenta), or **extensive fundal pressure**.

Risk: **Macrosomia, rapid L&D, placenta accreta**

Clinical:

- Absent uterus upon palpation of abdomen
- Smooth, round mass protruding from vagina
- Severe hemorrhage, hemodynamic instability, lower abdominal pain

Diagnosis: Clinical

Management:

- Manual replacement
- Tocolytics or Nitroglycerin (may be required before replacement)
- Uterine Atony (occurs after successful replacement): Oxytocin

Amniotic Fluid Embolism

General: Amniotic fluid enters maternal circulation due to **breakdown in the barrier of the uterine vessels**, resulting in **acute right ventricular failure, respiratory failure, and systemic inflammation**

Clinical:

- Acute onset of hypotension due to **cardiogenic shock** Due to R. Ventricular Failure
- Hypoxemic respiratory failure
- Disseminated intravascular coagulation (DIC)

Management: ABCs, supportive care

Postpartum

Obstetrics
OB-GYN

Sheehan's Syndrome

General: Ischemic infarction of the pituitary after hypovolemic shock from postpartum hemorrhage Sheehan: Hypovolemia post PPH = Infarction of Pituitary

Clinical: Anterior pituitary insufficiency, including failure to lactate, hypotension, amenorrhea, weight loss, loss of sexual hair

Diagnosis:

- Hormone testing (TSH, cortisol, estradiol)
- MRI of pituitary/hypothalamus to rule out other pathology

Management: Hormone replacement

Postpartum Fever

Note: Low grade fever is normal for first 24 hours post delivery. Postpartum fever is temperature $> 100.4^{\circ}\text{F}$ 2-10 days post delivery. $100.4^{\circ}\text{F} = 38^{\circ}\text{C}$

1	Wound Infection	- Surgical site infection (ie laceration, episiotomy) - Usually presents with swelling, erythema, exudate - Requires opening wound, debridement
2	UTI/Cystitis Pyelonephritis	- Similar presentation and treatment to normal upper or lower UTI
3	Mastitis/Breast Engorgement	- Diffuse swelling versus acute cellulitis of breast tissue Breast Engorgement = Overfilling with milk → (Diffuse Swelling) Mastitis = S. Aureus Cellulitis of Breast
4	Endometritis	- Infection of the uterine lining, usually polymicrobial - Risk: C-section, prolonged labor $100.4^{\circ}\text{F} = 38^{\circ}\text{C}$ - Presents with $T > 100.4^{\circ}\text{F}$, leukocytosis, tachycardia, abdominal pain, uterine tenderness - Rarely can present with toxic shock syndrome TSS = S. Aureus - Dx: Clinical - Tx: Gentamicin + Clindamycin
5	Septic Pelvic Thrombophlebitis	- Rare complication of delivery, where endothelial injury results in ovarian or deep venous thrombosis and polymicrobial infection Endothelial Injury = DVT + Infx - Presents with fever +/- severe abdominal pain, refractory to antibiotic therapy (usually started empirically for endometritis) - Dx: CT or MRI to evaluate for thrombi (Note: Usually picks up ovarian venous thrombus, but can be falsely negative) - Tx: Antibiotics + anticoagulation

For Infx

For DVT

Misc Postpartum Complications

Urinary Retention

- Common ~ 6 hours post delivery
- Presents with inability to void, dribbling, suprapubic pain
- Bladder scan to confirm
- Tx: Analgesics, ambulation, urinary catheterization as necessary

Ambulation = walking around (i.e encourage the woman to get out of bed and walk)

Pubic Symphysis Diastasis Diastasis = Splitting of two normally joined structures

- Injury from separation of pubic diaphysis
- Usually due to traumatic delivery usually of big baby Macrosomia
- Presents with midline abdominal pain with radiation down both legs

* Buzz words =
① - Pain worse with ambulation Pain worse with walking
② - Tenderness of symphysis pubis

- Tx: Supportive care, NSAIDs, PT Physical Therapy

Postpartum

Obstetrics
OB-GYN

Routine Postpartum Care

Pain

- NSAIDs, Acetaminophen, low dose opioids as necessary

Perineal Care

- Ice packs, monitor for intact repair

Usual Findings

- Transient fevers (for 24 hours), chills
- Breast engorgement
- Lochia
 - Rubra (red for 1-2 days postpartum)
 - Serosa (brown around day 3-4 postpartum)
 - Alba (yellow for weeks postpartum)
- Mild hair loss

Lochia = Vaginal Discharge post-Childbirth
1. Lochia Rubra (Red for day 1-2)
2. Lochia Serosa (Brown for day 3-4)
3. Lochia Alba (Yellow for weeks Postpartum)

Postpartum Depression

1 Blues	- Presents with 2-3 days of delivery, usually resolving in 2 weeks - Mild depression, irritability, tearfulness - Tx: Reassurance	SIGECAPS S: Sleep disturbances (insomnia or hypersomnia) I: Interest loss (also called anhedonia, a reduced interest or pleasure in most activities) G: Guilt or feelings of worthlessness (excessive or inappropriate guilt) E: Energy loss (fatigue or loss of energy nearly every day) C: Concentration problems (diminished ability to think or make decisions) A: Appetite changes (significant weight loss or gain, or a change in appetite) P: Psychomotor agitation or retardation (noticeable restlessness or slowness) S: Suicidal ideation (recurrent thoughts of death or suicide, or a suicide attempt) Dx: ≥ 5 criteria for ≥ 2w, of the 5 symptoms must be 1 "Anhedonia/Loss of Interest"
2 Depression	- Presents within 4 weeks of delivery - Presents with SIGECAPS symptoms [See: Psych], often has ambivalence to the baby - Tx: Antidepressants + psychotherapy	
3 Psychosis	- Can present at anytime after delivery, usually in someone with history of depression or bipolar disorder - Presents with delusions, hallucinations, disorganized thoughts - Tx: Antipsychotics, mood stabilizers - Often requires hospitalization given risk of infanticide	

Breastfeeding

General: After pregnancy, the estrogen and progesterone levels drop, prolactin rises, milk production/lactation is stimulated

- 1 - Colostrum: Early breast milk. Protein, fat, secretory IgA, and minerals.
- 2 - Mature Milk: Transitioned within 1 week postpartum. Contains protein, fat, lactose, water.

	Benefits	Contraindications
1 Infant	- Improved immunity (decreased risk of acute illnesses, such as sepsis, respiratory disease, gastroenteritis, UTI) - Improvement of GI function/maturity	- Galactosemia
2 Maternal	- ↓ rates of breast and ovarian cancer - Maternal-infant bonding - Accelerated recovery from childbirth - Quicker return to prepartum weight - Improved child spacing	- Active herpetic breast lesions - HIV or HTLV infection HTLV = Human T-cell Lymphotropic Virus - Current chemotherapy or radiation therapy - Abuse of street drugs or alcohol

Complication	Findings
1 Engorgement	- Common. Warm, firm, tender, swollen breast. Low-grade fever. Overfilled with milk - Tx: Continue breastfeeding. Ice packs, analgesia as needed.
2 Mastitis	- Cellulitis of periglandular tissue caused by nipple trauma by S. Aureus - Most commonly MSSA/MRSA - Presents with unilateral breast swelling, tenderness, erythema, purulence, and possibly fever/leukocytosis - Tx: Continue breastfeeding. Antibiotics: Dicloxacillin or Cephalexin, with TMP-SMX or Clindamycin if suspected MRSA.
3 Abscess	- Focal area of erythema and fluctuance, often associated with mastitis - Dx: Clinical +/- US - Tx: Antibiotics and needle drainage. I&D if refractory. I&D = Incision and Drainage

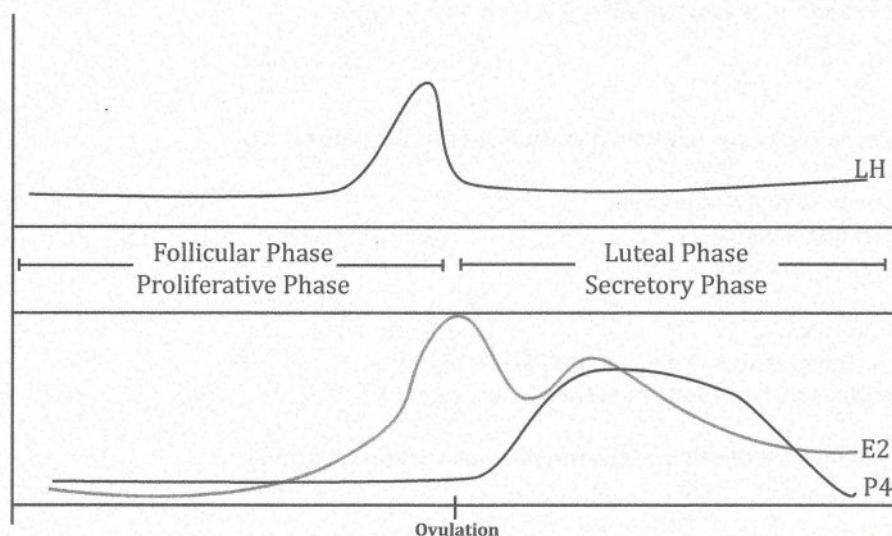
Lactation Suppression

- Utilized for those not trying to breastfeed
- Engorgement will have negative feedback and stop prolactin production
- Tx: Use supportive bra, minimize nipple stimulation, cold packs, NSAIDs. Bromocriptine is not indicated.

-Bromocriptine = Dopamine Agonist = ↓ Prolactin production
-Used to be used for Lactation Suppression, It's no longer the case
-Stopped due to ↑ Cardiovascular Risks, ↑ Psychiatric Effects, Safer Non-pharmacological methods

Menstrual Cycle

Gynecology
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Menstrual Phases	
Follicular (Proliferative)	- Starts with menstruation, ends at LH surge/ovulation - Variable in length, but averages 13 days - Development of straight glands and thin secretions - At end of follicular phase, a dominant follicle is selected
Ovulation	- Estradiol reaches a peak, causing positive feedback to the pituitary, resulting in LH surge - Follicle releases ovum, and then transitions to corpus luteum - "Mittelschmerz" = Ovulation pain resulting from ovulation and leakage of blood that irritates peritoneum
Luteal	- Corpus luteum produces progesterone, stimulating endometrial proliferation and secretions - Corpus luteum eventually breaks down without LH or β-hCG, with resulting drop in progesterone, and eventual sloughing of endometrial lining - Ends when menses begins

Premenstrual Syndrome (PMS)/Dysphoric Disorder (PMDD)

General: A group of symptoms that can occur within 3-5 days preceding menses

- PMS: Presence of one or more of the below symptoms
- PMDD: Below symptoms, PLUS significant socioeconomic impairment

Clinical:

- Affective lability, irritability, depressed mood, anxiety
- Anhedonia, problems concentrating, anergia, appetite changes
- Hypersomnia/insomnia, physical symptoms (bloating, breast tenderness)

Diagnosis:

- Prospective symptom diary for at least two months
- Rule out other medical disorders (ie hypothyroidism)

Management:

- PMS: Regular exercise, stretching, stress relief techniques
- PMDD: SSRI (alt: OCPs)

Menstrual Cycle

Gynecology
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Menopause

General: Physiologic cessation of menstruation in a woman > 45 y/o.

- Average age ~51

Clinical:

- Irregular menses for years leading up to final menstrual period
- Hot flashes
- Vaginal dryness, sexual dysfunction
- Fatigue, sleep disturbance
- Irritability, mood changes

- ↑ FSH, FSH:LH ratio > 1
- Osteoporosis/progressive bone loss (loss of estrogen)
- ↑ Risk of cardiovascular events and atherosclerosis

Diagnosis: Cessation of menses for 12 months (no further workup required)

Management:

Vaginal Atrophy	- Topical vaginal estrogen
Hot Flashes	- Hormone Replacement Therapy (Combo E2/P4) - SSRI, SNRI, gabapentin are options if HRT contraindicated

Hormone Replacement:

- Indicated if moderate-to-severe vasomotor symptoms (< 60 y/o and menopause within last 10 years)
- Transdermal HRT preferred, with combination estrogen/progestin
- Risk: ↑ risk of CV event, stroke, VTE, breast cancer
- Contraindications:
 - Thromboembolic history
 - Endometrial or breast cancer

Primary Ovarian Insufficiency

General: Impaired ovarian function in women < 40 years old

Etiology:

- Autoimmune
- Prior chemotherapy or radiation therapy
- Genetic (ie Fragile X [FMR gene mutation])
- Other genetic disorders (often have family history)

Clinical:

- Progressive oligomenorrhea
- Hot flashes, vaginal dryness, fatigue, etc

Diagnosis:

- ↑ FSH (in menopausal range)

Management:

- Emotional support
- Hormone replacement (combined estrogen/progesterone)

Progestone Effect:
 1. Maintain Endometrium → Thinning → Microshedding/Spotting
 2. ↑ Cervical Mucus Viscosity
 3. Depression
 4. (High Doses) Inhibit LH Surge → (Partially) Inhibit Ovulation

Effects of unopposed Estrogen:
 1. ↑ Endometrium (Endometrial Hyperplasia) → (May lead to Endometrial Cancer)
 2. Breast Cancer
 3. ↑ Risk of DVT
 4. ↓ FSH

Contraceptives Overview:
 1. Surgical
 1. Vasectomy
 2. Tubal Ligation
 3. Hysteroscopic (Essure)
 2. IUD (Intrauterine Device)
 1. Mirena (Levonorgestrel)
 2. Copper (Paragard)
 3. Hormonal
 1. Implant
 2. Injection
 3. Mini-pill
 4. OCPs
 5. Ring
 6. Patch
 4. Other
 1. Male/Female Condoms
 2. Fertility Awareness
 3. Spermiocide (Nonoxonyl-9 Octoxynol-9)
 4. Lactational Amenorrhea
 5. Emergency
 1. Copper IUD
 2. Ulipristal (Ella)
 3. Levonorgestrel (Plan "B")
 4. OCPs

Gynecology
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Contraception

↑ Risk of Ectopic when the following fail:

1. Tubal Ligation
2. Copper IUD
3. Mirena

Mechanism of Ovulation Inhibition:

1. Progesterone → Prevent LH Surge → Partial Ovulation Inhibition
2. Estrogen → Suppress FSH release from Pituitary = No Follicle Maturation = Complete Ovulation Inhibition

Method	Mechanism	Positives/Indications	Side Effects
1 Surgical = 3			
① Vasectomy	- Bilateral vas deferens ligation - Semen analysis after (3 months) + (20 Ejaculates) = Should be azospermic - otherwise Vasectomy Failed	- Permanent efficacy - Until (3 months) + (20 Ejaculates) = use alternate method - Permanent	- Must use contraception for 6-8 weeks - Ensure azospermia with semen analysis
② Tubal Ligation	- Variety of surgical methods to ligate tubes - Low failure rate - but if it does fail = ↑ Risk of Ectopic	- Permanent, safe	- Generally irreversible, but reversal procedures may be able to restore fertility - Increased risk for ectopic pregnancy
③ Hysteroscopic ("Essure")	- Placement of metal coil device in tubes, inducing fibrosis - **OFF MARKET STARTING 2019**	- Minimally invasive	- Backup contraception for 12 weeks - Confirm placement with hysterosalpingogram
2 IUD - Mirena = Amenorrhea ± (microshedding) - Copper = Normal Menses (Heavy First 6 months, then normal)			
① Levonorgestrel (Mirena, Skyla)	- Local hormonal release, increasing cervical mucus viscosity and inducing endometrial atrophy - Local Progesterone - Amenorrhea (micro-shedding/spotting)	- Effective for 3-8 years depending on model - Immediate fertility when removed - Safe with breastfeeding - Highly efficacious - Induces amenorrhea or irregular periods	- Irregular bleeding/spotting (usually worse in initial 3-6 months, then improves) - Increased ectopic pregnancy rate - If Mirena fails → ↑ Chance of Ectopic - Local progesterone release = Maintain Endometrium = Prevent Growth = Microshedding/Spotting
② Copper (Paragard)	- Induces inflammation that creates hostile environment for implantation - Heavier and ↑ Painful menses for first 6 months - Then normal menses	- Effective for 10 years - Immediate fertility when removed - Safe with breastfeeding - Highly efficacious	- Cramping, heavier bleeding during periods - Increased ectopic pregnancy rate - If Copper IUD Fails → ↑ Higher chance of Ectopic
③ IUD Contraindications: Mirena and Copper - Pregnancy, undiagnosed abnormal uterine bleeding, active gynecologic infection, Endometrial CA, PR+ Breast CA (Progesterone +ve) - Relative contraindications include structural uterine abnormality, recent STI, prior ectopic			
3 Hormonal			
① Implant (Nexplanon)	- Progestin (Etonogestrel) implant in arm - Inhibits ovulation - Increases cervical mucus viscosity	- 3 year lifespan - Immediate fertility when removed - Safe with breastfeeding	- Irregular, lighter periods
② Injections (Depo-Provera)	- Depo progestin (Medroxyprogesterone) - Inhibits ovulation - Increases cervical mucus viscosity	- Given every 3 months	- Irregular, possibly heavy bleeding (during initial months) - Amenorrhea (develops after ~ a year) - Decreased bone mineral density (reversible, encourage exercise, Ca/Vit D)
③ Mini-pill	- Progestin only pill - Affects cervical mucus and endometrium - Ovulation not consistently suppressed	- Pill taken daily	- Must be taken at same time every day - Irregular bleeding possible
-28 Cycle (Continuous, No Breaks) -Since it only partially blocks ovulation -Irregular Period (Microshedding/Spotting) -Mini Pill = "Progesterone Contraindications" (Psych)			
④ OCPs	- Combined estrogen-progestin - Inhibits gonadotropin surge/ovulation	- Pill taken daily (with 1 week hormone free period) - Decrease ovarian and endometrial cancer risk - Decreases benign breast conditions - Predictable, lighter less painful menses - Improves acne - Immediate fertility on cessation	- Bloating, nausea, breast tenderness common - Breakthrough bleeding - Increased risk of VTE - ↑ Stroke risk (especially in those that smoke, older age, or history of migraine w/ aura) - ↑ Risk of MI (very small risk now with low dose pills) - ↑ Blood pressure (mild effect)
-21/7 Cycle (1 week break) -Since it completely blocks ovulation -Regular Periods -Combined Pill = "Estrogen Contraindications" (Endometrial CA/Endometrial CA/DVT)			
⑤ Ring		- Placed in vagina for 3 weeks, then removed (with 1 week ring free)	Estrogen Contraindications: Most Imp: 1. Smoker 2. >35y - > 35 y/o and daily smoker - Severe, uncontrolled hypertension - History of VTE, stroke, or CAD - Breast cancer - Cirrhosis or hepatocellular adenoma - Rarest Benign liver tumor due to (OCPs)
⑥ Patch		- Weekly patch application (wear for 3 weeks, then 1 week off)	

Contraception

Gynecology
OB-GYN

4 Other Contraceptive Methods

Option	Benefits
① Male/Female Condoms	- Provide STI/HIV protection
② Fertility Awareness	- Timing ovulation via use of a calendar and possibly basal body temperature - Effective way of trying to get pregnant, not preventing it
③ Spermicide (Nonoxynol-9 Octoxynol-9)	- Not a primary method of birth control, but can be added to others - Can increase risk of UTI
④ Lactational Amenorrhea	- Must breastfeed every 3 hours and remain amenorrheic - Not 100% reliable, and should use another form of contraception - Options postpartum for those breastfeeding include IUDs and progestin-only pills or depots - Estrogen avoided postpartum for at least 1 month (↑DVT risk) + (↓Breast-Milk Production) - Postpartum Ideal Contraception = Copper or Mierna

5 Emergency Contraception Options

Method	Timing	Efficacy	Mechanism
① Copper IUD	Up to 5' days	99%	- Inflammatory reaction that is toxic to sperm and ova, preventing implant (hostile environment)
② Ulipristal ("Ella") -Progesterone Receptor Antagonist	Up to 5 days	98%	- Antiprogesterin - Delays ovulation
③ Levonorgestrel ("Plan B")	Up to 3 days	60-90%	- Delays ovulation
④ OCPs (Yuzpe regimen)	Up to 5 days	50-75%	- Delays ovulation

Overview of Infertility

General: Inability to conceive within 12 months of active attempts (> 80% of those trying for this period of time will conceive)
- Infertility workup should begin at 12 months, but it is reasonable to start earlier (ie 6 months) in those > 35 y/o

Etiology	Select Examples	Clinical Findings
Male Factors - Should always start with semen analysis, which should be repeated if abnormal - If sperm counts are decreased, LH/FSH/Testosterone should be checked - If normal semen analysis, either this is a female problem, or idiopathic male infertility		
Testicular Defect	- Testicular insults (toxins, torsion, infection, varicoceles)	- Oligo or azoospermia - Normal endocrine testing
Hypogonadism	Primary Hypogonadism (↓ T, ↑ FSH/LH) - Klinefelter, other genetic disorder Secondary Hypogonadism (↓ T/FSH/LH) - Prolactinoma, hypothyroidism	- Oligo or azoospermia
Sperm Abnormalities		- Abnormal sperm morphology or motility
Sperm Transport	- Ejaculatory duct obstruction - Congenital absence of vas deferens	- Oligo or azoospermia - Normal endocrine testing - GU ultrasound may reveal structural cause
Female Factors - Assessment of ovulatory status (ie history of regular menstrual cycles, can check midluteal progesterone level) - Hysterosalpingogram (to evaluate tubal patency/uterine cavity abnormalities) - Ovarian reserve analysis: - Day 3 FSH (abnormally elevated with ↓ follicles), estradiol (↑ with low follicle reserve) - Anti-Müllerian hormone level (declines over time with decreasing follicle pool)		
Ovarian Factors	- Hypogonadotropism - PCOS - Decreased ovarian reserve	- Abnormal menstrual history, endocrine analysis - Abnormal reserve analysis
Tubal Factors	- Pelvic inflammatory disease - Endometriosis - Any other cause of pelvic adhesions	- Hysterosalpingogram abnormalities
Cervical Factors	- History of cervical surgery	
Uterine Factors	- Fibroids, polyps, or adhesions	- Hysterosalpingogram or TVUS abnormalities

Management of Infertility

Method	Features
Ovulation Induction	- Used for ovulatory disorders - Clomiphene is most common drug used (selective SERM at pituitary/hypothalamus, induces ovulation after ~ 1 week) - Alternative agents: Aromatase inhibitors (Letrozole), GnRH agonists (Leuprolide) - Often associated with hot flashes and ovarian hyperstimulation (syndrome of ovarian enlargement, pain, ascites)
Intrauterine Insemination	- Used for cervical dysfunction or severe sexual dysfunction - Concentrated sperm injected into uterus at proper time of cycle OR after stimulation (ie with Clomiphene)
In-Vitro Fertilization	- Used in those with severe structural abnormalities (blocked tubes, severe endometriosis), severe male factor infertility, poor response to pharm induction agents, diminished ovarian reserve - Ovaries are stimulated, oocytes aspirated, fertilized in laboratory, then transferred into the uterine cavity

Disorder Specific Therapy:

Endometriosis	- Surgical resection and lysis of adhesions - Assisted reproductive technologies if this fails
Uterine Abnormalities	- Consider surgical correction (not great data for this either way)
Cervical Factor Infertility	- Intrauterine insemination

Amenorrhea

Primary Amenorrhea

General: Defined as

- Absence of menses by 15 years old OR
- Absence of menses and secondary sexual characteristics by age 13

-13y + No Secondary Sexual Characteristics
-15y + Secondary Sexual Characteristics

Here's the updated comparison with the additional information about internal organs:

1. Genetic Defect:

- **AIS:** Caused by mutations in the **androgen receptor** gene, leading to resistance to androgen action despite normal androgen levels.
- **5-Alpha Reductase Deficiency:** Caused by a deficiency in the **5-alpha reductase enzyme**, which is required to convert testosterone to dihydrotestosterone (DHT), a more potent androgen.

2. Phenotypic Sex:

- **AIS:** Patients (XY) appear **fully female externally** in complete AIS due to total androgen receptor insensitivity. They lack male external genitalia but have testes.
- **5-Alpha Reductase Deficiency:** Patients (XY) typically have **ambiguous genitalia at birth** with underdeveloped male external genitalia. At puberty, some masculinization can occur due to increased testosterone.

3. Pubertal Development:

- **AIS:** No masculinization at puberty (due to lack of androgen effect), but **breast development** occurs because of estrogen action.
- **5-Alpha Reductase Deficiency:** Partial masculinization at puberty (e.g., voice deepening, increased muscle mass), but **minimal breast development** due to some androgen effect.

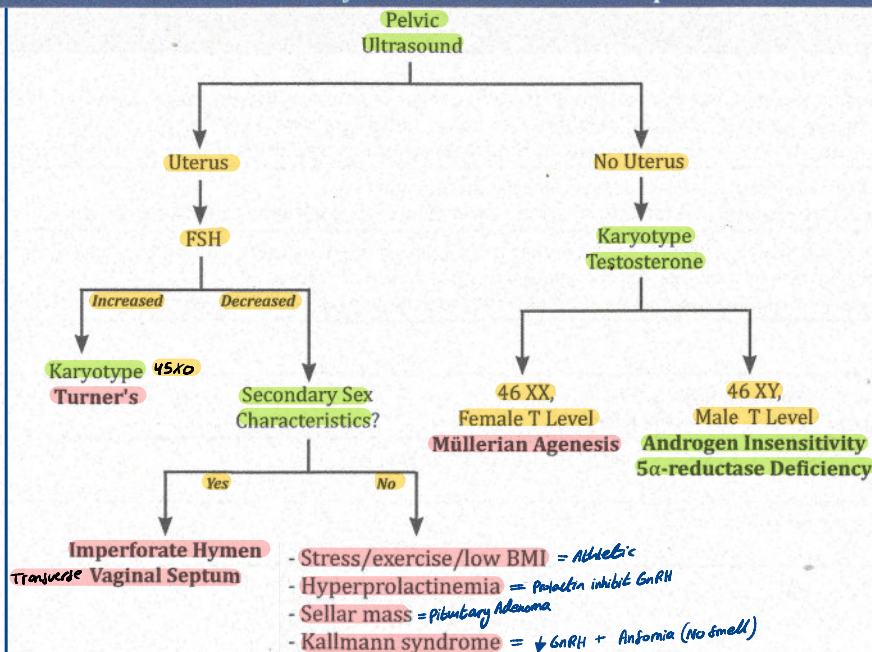
4. Internal Reproductive Organs:

- **Both AIS and 5-Alpha Reductase Deficiency:** Patients have **no ovaries or uterus** because they are genetically male (XY). Instead, they have **undescended testes** located internally, often in the abdomen or inguinal canal.

Etiology	Axis	Anatomy	Features	Diagnosis
Central Hypogonadism	-	+	Etiologies vary, including: - Stress/exercise/low BMI = <i>Atletic</i> - Hyperprolactinemia = <i>Prolactin inhibit GnRH</i> - Sellar mass = <i>Pituitary Adenoma</i> - Kallmann syndrome (low GnRH production, <i>anosmia</i>) - Constitutional pubertal delay	↓ FSH/LH MRI
Ovarian Insufficiency <i>AKA Turner - No ovaries only uterus</i>	-45 XO	+	Etiologies vary, including: - Turner's syndrome - Prior chemotherapy, radiation	↑ FSH/LH Karyotype
Outflow Tract Disorders				
Müllerian Agenesis	-Müllerian Agenesis *Failure of Müllerian Duct Development 1. Associated with Skeletal-Renal Problems 2. No Uterus/Vagina only Ovaries 3. Normal FSH/LH and Normal Estrogen/Progesterone *Fertile via IVF Surrogacy	-	- Congenital absence of upper vagina, cervix, and uterus	Ultrasound
Lower GYN <i>- Imperforate Hymen - Transverse vaginal septum</i>	-	+	- Transverse vaginal septum - Imperforate hymen	Clinical exam
Enzyme/Hormonal Issues				
Androgen Insensitivity <i>- AKA testicular feminization - Defect in Androgen Receptor - 46XY - No ovaries/uterus - only undescended testes</i>	+	-	- XR disorder in 46XY patients due to defect in androgen receptor - Normal external genitalia, but no upper vagina, uterus, tubes - Testes often undescended or in labia majora. Sparse sexual hair , but breast development present. - ↑ Testosterone <i>but no receptor</i> - Dx: Clinical , plus XY karyotype , and genetic testing for AR gene (<i>Androgen Receptor</i>) - Tx: Gonadectomy (after pubertal development), hormone replacement , vaginal dilation (<i>Turn him into a female</i>)	
5α reductase Deficiency	+	-	- AR disorder of lack of male virilization from abnormal conversion of T to DHT <i>Testosterone → Dihydrotestosterone</i> - Normal internal male urogenital tract, but external genitalia is typically female or indeterminate - Individual appears male, and will develop further male sex characteristics during puberty - Dx: Increased T:DHT ratio - Tx: Assign male gender OR gonadectomy/estrogen	

Management: Treat/manage underlying condition, estrogen replacement (if necessary)
- Surgical management of structural disorders

Primary Amenorrhea-- Workup



PCOS:
*Dark "Pillcyst" = "Multiple Follicular Cysts"
*US Hallmark = Multiple Follicular Cysts
common cause of Secondary Amenorrhea

Polycystic Ovary Syndrome:
(Rotterdam) = 2/3 of 1, 2, 3, 4 = Androgen excess + Suppressed Gonadotropin Release
1. Ovarian Cystology = 20+ Follicles (Multiple Follicular Cysts) + (Indistinct)
2. Hyperandrogenism (Virilization) (Acne/Hirsutism/Deepening of voice)
3. Anovulation (Irregular/absent periods) + (Oligomenorrhea)
4. Androgen Excess (from Insulin Resistance)
*Elevated LH:FSH ratio (Hyperandrogenism) + (Indistinct)
*Elevated LH:FSH ratio (Hyperandrogenism) + (Indistinct)
*Elevated LH:FSH ratio (Hyperandrogenism) + (Indistinct)

Hallmark Symptoms:
1. Anovulation + Irregularity (T/F)
2. Hyperandrogenism (Virilization)
3. Hyperandrogenism (Insulin Resistance) + (Acne/Hirsutism)
4. Anovulation + Irregularity (T/F)
5. Anovulation + Irregularity (T/F)
6. Anovulation + Irregularity (T/F)
7. Anovulation + Irregularity (T/F)
8. Anovulation + Irregularity (T/F)
9. Anovulation + Irregularity (T/F)
10. Anovulation + Irregularity (T/F)

Diagnosis:
1. Menstrual Irregularity
2. Menstrual LH:FSH ratio (> 2 or 3:1)
3. Virilization
4. Obesity
5. Hyperandrogenism
6. Hirsutism
7. Insulin Resistance
8. Hirsutism
9. Hirsutism
10. Hirsutism

Diagnosis:
1. Menstrual Irregularity
2. Menstrual LH:FSH ratio (> 2 or 3:1)
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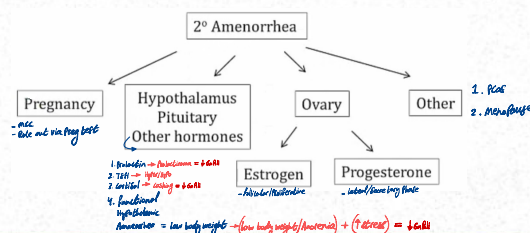
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3. Virilization
4. Obesity
5. Hyperandrogenism
6. Hirsutism
7. Insulin Resistance
8. Hirsutism
9. Hirsutism
10. Hirsutism

- ① serum = 1 mIU/mL = +ve within 1w of missed period (more sensitive)
 ② urine = 20 mIU/mL = +ve after 2w of missed period (less sensitive)

-General Effect of ↑Estrogen:
 *↑Estrogen = ↑HDL + ↓LDL, ↓Osteoclast Activity, ↑Clotting Factors + ↑Protein S/C so
 1. ↑DVT/PE/MI/Stroke Risk
 2. ↑Endometrial CA Risk
 3. ↑Breast CA Risk

Amenorrhea



Progestin Challenge:
 - Make test for cause of amenorrhea, not used any more
 - Many false positives
 1. Administer Progestin (Oral or IM)
 2. Observation of menstrual bleeding within 7d

All Bleeding Occurs:
 Indicates Estrogen present + (Endometrial Proliferation)
 but no progesterone (since progesterone rise and fall is what triggers menses)
 or progesterone causes rise then fall since it's opposed + menses
 *Estrogen can cause menses alone, since rise and fall of Progesterone is what triggers menses
 -> PCOS (Characterized) Or Ovulation or not Cause Estrogen or no Progesterone

All No Bleeding Occurs:
 Indicates Estrogen Not Present or (Mechanical Outflow Problem)
 -> Menopause
 -> Follow-up with Estrogen-Progestin challenge

Menopause:
 - General Rule
 - Average age = 51y
 - Normal course of menopause due to (Depletion of Ovarian Follicles)
 - Preceded by Irregular Periods
 - Loss of Estrogen Production from Ovaries (and Estrogen from Placenta)
 - Mean onset of Estrogen post-Menopause is Estrogen (E1) from Adipose Tissue
 - Loss of Estrogen from Follicles -> Induces Normally expressed FSH release
 - Menopause = 1950-1960 + Irregular Periods are the earliest signs

Causes:
 1. Low Estrogen (FSH ↑)
 2. Hypogonadism
 3. Uterine Anomaly
 4. CNS Risk factor (Estrogen = 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)

Secondary Amenorrhea

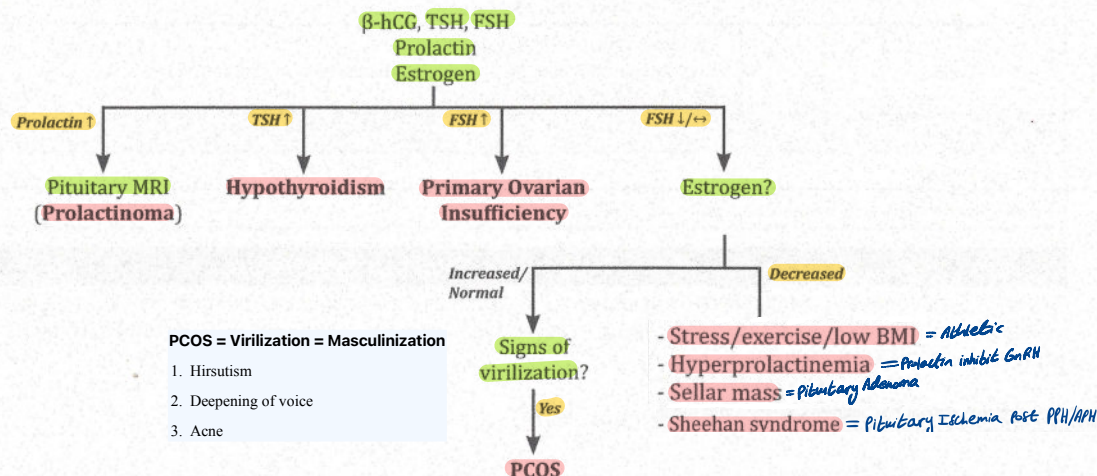
General: Absence of menses for 6 consecutive months (if normally irregular) or 3 consecutive months (if previously regular cycles)

Etiology	Features
Pregnancy	- Most common cause
Ovarian	- Primary ovarian insufficiency = Early menopause - PCOS
Hypothalamic	- Functional hypothalamic (low weight, excess exercise, stress) → Just like Primary but she started exercising after menarche - Systemic illness
Pituitary	- Prolactinoma = inhibit GnRH → Just like 1° but After menarche - Sheehan syndrome = Pituitary Ischemia Aft PPH/APH - Other sellar masses → Just like 1° but After menarche
Uterine	- Asherman syndrome (adhesions from prior uterine surgery or infection) - Cervical stenosis = Dysmenorrhea + Amenorrhea
Other	- Hypothyroidism - Medications: Atypical antipsychotics, dopamine antagonists

Diagnosis: See workup algorithm on next page

- Always start with urine β-hCG pregnancy test
- FSH, E2, TSH, prolactin

Secondary Amenorrhea-- Workup



Secondary Amenorrhea-- Management

Etiology	Management
Hypothalamic	- Lifestyle changes (increased caloric intake, decreased exercise) - CBT (especially if under stress) if Functional Hypothalamic (due to stress)
Hyperprolactinemia	- [See: Endocrine] - Bromocriptine or Cabergoline
Primary Ovarian Insufficiency	- Estrogen therapy (prevent bone loss) Hormone Replacement
Asherman	- Hysteroscopic lysis of adhesions
PCOS	- Weight loss, OCPs

Hyperandrogenism

Gynecology
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Overview of Hirsutism and Virilization

General: Excess androgen production from ovary (Testosterone) or adrenal glands (DHEAS)

Clinical:

Hirsutism	- Excess hair growth (dark, coarse hairs) in androgen-dependent areas (upper lip, chin, torso, buttocks) - Although hirsutism refers to hair growth, it is often associated with acne and male-pattern hair loss
Virilization	- Hirsutism as above, PLUS the following: clitoral enlargement, increased muscle mass, deepening of voice, male-pattern hair loss

Diagnosis: DHEAS and T levels. Depending on concern for source: Ovarian US or Adrenal CT/MRI.

Differential of Hyperandrogenism

Etiology	T	DHEAS	Features	Management
Ovarian Causes				
PCOS	↑	↔	- Hirsutism, insulin resistance, oligomenorrhea	- Weight loss, OCPs
Sertoli-Leydig	↑↑	↔	- Severe virilization, rapid onset - Androgen production from ovarian tumor	- Surgical excision +/- chemotherapy
Hyperthecosis	↑↑	↔	- Excess active luteinized stromal cells in the ovaries - US demonstrates increased size of ovaries (bilateral), increased stroma	- Bilateral oophorectomy
Adrenal Causes				
Adrenal Tumor	↔	↑↑	- Excess androgen production from adrenal adenoma or carcinoma - Dx: CT or MRI (unilateral mass)	- Surgical resection
CAH (non-classical)	↔	↑	- 21-hydroxylase deficiency - Presents similarly to PCOS (ie hirsutism without virilization) - Dx: ↑ 17-hydroxyprogesterone	- Steroids
Other Causes				
Cushing Disease				
Idiopathic Hirsutism (normal menstrual cycles, labs)				

Polycystic Ovarian Syndrome

General: Syndrome caused by elevated androgens. Multifactorial and complex, the disorder occurs in those with genetic susceptibility and insulin resistance, resulting in excessive LH release, abnormal ovarian follicular development, and excessive production of androgens.

Risk: Often comorbid with metabolic syndrome, OSA

Clinical:

- Androgen excess (acne, male pattern hair loss, hirsutism)
- Menstrual irregularities (from decreased ovulation or anovulation)
- Obesity, insulin resistance
- ↑ Risk for endometrial hyperplasia/adenocarcinoma
- Lab findings: ↑ LH/FSH ratio, ↑ Testosterone levels, ↑ Estrogen levels

Diagnosis: Rotterdam criteria (≥ 2/3 of the following)

- Oligomenorrhea
- Hyperandrogenism (acne, balding, hirsutism, ↑ serum T)
- Polycystic ovaries on TVUS^A

Management:

- Weight loss
- Combined estrogen-progestin contraceptives (for menstrual irregularity, symptoms of excess androgens)
- Ovulation induction: Either Letrozole or Clomiphene



-Dysmenorrhea Workup:
 1st:
 -History + Physical + B-hCG (to rule out pregnancy) + STD Screening (Chlamydia/Gonorrhea) to rule out PID + TVUS (to look for uterine enlargement)
 2nd:
 NSAID + Continuous OCPs (Tx for Primary Dysmenorrhea and Endometriosis)
 3rd:
 -Pelvic US/MRI
 -Hysteroscopy

Dysmenorrhea

-Primary Dysmenorrhea: Excessive ↑Prostaglandin (Oxytocic) = ↑Uterine Contractions = Vasoconstriction = Ischemia = Pain during menses

Primary Dysmenorrhea

General: Recurrent, crampy, midline lower abdominal pain that occurs during menses in the absence of pathology that could cause the pain. Caused by uterine ischemia from vasoconstriction associated with prostaglandin release.

- Clinical:**
- Primary Dysmenorrhea = Day 1-3 of menses
 - Endometriosis = 1-2 weeks before menses
 - Presents with low, midline, spasmodic pelvic pain
 - Occurs in first 1-3 days of menstruation
 - Versus endometriosis, which is pain days to weeks before cycle
 - Associated with nausea, diarrhea, flushing, headache

Diagnosis: Clinical diagnosis of exclusion

Management:

- NSAIDs (Ibuprofen, Mefenamic acid) NSAIDs = ↓Prostaglandin Release
- Combined OCPs Progesterone in Combined OCPs = Tocolytic = ↓Uterine Contraction Opposing Prostaglandin Oxytocic effect
- Others: Heat, exercise, massage Heat, Exercise, Massage = Vasodilators

Secondary Dysmenorrhea

General: Menstrual pain associated with pathologic process

Etiology:

- ① - Adenomyosis
- ② - Endometriosis
- ③ - Cervical Stenosis
- ④ - Pelvic inflammatory disease
- ⑤ - Others: Adhesions, fibroids

-So all of these are causes of Secondary Dysmenorrhea:

1. Adenomyosis
2. Endometriosis
3. PID
4. Fibroids
5. Adhesions
6. Cervical Stenosis

Diagnosis/Management: Differs based on etiology

Adenomyosis

General: Invasion of endometrial glands/stroma into the uterine musculature
 - Myometrium becomes hypertrophic and hyperplastic in response

-Adenomyosis = Endometrial Invasion of Myometrium
 -Endometriosis = Normal Uterus Size
 -Adenomyosis = Enlarged Uterus
 (Buzzwords: "Globular" "Boggy")

Risk: Endometriosis, fibroids

-Classical Presentation: 1. Menorrhagia + 2. Dysmenorrhea + 3. Enlarged Uterus

Clinical:

- Dysmenorrhea
- Menorrhagia
- Enlarged, boggy, uterus

-Adenomyosis + Endometriosis = usually coexist
 -Adenomyosis = Menorrhagia + Dysmenorrhea
 (so Heavy Bleeding → Uterine Contractions → Pain/Dysmenorrhea)

Diagnosis: TVUS or MRI

- Definitive diagnosis is histologic (but typically imaging is utilized)

Management: Progesterin = Synthetic Progesterone

- Progestins (IUDs, pills): Can control menorrhagia short term
- Definitive therapy: Hysterectomy or uterine artery embolization
 or Adenomyomectomy

Common locations of Endometriosis

- Ovaries
- Fallopian Tubes
- Douglas's Pouch (Rectouterine Pouch)
- Uterus
- Sigmoid/Left Colon

Rare locations of Endometriosis:

- Brain
- Lungs
- Liver

-Endometriosis = Normal Uterus Size

-Adenomyosis = Enlarged Uterus

-Sliding Sign = Rectum + Sigmoid sliding across Uterus

+ve = Normal

-ve = Can't slide = Adhesions In Douglas Pouch (Rectouterine) = Advanced Endometriosis

Gynecology
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Dysmenorrhea

Endometriosis

General: Functional **endometrial glands and stroma outside uterus**. Pathophysiology unknown, but current theories include: Endometrial tissue outside the uterus

- ① - Retrograde menstruation
- ② - Lymphatic or vascular spread
- ③ - Metaplastic transformation of tissue

①

②

③ menorrhagia

④ hx

Risk: ↑ risk with nulliparity, early menarche, heavy menstrual bleeding, family history

Clinical: Dysmenorrhea

- ① - **Cyclic pelvic and/or rectal pain** (classically **1-2 weeks before menses**)
- ② - **Abnormal uterine bleeding**
- ③ - **Dyspareunia**
- ④ - **Dyschezia** (painful defecation)
- ⑤ - **Ovarian mass** (**endometrioma, "chocolate brown"**) Chocolate Cyst
- ⑥ - **Infertility**
- ⑦ **Dogla's Pouch (RectoUterine Pouch)**

- Physical exam can reveal: **Posterior vaginal fornix tenderness** or nodules, **fixation of the cervix or uterus** from adhesions, or **adnexal mass**

Endometriosis Symptoms:

*Cyclic symptoms that occur 1 week before menses)

1. Infertility

2. Irregular Bleeding

3.4 Ds:

-Dysuria (Bladder Involvement)

-Dyspareunia

-Dysmenorrhea

-Dyschezia

4. Posterior Vaginal Fornix Tenderness

(Douglas's Pouch/RectoUterine Pouch Involvement)

Diagnosis:

- ② - **Laparoscopy** (biopsy for histologic confirmation, plus staging of disease)
- ① - **Patients are often treated empirically without surgical/histologic diagnosis**, and the **response to therapy** dictates whether laparoscopy is necessary
- ③ - Gold Standard for Endometriosis Dx → Pelvic MRI

-Typically Combined Pills given 21/7 (1 week break)

-Since Combined pills completely inhibit ovulation (unlike minipills)

-In case of Endometriosis 1st line Tx = Continuous Combined Pill

Management:

Pain	- First line: NSAIDs plus combined oral contraceptives (hormones used continuously) - Second line: GnRH agonist (ie Leuprolide) plus add back estrogen/progestin - Refractory: Aromatase inhibitors (Anastrozole, Letrozole) - For Endometriosis 2nd Line Tx = GnRH Agonist + Estrogen - Estrogen added back to prevent osteoporosis - If refractory to the pharmacologic measures above, laparoscopy is often required, both diagnostically and therapeutically
Infertility	- Laparoscopy and lysis of adhesions - Assisted reproduction technologies
Endometrioma Aka Chocolate Cyst	- Laparoscopic cystectomy

- GnRH Agonist = ↓ estrogen = osteoporosis after 6 months if replacement not given

Abnormal Uterine Bleeding

Gynecology
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Definitions	
Normal	- Menses every 28 days (can range from 24-38 day cycles) - Up to 8 days of bleeding, up to 80 mL of blood loss
Heavy	- > 80 mL of total blood loss
Prolonged	- > 8 days of bleeding
Frequent	- Bleeding more often than every 24 days
Infrequent	- Bleeding less often than every 38 days

Differential Diagnosis of Abnormal Uterine Bleeding

General: Bleeding outside the typical 2-7 days period of a normal 28 day cycle

Etiology: "PALM COIN"

- Polyp
- Adenomyosis
- Leiomyoma
- Malignancy
- Coagulopathy
- Ovulatory dysfunction
- Endometrial
- Iatrogenic (IUDs)
- Not yet classified (ie pregnancy, the most common cause)

Diagnosis:

- Broad workup, including β -hCG, CBC, coags, TSH, prolactin, pap smear
- Any postmenopausal women with uterine bleeding deserves endometrial biopsy

Management of Abnormal Uterine Bleeding	
Pharm	- Combined contraceptives or progestin IUD/injectable - NSAIDs or Tranexamic acid for those with contraindication
Surgical	Definitive: - Endometrial ablation - Uterine artery embolization - Hysterectomy
Acute Bleeding	- Supportive care (2x large bore IV, crystalloids, RBC transfusions) - Uterine tamponade with balloon or gauze - Hemodynamically stable: IV estrogens - Hemodynamically unstable: Uterine curettage

Vaginitis

Gynecology
OB-GYN

	Bacterial Vaginosis	Trichomoniasis	Vulvovaginal Candidiasis
Micro	- Shift in vaginal flora away from lactobacilli, to diverse bacteria including anaerobes - <i>Gardnerella vaginalis</i> predominant	- Protozoan <i>Trichomonas vaginalis</i>	- Overgrowth of <i>Candida albicans</i> (part of normal vaginal flora) - Other <i>Candida</i> also possible (ie glabrata)
Risk	- Sexual activity - Frequent douching	- Unprotected sex (passed person-to-person via sexual contact)	- Diabetes mellitus, antibiotic use, immunocompromised states
Clin	- Odor; increased discharge	- Increased discharge, odor, pruritus, dysuria	- Vulvar pruritus, with possible burning, irritation
Exam	- Homogenous thin gray-white discharge	- Erythema of the vulva and vaginal mucosa - Punctate hemorrhages of upper vagina/cervix ("Strawberry cervix") - Profuse, malodorous yellow-green discharge	- Erythematous, excoriated vagina - Thick, white, discharge with curdy texture without odor
pH	> 4.5	> 4.5	4.0-4.5
Whiff	Positive	Occasionally positive	Negative
Wet Mount	Clue cells (epithelial cell with bacteria)	Motile trichomonads (bigger than WBC, smaller than epi cells)	Pseudohyphae
KOH Prep	Negative	Negative	Positive (pseudohyphae)
Tx	PO Metronidazole (500 mg PO BID 5-7 days) Topical Metronidazole (5 days) (Vaginal or oral Clindamycin can also be used)	PO Metronidazole or Tinidazole * Partners should also be evaluated and treated	PO Fluconazole (1 time) or topical azoles * Cases of recurrent disease may require longer PO or topical regimens * Glabrata treated with intravaginal boric acid
Other	Amsel Criteria ($\geq 3/4$): Classic vaginal discharge, elevated pH, clue cells, fishy odor		

--Perihepatitis/Fitz-Hugh-Curtis Syndrome--

*LGT = Lower Genital Tract

*UGT = Upper Genital Tract

-Perihepatitis = Infx ascend from LGT→UGT→Liver Peritoneum (Perihepatic Space)

-Fitz-Hugh-Curtis Syndrome = Perihepatitis caused by Gonococcal/Chlamydial PID

-Clinical Presentation: 1.RUQ Pain + 2.PID Symptoms (Dysuria,Fever, Vaginal Discharge,Pelvic Pain)

PID Symptoms:

1.Pelvic Pain

2.Cervical Tenderness upon manipulation (Chandelier Sign)

3.Dysuria

4.Vaginal Discharge

5.Uterine Tenderness

6.Systemic: Fever+Chills+Leukocytosis

-Perihepatitis = PID + RUQ Pain + ↑LFTs + Pleuritic Pain (pain upon breathing)

-TOA (Tubo-Ovarian Abscess) = PID + Acute Abdomen/Sepsis + Non-Responsive Abx

Hospitalization Criteria for PID

-High Fever

-Nausea and Vomiting

-TOA

-PID during Pregnancy

(Pregnancy = Thick Cervical Mucus = Protective from PID)

Upper Gyn Infection

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Pelvic Inflammatory Disease

General: Acute bacterial infection of the upper genital tract, including uterus, fallopian tubes (salpingitis), ovaries, peritonitis. Typically due to ascending infection from lower genital tract. (Any Infx above cervix)

Etiology:

-Mcc cause of PID = 1.Gonorrhoeae 2.Chlamydia

-Gonorrhea and Chlamydia (mcc)

-Other assorted bacteria also implicated less commonly (Mycoplasma genitalium, group A/B Strep, E. Coli, Klebsiella, etc)

Risk: Sexually active (esp. multiple partners), lack of barrier protection, history of PID or STI

-Pregnant women usually not at risk given mucus plug

Clinical:

chandelier sign = Intense pain felt upon cervical manipulation during pelvic examination

-Acute onset lower abdominal or pelvic pain

-Uterine, cervical ("Chandelier sign"), and/or adnexal tenderness

-Purulent cervical discharge, possible bleeding/spotting

-Systemic symptoms: Fevers, chills, leukocytosis

Diagnosis: Clinical diagnosis

① Lower abdominal/pelvic pain + uterine, cervical, or adnexal tenderness

-Generally the above is enough to warrant empiric therapy

-Pelvic imaging (ie TVUS, CT) supportive, but unnecessary for diagnosis

Management:

Hospitalized

- "Foxy Doxy": Cefoxitin IV + Doxycycline PO

-Clindamycin + Gentamicin (alternative regimen)

-Should admit: Pregnant women, poor compliance (ie teenagers), TOA, perihepatitis, failed outpatient therapy, women unable to tolerate PO, severe presentations

Outpatient

-Ceftriaxone 1x IM + Doxycycline (14 days)

"Foxy Doxy" = CeFOXitine, DOXYcyclin

Complications:

① - Infertility, ↑ ectopic pregnancy risk

② - Pelvic adhesions

② - Perihepatitis (Fitz-Hugh-Curtis) Perihepatitis = 1.RUQ Pain + 2.↑LFTs + 3.PID Symptoms (Pelvic Pain, Vaginal Discharge, Fever, Dysuria)

-Inflammation of the liver capsule/peritoneum

-RUQ abdominal pain (often pleuritic), possible abnormal LFT's

-Laparoscopy: Purulent/fibrinous exudates surrounding the liver

④ - Tubo-Ovarian Abscess (TOA) TOA (Tubo-Ovarian Abscess) = 1.PID Symptoms + 2.Acute Abdomen/Sepsis + 3.Unresponsive to Abx

-10% of patients with PID develop TOA, an inflammatory mass of the tubes and/or ovaries

-Typically polymicrobial

-Presents like PID, but may be extra sick or not responding to abx

★ - Rupture TOA can present with acute abdomen and sepsis

-Dx: Imaging (TVUS)

-Tx: Antibiotics for uncomplicated cases, but surgical drainage or salpingo-oophorectomy if unresponsive or severe infections

PID Symptoms +

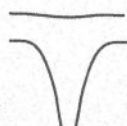
1.Perihepatitis = RUQ and ↑LFTs and Pleuritic (worse with breathing)

2.TOA (Tubo-Ovarian Abscess) = Acute Abdomen/Sepsis + Unresponsive to Abx

Congenital Gyn Abnormalities

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	General/Clinical	Management
Vaginal Abnormalities		
Imperforate Hymen	- Hymenal epithelium normally degenerates, but can abnormally persist - Obstruction can cause hydrocolpos, mucocolpos, or hematocolpos - Rarely can cause primary amenorrhea	- Surgery
Transverse Vaginal Septum	- Failure of canalization between the lower 2/3 and upper 1/2 of the vagina (Müllerian ducts do not fuse to the urogenital sinus) - Presents with short vagina with blind pouch - Can also present with primary amenorrhea, cyclic pelvic pain	- Surgery
Vaginal Agenesis	- Complete absence of vagina - Frequently associated with Mayer-Rokitansky-Küstner-Hauser, with associated absence of uterus and cervix	- Vaginal dilators or surgical vaginoplasty
Uterine Abnormalities		
Congenital Uterine Anomalies	- Congenital uterine abnormalities due to abnormal Müllerian duct fusions during embryonic development - Generally idiopathic, but can be associated with DES exposure - Increased risk for associated renal abnormalities or inguinal hernia - Rarely symptomatic - Dx: TVUS, MRI, or hysterosalpingogram	- Generally no intervention required - Surgical correction if recurrent pregnancy loss



Normal



Septate



Bicornuate



Didelphys



Unicornate

Vaginal/Cervical Lesions

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	General/Clinical	Management
Skin Lesions		
Lichen Sclerosus	- Presents with thin, white, wrinkled skin localized on the labia ("paper thin") - Shrinkage and agglutination of labia minora - Often causes severe pruritus, dyspareunia - Increased risk of SCC in this area	Dx: Biopsy Tx: High potency topical steroids
Lichen Simplex Chronicus	- Localized thickening of the vulvar skin from excess scratching and pruritus	Tx: Topical steroids (to break itch-scratch cycle)
Vulvar Lichen Planus	- Presents with vulvar pain, pruritus, discharge - Brightly erythematous erosions with "lacy" white striae - Lesions also can be intravaginal or involve other mucosal areas	Dx: Biopsy Tx: High potency topical steroids
Vulvar Psoriasis	- Classic scaling red plaques, typically also located elsewhere on body - Typically asymptomatic or only mild pruritus	Dx: Clinical or biopsy Tx: Topical steroids, UV light
Cysts		
Bartholin's Cyst	- Obstruction of Bartholin's duct and dilation of the gland - Can occur idiopathically or from trauma - Presents with cysts lateral to the vaginal orifice	- If asymptomatic: Observation If infected or symptomatic: - I&D PLUS word catheter placement - Marsupialization (second line) - Antibiotics if recurrent, high risk, or appearing septic
Skene's Gland Cyst	- Paraurethral gland cysts, located in the anterior vagina near the opening of the urethra	
Gartner's Cyst	- Remnants of mesonephric ducts, typically located on the lateral vaginal wall - Generally asymptomatic	
Cervical Lesions		
Cervical Cysts	- Nabothian cysts most common, caused when glandular columnar cells become covered by squamous epithelial, but still produce mucus - Generally asymptomatic	- Self-limited
Cervical Polyps	- Polyps often originate from the endocervical canal, appear as broad based or pedunculated lesions - Often asymptomatic, but can cause intermenstrual or postcital bleed	- Polypectomy if symptomatic
Cervical Stenosis	- Narrowed endocervical canal, which can cause buildup of menstrual flow - Risk: Cervical surgery, cancer - Presents with severe dysmenorrhea, relieved with increased flow - Diagnosis: Clinical exam (try to pass dilator)	- Cervical dilation (laminaria, stent, or surgical dilation)

Pelvic Organ Prolapse

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General: Herniation of the pelvic organs past the vaginal walls. Commonly seen after menopause due to decreased estrogens, vaginal atrophy, and effects of gravity.

Subtype	Definition
Cystocele	- Bladder bulge into the anterior vagina
Rectocele	- Rectum bulge into the posterior vagina
Enterocoele	- Protrusion of the small intestines and peritoneum into vagina
Urethrocele	- Prolapse of urethra into the vagina - Often occurs concurrently with cystocele
Uterine Prolapse	- Prolapse of the uterus into the vagina

Risk: ↑ Age, high parity or history of traumatic delivery, history of pelvic surgery, obesity, chronic constipation

Clinical:

- Pelvic pressure, heaviness or sensation of bulging
- Protrusion of tissue from the vagina
- Can be associated with urinary, bowel, or sexual issues (ie dyspareunia)
 - Urinary incontinence, a sense of incomplete bladder emptying
 - Defecatory issues (may need to "splint," ie apply pressure to the posterior vagina to allow for defecation)

Diagnosis: Clinical exam. POP-Q score can be utilized to characterize and risk stratify.

Management:

Conservative	- Pelvic floor exercises - Vaginal Pessaries - Silicone devices that support the pelvic organs - Regularly remove and clean to avoid infection
Surgical	- Indicated for symptomatic prolapse or failure of conservative tx Types Include: - Hysterectomy with colpopexy (vaginal vault suspension) - Colporrhaphy (fix the hernia) - Colpocleisis: Close the vaginal opening (done in those at high risk of surgery and don't need vagina)

Vesicovaginal Fistula

General: Fistula between vagina and bladder. Associated with recent pelvic surgery, radiation, malignancy, history of traumatic labor.

Clinical: Painless continuous leakage of urine into vagina

Diagnosis: Dye tests, cystoscopy

Management: Surgical correction

Cervical Neoplasia

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Cervical Cancer

General: Cancer of the cervix, either squamous cell (~70%) or adenocarcinoma (~25%). Highly associated with HPV (16, 18, 31, 45). Usually originates at the transformation zone (junction between squamous epithelium of ectocervix and glandular epithelium of the endocervix).

Risk: Early onset of sexual activity, multiple or high risk sex partners, history of other STI's, immunocompromised (such as HIV), smoking

Clinical:

- Often asymptomatic
- Metrorrhagia, postcoital spotting, cervical ulceration all possible

Diagnosis: Biopsy for definitive diagnosis

- Often picked up on Pap smear screening, which should be followed by colposcopy and directed biopsy
 - Colpo performed by staining cervix with acetic acid
 - Findings include acetowhite epithelium, mosaicism, punctuations, atypical vessels

Dysplasia	Location	Bethesda	CIN
Mild	- Bottom 1/3 of cervical epithelium	LSIL	I
Moderate	- Bottom and middle 1/3 of cervical epithelium	HSIL	II
Severe or Carcinoma in situ	- > 2/3 of cervical epithelium	HSIL	III

Stage	Description
I	- Confined to cervix: - IA: Microscopically diagnosed - IB1: Clinically visible, < 4 cm in greatest dimension - IB2: Clinically visible, > 4 cm in greatest dimension
II	- Spread beyond cervix (ie upper vagina or parametrium)
III	- Spread to lower vagina or pelvic side wall
IV	- Invades bladder, rectum, or distant metastasis

Management of Cervical Malignancy

Lesion	Intervention
CIN 1	- Monitor Pap +/- HPV q12 months. Repeat colposcopy if abnormal. - If CIN 1 persists for 2 years: Conization/LEEP
CIN 2/3	- Conization/LEEP - If plans to become pregnant: Can consider q6 month cytology + colposcopy for one year if CIN 2
Cancer	- Early Disease (Stage IA-IB): Surgical conization or hysterectomy - Advanced Disease (Stage IB2 or higher): Chemo + radiation therapy

If Pregnant:

- LSIL or HSIL paps should be investigated with colposcopy
- CIN I: Defer further management to 6 weeks postpartum
- CIN II-III: Follow routine colposcopy during pregnancy
- Invasive Cervical Cancer: Depends on patient's wishes, but can consider abortion with treatment, localized excision procedure, or defer treatment until after delivery

Types of Procedures:

- Cold knife conization
- LEEP (loop electrical excision procedure)
- Side Effects:
 - Cervical stenosis
 - Cervical insufficiency (↑ preterm risk or second trimester loss)

Prophylaxis: HPV 9-valent vaccine (okay to use ages 9-45 y/o)

Cervical Neoplasia

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Cervical Cancer Screening	
Normal Risk Individuals	
21-29 y/o	- Pap test q3 years
30-65 y/o	- Pap test q3 years OR - Pap + HPV cotest q5 years
> 65 y/o	- If normal risk, and patient has 3 negative paps or 2 negative cotests in the last 10 years, screening can stop
Special Situations	
Smokers	- Reasonable to extend screening to 75-80 y/o
Immuno-suppressed	- Start screening at time of first sexual activity - Screen q1 year
Hysterectomy	- If total hysterectomy (ie cervix removed), no screening needed UNLESS history of CIN grade II or higher lesion (in which case vaginal cytology is reasonable)
Post-ablative for CIN	- After surgery for CIN, pap + HPV q1 years for 2 years - If normal, return to normal screening schedule for at least 20 years

Interpretation of Screening	
AGC (Atypical Glandular Cells)	- Colposcopy, endocervical sampling - Endometrial biopsy if > 35 y/o OR < 35 but at risk for endometrial dysplasia (obesity, PCOS, etc)
ASC-US (≥ 25 y/o)	- Check HPV if available (otherwise, repeat cytology in one year) - ASC-US + HPV (+): Colposcopy - ASC-US + HPV (-): Cotest in 3 years
LSIL (≥ 25 y/o)	- LSIL + HPV (-): Repeat co-test in 1 year - LSIL + HPV (+ or unknown): Colposcopy
ASC-US or LSIL (21-24 y/o)	- Repeat cytology in 12 months - If cytology remains abnormal → Colposcopy
HSIL or ASC-H	- Colposcopy - If negative, follow with q6M colposcopy for 2 years
NILM but HPV(+)	- Either repeat cotest in 1 year OR DNA type HPV - If HPV 16 or 18 positive → Colposcopy

Endometrial Neoplasia

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Endometrial Polyps

General: Hyperplastic overgrowth of endometrial glands/stroma. Generally benign, but are possibly malignant (especially in those that are postmenopausal).

Risk: High estrogen levels (obesity, Tamoxifen, hormone replacement therapy)

Clinical: Often asymptomatic, but can cause abnormal uterine bleeding

Diagnosis: TVUS or hysteroscopy is suggestive, but definitive diagnosis on histology

Management:

Premenopausal	- Polypectomy if symptomatic or if at high risk for endometrial hyperplasia/cancer
Postmenopausal	- Polypectomy for all

Uterine Leiomyoma (Fibroids)

General: Benign smooth muscle tumors arising from the myometrium. Sensitive to estrogen and progesterone. Malignant transformation to leiomyosarcoma is very rare.

Subtypes:

Intramural	- Located within uterine wall
Submucosal	- Located beneath endometrium, extending into and distorting uterine cavity - Highest risk for bleeding
Subserosal	- Extend from myometrium to the serosal surface of the uterus
Cervical	- Located within cervix

Risk:

- Black women
- Increased estrogen exposure (low parity, early menarche)
- Alcohol ↑ risk, smoking possibly protective

Clinical:

- Abnormal uterine bleeding
- Bulk Symptoms: Bloating, constipation, ↑ urinary frequency or retention
- Pelvic pain: Dysmenorrhea, dyspareunia
- Exam demonstrates firm, nontender, irregularly shaped uterus

Diagnosis: TVUS (first line)

- Saline sonography or hysteroscopy (can characterize uterine cavity)

Management:

Expectant	- Reasonable to monitor patient if asymptomatic or postmenopausal - Growing fibroid in postmenopausal patient concerning for malignancy
Pharmacologic	- OCPs, progestin IUDs, GnRH agonists can be trialed for symptomatic patients, but evidence for efficacy lacking
Surgical	- Indicated if symptomatic (abnormal uterine bleeding, infertility) - Myomectomy (if patient wishes to maintain fertility) - Hysterectomy or uterine arterial embolization (if done childbearing)

Endometrial Neoplasia

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Endometrial Hyperplasia

General: Hyperplastic proliferation of endometrial glands, typically associated with continuous estrogen exposure. Categorized into the following groups:

Subtype	Findings	Cancer Risk
Simple Hyperplasia w/o Atypia	- Mildly crowded glands	< 5%
Complex Hyperplasia w/o Atypia	- Crowded glands, elevated gland-to-stroma ratio	< 5%
Simple Atypical Hyperplasia	- Mildly crowded glands - Nuclear atypia (enlargement, prominent nucleoli)	> 10%
Complex Atypical Hyperplasia	- Crowded glands, elevated gland-to-stroma ratio - Nuclear atypia (enlargement, prominent nucleoli)	> 20%

Risk: Obesity, PCOS, anovulation, isolated estrogen therapy, estrogen producing tumor

Clinical: Abnormal uterine bleeding, most commonly postmenopausal

- US may show thickened endometrial stripe (> 4 mm)

Diagnosis: Endometrial Biopsy. Indicated if:

- ≥ 45 with abnormal uterine bleeding or postmenopausal bleeding
- < 45 with abnormal uterine bleeding + unopposed estrogen, lynch syndrome, or failed medical management
- > 35 with atypical glandular cells on Pap test

Management:

- No atypia: Progestin IUD
- Atypia: Hysterectomy. Progestin IUD if wish to preserve fertility.

Endometrial Carcinoma

General: Most common gynecologic malignancy in US. Subtypes:

Type I	Endometrioid	- Derives from atypical endometrial hyperplasia - Favorable prognosis (compared to type II)
Type II	Serous, Clear cell, Carcinosarcoma	- Unrelated to estrogen exposure, associated with p53 mutation - See in older aged individuals - Poor prognosis

Risk: Same as hyperplasia: Obesity, PCOS, anovulation, isolated estrogen therapy. Plus:

- Hypertension, diabetes
- Lynch syndrome (should receive regular screening)

Clinical: Asymptomatic or abnormal uterine bleeding

Diagnosis: Biopsy

Management: TAH, bilateral salpingo-oophorectomy, lymphadenectomy

- Surgery is used to stage patients, establish type of disease (for all patients)
- Adjuvant therapy dictated by stage/risk
 - Radiation therapy for locally invasive tumor (myometrium, cervix)
 - High risk disease receives chemotherapy +/- radiation

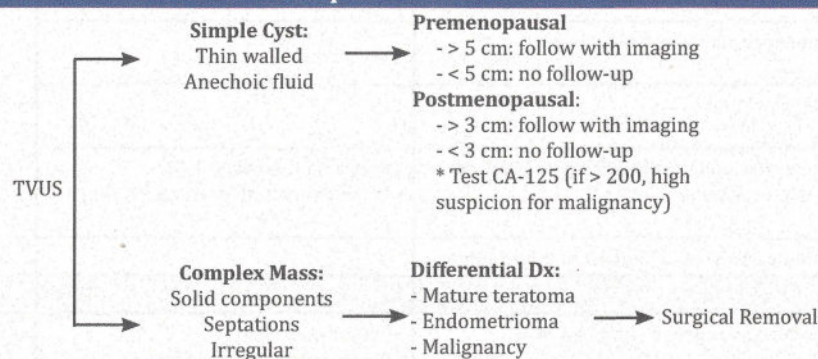
Ovarian Neoplasia

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Differential Diagnosis of Adnexal Mass

Etiology	Features	Management
Benign Cysts		
Follicular	- Most common, occurs when follicle fails to rupture after follicular maturation	- Self-limited
Corpus Luteal	- Corpus luteum failure to involute, continues enlargement after ovulation - Normal in early pregnancy	- Self-limited
Theca-Lutein	- Luteinized follicle cysts from overstimulation due to β -hCG	- Self-limited
Benign Mass		
Teratoma	- Dermoid cyst - Characteristic US finding: Hyperechoic contents, hyperechoic lines or dots, fluid, and areas of acoustic shadowing	- Cystectomy
Cystadenoma	- Serous or mucinous cystadenomas are most common benign ovarian tumors - Thin walls with multiple locules possible, > 5 cm in size	- Cystectomy (especially if symptomatic) - Observation (also reasonable)
Pathologic Masses		
Endometrioma	- Endometriosis of the ovary - Presents with mass, pelvic pain, dysmenorrhea - "Chocolate Cyst," appears complex on US (homogeneous internal echoes)	- Laparoscopy
Tubo-Ovarian Abscess	- Inflammatory mass associated with PID	- Antibiotics, surgery [See: PID]
Malignant Masses		
Epithelial Carcinoma	- See discussion for full details	
Pregnancy Associated		
Luteal Cyst or Luteoma	- Cystic or solid corpus luteum	Self-limited
Ectopic	- Pain, vaginal bleeding, etc	[See: Ectopic Preg]

Workup of Adnexal Mass



Adnexal Mass Complications

Etiology	Features	Management
Hemorrhagic Cyst	- Most commonly physiologic cyst that develops internal bleeding - Often presents with mild to severe abdominal pain - US demonstrates cystic mass with internal echoes	- Usually self-limited (supportive care) - Hospitalization, blood products may be required in more severe cases - Surgery if bleeding continues/unstable
Ruptured Cyst	- Rupture of a benign or pathologic cyst, with resulting fluid/blood leakage into peritoneum - Presents with severe, unilateral lower abdominal pain - US shows ovarian cyst + serous fluid in pelvis	
Ovarian Torsion	- Complete or partial rotation of ovary around suspensory ligaments, resulting in ischemia - Risks: Cystic mass (esp > 5 cm) or ovulation induction - Presents as acute onset pelvic pain, adnexal mass, nausea/vomiting - US shows mass, doppler may show limited blood flow	- Ovarian detorsion - Cystectomy - Oophorectomy if fully necrotic

Ovarian Neoplasia

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Epithelial Ovarian Neoplasia

General: Majority of primary ovarian neoplasms are epithelial histology. Subtypes include serous (most common), mucinous, clear cell, endometrioid.

Risk:

- ↑ Age, low parity, infertility
- Positive family history (first degree relative), BRCA, Lynch II
- Decreased Risk: OCPs, multiparity, breast feeding, chronic anovulation

Clinical:

- Pelvic/abdominal pain, bloating, early satiety adnexal mass
- US: Complex, cystic mass with solid components, thick septations

Diagnosis: Histology after surgical removal

Management: Total hysterectomy and salpingo-oophorectomy + lymph node dissection

- Adjuvant chemotherapy in most
- CA-125 surveillance

	General	Clinical	Management
Germ Cell	- Primarily arise in young women (10-30 y/o) - Associated with β -hCG, AFP, LDH production	- Present with abdominal mass or pain - Bleeding, precocious puberty (β -hCG)	- Oophorectomy/cystectomy
Dysgerminoma	- Tumor of undifferentiated germ cells - LDH, placental AlkPhos production		- Oophorectomy/cystectomy
Mature Teratoma	- "Dermoid Cyst." Benign, mature tissues of ectodermal, mesodermal, endodermal origin.	- Generally asymptomatic (torsion possible) - TVUS: Characteristic appearance	
Immature Teratoma	- Immature, trilineage malignancy		
Yolk Sac Tumor	- AFP elevation		
Choriocarcinoma	- Nongestational choriocarcinoma is very rare - β -hCG producing	- Precocious puberty (kids) - Postmenopausal bleeding (adults)	
Embryonal	- Undifferentiated, often part of mixed tumor		
Stromal			
Granulosa	- Produce estrogen or Inhibin A or B	- Precocious puberty - Postmenopausal bleeding	- Unilateral oophorectomy (if wish to preserve fertility) - TAH-BSO (adults who complete child bearing)
Sertoli-Leydig	- Produces androgens	- Virilization	
Fibroma	- Benign solid stromal neoplasms	- Meigs: Fibroma + ascites + pleural effusion	- Unilateral oophorectomy
Fallopian Tube	- Typically adenocarcinoma derived from tubes	- Latzko's triad: Profuse watery discharge, pelvic pain, mass	- Similar to epithelial ovarian cancer

Vulvar/Vaginal Neoplasia

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Vulvar Neoplasia

General: Most commonly squamous cell carcinoma of the vulva

Risk:

- HPV/cervical cancer
- Vulvar lichen sclerosis
- Immunodeficiency
- Smoking

Clinical:

- Mass that can cause pruritus, pain, bleeding
- Varied appearance: Plaque, ulcers, nodular mass all possible

Diagnosis: Biopsy

Management:

- Surgical Excision (partial vulvectomy) +/- lymph node dissection
- Chemotherapy or radiation for advanced disease

Other Histologic Subtypes

Melanoma	- Presents as a black itchy mass, with biopsy revealing proliferation of melanocytes - Treated similarly to vulvar SCC with vulvectomy and LN dissection
Paget's	- Rare, intraepithelial adenocarcinoma of the vulva - Presents with pruritus, erythematous "eczematous" appearing lesion - 20% have coexisting adenocarcinoma elsewhere (ie breast) - Diagnosis and management with biopsy and excision as above

Vaginal Neoplasia

General: Most commonly squamous cell carcinoma of the vagina, with similar risk factors as cervical cancer. Rarely adenocarcinoma or clear cell carcinoma.

Risk:

- HPV, immunosuppression, chronic inflammation
- DES (adenocarcinoma or clear cell carcinoma)

Clinical:

- Presents with vaginal bleeding, discharge, or postcoital bleeding
- Most likely upper 1/3 of vagina

Diagnosis: Biopsy. Colposcopy used if difficulty identifying lesion.

Management:

VAIN (Squamous atypia without invasion)	- Excision, laser ablation, or topical therapy
Stage I (Limited to vaginal wall)	- Local excision
Stage II-IV	- Chemotherapy and/or radiation therapy

Evaluation of Nipple Discharge

General: Nipple discharge can range from normal lactation, galactorrhea, or pathologic discharge

Etiology	Presentation	Differential Diagnosis
Lactation	- Milk production - Occasionally bloody during pregnancy (benign)	- Pregnancy - Post-partum (up to 6 months after cessation of breastfeeding)
Galactorrhea	- Bilateral milky discharge - Typically white, clear, or straw colored - Caused by hyperprolactinemia	- Chronic breast stimulation (ie from clothing) - Medications (dopamine inhibitory meds) - Prolactinoma - Hypothyroidism
Pathologic	- Usually unilateral production of fluid from single duct - Can be serous or blood tinged	- Intraductal papilloma - Malignancy - Duct ectasia - Mastitis or abscess

Diagnosis:

- Ultrasound +/- mammography (used if > 30 y/o)
- If multi-ductal: Pregnancy test, prolactin, TSH
- Biopsy if mass found

Management:

- Physiologic: Treat underlying, remove meds, etc
- Pathologic: Surgical (duct excision)

Intraductal Papilloma	- Benign proliferation of ductal epithelium - Present with bloody nipple discharge - Dx: Imaging (mammo), following by core needle biopsy - Tx: Excision
Duct Ectasia	- Inflammation and fibrosis of the ductal system - Often presents with green, sticky nipple discharge

Evaluation of New Breast Mass

General: New breast masses can represent benign or malignant processes. Often found on patient self-breast exam.

Etiology: See next page for full DDx

Diagnosis:

- < 30 y/o: Ultrasound +/- mammogram (if highly suspicious)
- > 30 y/o: Mammogram (even if recent normal)
- MRI diagnostically difficult cases

Management:

- Core needle biopsy (generally preferred method for tissue diagnosis)
- FNA: Reasonable alternative if US highly suggestive of simple cyst

Breast

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	General	Clinical	Management
Benign Breast Masses			
Cyst	- Simple Cyst: Simple fluid filled lesion, always benign - Complex Cyst: Also typically benign, but should confirm with FNA, follow with imaging	- Solitary mass, possibly painful - Ultrasound: - Simple: Ovoid, homogenous, anechoic - Complex: Thick walled, septated, solid components	- Can observe simple, asymptomatic cysts - FNA (symptomatic or complex) - Surgically remove if recurrent
Fibroadenoma	- Most common benign breast tumor - Slow growing proliferation of epithelial and stromal components	- Well defined, mobile, rubbery mass - US: Well-defined, solid mass - Dx: Core needle biopsy (can also repeat imaging in 3-6 months)	- Reassurance or Surgical Excision
Fibrocystic Changes	- Not a specific condition, but rather a term to describe nonspecific nonproliferative breast lesions (cysts, hyperplasia, etc)	- Bilateral breast swelling, pain, tenderness, lumpiness - Symptoms are often cyclic, worst before menses occurs, improving after menses	- Reassurance - For pain: Supportive bra, NSAIDs - Tamoxifen if severe
Galactocele	- Cystic collections of fluid, usually caused by an obstructed milk duct - Common with breastfeeding	- Soft cystic mass on exam - US shows complex cystic mass - Dx: FNA (resulting in milky substance)	- Reassurance
Fat Necrosis	- Benign lesion that occurs after chest trauma or breast surgery/radiation	- Presents with irregular breast mass - Can appear similar to malignancy on US - Dx: Biopsy (fat, foamy macrophages)	- Reassurance
Malignant Breast Masses			
Phyllodes	- Rare, breast tumors of fibroblast and stromal proliferation	- Large, smooth, irregular, painless mass - Appears smooth, with multiple lobules on mammography - Dx: Core biopsy	- Wide Local Excision

Breast Cancer

General: Most common cancer in women and second most common cause of death. Most commonly derived from epithelial tissues.

Premalignant	
Atypical Ductal Hyperplasia	- Proliferation of atypical ductal cells similar to DCIS but less extensive - Surgical excision is indicated
DCIS	- Premalignant lesion, with atypical ductal cells restricted above the ductal basement membrane
LCIS	- Often found incidentally on breast biopsy performed for some other reason - Premalignant expansion of epithelial cells contained within breast lobules - Most commonly multicentric and bilateral
Malignant	
Invasive Ductal	- Most common type of breast cancer - Cords and nests of cells with possible gland formation
Invasive Lobular	- Single-file cellular infiltrate the mammary stroma and adipose tissue (associated with loss of E-cadherin) - Elevated risk for bilateral disease
Inflammatory	- Extremely aggressive, rapid subtype with dermal lymphatic invasion - Clinically presents with edema, erythema, peau d'orange (dimpling, pitting)
Paget's	- Epidermal spread of malignant ductal cells, resulting in eczematous changes to the nipple - Often concomitant with invasive carcinoma

Risk:

↑ Risk	- Age > 70 (very high relative risk), mother or sister with breast cancer - BRCA1/2 - Excess estrogen exposure (Age < 12 at menarche, age > 30 at first birth, age > 55 at menopause, hx of OCP or HRT use) - > 2 EtOH drinks/day
↓ Risk	- Breastfeeding, increased parity, normal BMI, regular exercise

Clinical:

- Early Findings: Single, nontender, firm mass with ill defined margins OR mammographic abnormalities on routine screening
- Late Findings: Regional lymphadenopathy or other metastatic disease, Peau D'Orange skin (invasion of dermal lymphatics), dimpling (tethering of Cooper ligament)

Diagnosis: Core needle biopsy (often image guided)

- Preferred to FNA given higher diagnostic yield, ability to test receptor status (ER/PR/HER2)

Management of Breast Cancer

DCIS	- Mastectomy OR Breast conserving therapy (BCT) (Lumpectomy + Radiation) - Adjuvant hormonal therapy if ER positive (Tamoxifen or Anastrozole)
LCIS	- Observation - Surgically remove those high risk histologic features (ie necrosis)
Early Stage (Stage I, IIA, IIB)	Defined as disease limited to breast with only limited spread to axillary nodes <u>Primary Surgery</u> - Mastectomy OR breast conserving therapy - Sentinel lymph node biopsy (for all), with dissection if positive Note: Large or multifocal disease should undergo mastectomy <u>Adjuvant Therapy</u> - Hormone therapy if ER/PR+ (Tamoxifen) or HER2 + (Trastuzumab) - Chemotherapy (if high risk, ie large tumors or triple negative disease)
Locally Advanced (Stage III, also subset of IIB)	Defined as extension to chest wall/skin, > 5 cm in size, or extensive regional lymphadenopathy - Neoadjuvant Chemotherapy - Surgery (mastectomy or breast conserving therapy)
Metastatic (Stage IV)	- Hormone therapy and/or systemic chemotherapy

Screening for Breast Cancer	
Age	Screening Recommendation
< 40	- Not indicated for average risk women
40-50	- Guidelines vary by expert group - Overall, an individualized "shared decision making" model is encouraged
50-75	- Screening recommended for all (q2 years) - Note: Frequency is debated and varies between expert groups (q1-2 years)
>75	- Not indicated, unless life expectancy >10 years

High Risk:

- Defined as BRCA mutation +, personal history of ovarian/breast cancer, radiation therapy earlier in life, or strong family history (as determined by risk calculator with > 20% risk)
- Should start screening early with alternating q6 month mammogram/MRI

Modality:

- Mammography (primary modality used for all, including dense breasts)
- Ultrasound (used to follow up certain lesions on mammography)
- MRI (used as adjunct in certain high risk patients)
- Screening clinical or self breast exam: Not indicated

Mammography:

BI-RADS Category	Management	Cancer Risk
0: Incomplete	- Additional imaging	N/A
1: Negative	- Continue routine screening	0%
2: Benign	- Continue routine screening	Near 0%
3: Probably Benign	- 6 month follow up	< 2%
4: Suspicious	- Core needle biopsy	2-95%
5: Highly Suggestive	- Core needle biopsy	> 95%
6: Known Malignancy		N/A

Benign Findings: Skin or vascular calcifications. Eggshell or rim calcifications.

Pathologic Findings: Clustered, granular microcalcifications. Fine pleomorphic, linear, or linear-branching calcifications.

BRCA

General: BRCA1 and 2 genes code for tumor suppressor proteins involved in DNA damage detection and repair (double strand breaks). Autosomal dominant inheritance. Mutations in these genes place patients at risk for malignancy, specifically breast and ovarian, as below.

BRCA 1	- Breast cancer (50-70% risk) - Ovarian cancer (~40% risk)
BRCA 2	- Breast cancer (50-70% risk) - Ovarian cancer (~15% risk). Male breast and pancreatic cancer.

Management:

Screening for Mutation	Indicated if: - Personal history of breast cancer PLUS age < 50, strong family history, or multiple breast cancers in same patient - Family history of BRCA gene variant - > 3 cancers on same side of family (breast, ovarian) - Strong family history (cancer diagnosis at age < 45, > 2 primary breast cancers in an individual or on the same side of family with one < 50)
Screening in BRCA Patient	- Breast Ca: Annual MRI and mammogram, starting at age 25-30 - Ovarian Ca: q6 month ultrasound + CA125, starting at age 30 Note: The above screening is assuming the patient has not undergone risk reducing surgery like mastectomy or BSO
Prophylaxis in BRCA +	- Surgical: Bilateral mastectomy (any age per patient preference), Bilateral salpingo-oophorectomy (age 35-45 after childbearing). - Pharm: If no mastectomy, can consider Tamoxifen

	Mechanism	Indication	Side Effects/Management
Reproductive Hormones			
Estrogen Ethinyl estradiol	- Estrogen receptor agonists	- Hormone replacement therapy - Contraception	- Increased risk of venous thromboembolism - Increased risk of endometrial cancer
Progestins Levonorgestrel Medroxyprogesterone Etonogestrel Norethindrone	- Progesterone receptor agonists	- Hormone replacement therapy - Contraception	
GnRH Agonists Leuprolide	- GnRH agonist - If used continuously, acts as an antagonist	- Fibroids, endometriosis - Precocious puberty - Infertility (pulsatile) - Prostate cancer	- Menopausal symptoms when used continuously
SERMs			
Clomiphene	- Antagonist at estrogen receptors in hypothalamus	- Infertility	- Hot flashes - Vision changes (blurring, double vision, scotomata) → Warrants discontinuation of therapy
Tamoxifen Raloxifene	- Antagonist of estrogen at breast, but agonist at bone	- ER/PR + breast cancer - Osteoporosis	- Hot flashes - Increased risk of venous thromboembolism
Other Hormone Antagonists			
Mifepristone Ulipristal	- Progesterone receptor antagonist	- Emergency contraception or abortifacients	- Abdominal pain, uterine cramping, and vaginal bleeding
Anastrozole Letrozole	- Aromatase inhibitors	- ER/PR + breast cancer (if post-menopausal)	- Osteoporosis