Obstetrics & Gynecology

Medicine. (University of Massachusetts Medical School)

Obstetrics & Gynecology

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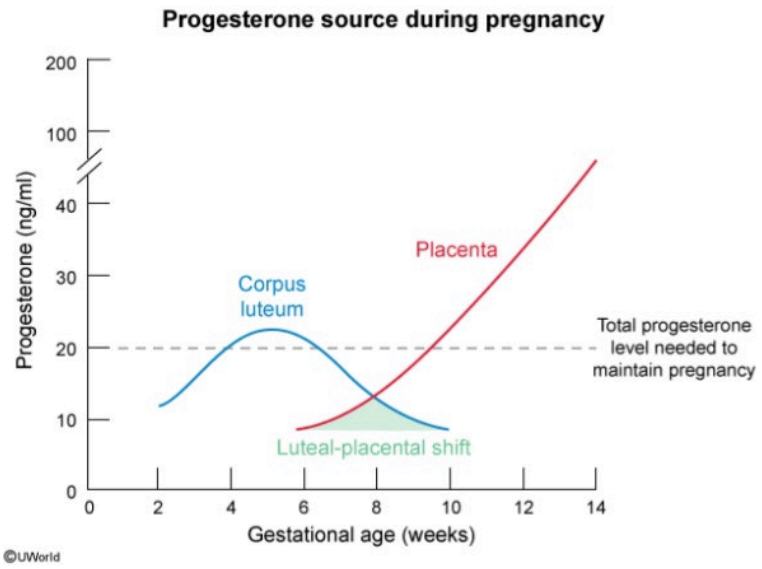
Obstetrics

Physiology of Pregnancy



Physiologic changes of pregnancy	
Cardiovascular	• ↑ Blood volume (plasma > RBC mass) • ↓ Systemic vascular resistance • ↑ Heart rate & cardiac output
Pulmonary	• ↑ Central respiratory drive (hyperventilation) • ↓ $PaCO_2$ (respiratory alkalosis), ↑ PaO_2
Renal	• ↑ Renal blood flow & urine output • ↑ GFR, ↓ BUN & serum creatinine • ↑ HCO_3^- excretion (metabolic compensation) • ↓ Serum Na^+ concentration (↑ ADH secretion)
Hematologic	• ↑ Prothrombotic coagulation factors • ↓ Hemoglobin concentration (dilutional anemia)

Cardiovascular:

- MAP=CO x SVR.
- CO increased in the first trimester due to increased SV and in the third trimester due to increased HR.
- Decrease in systemic vascular resistance due to progesterone → fall in mean arterial pressure.
    - CO compensate by increasing the HR (by 15% only).
- Increase in preload to decrease viscosity and increase cardiac reserve.

- Increase in RBC count to increase oxygen delivery.
    - Hemoglobin = RBC count/ plasma.
    - Plasma increases even more to reduce viscosity.
- IVC compression by the enlarged uterus when the mother lies on her right side.
    - Decrease in preload.
    - Move the mother to the opposite side or supine position.

Maternal cardiopulmonary adaptations to pregnancy	

Maternal adaptations	• Cardiac
	  ◦ ↑ Cardiac output
	  ◦ ↑ Plasma volume
	  ◦ ↓ Systemic vascular resistance
	• Respiratory
	  ◦ ↑ Tidal volume
	  ◦ ↓ Functional residual capacity (elevation of diaphragm)

Clinical manifestations	• Peripheral edema • ↓ Blood pressure • ↑ Heart rate • Systolic ejection murmur • Dyspnea

Pulmonary:

Pulmonary changes in pregnancy	
Pathophysiology	• Progesterone-induced hyperventilation
Clinical features	• Dyspnea of pregnancy • ↑ PaO_2, ↓ $PaCO_2$ (respiratory alkalosis)
Lung volumes	• ↑ Minute ventilation (mostly via ↑ tidal volume) • ↓ Residual volume & functional residual capacity • Normal vital capacity & FEV1

- Progesterone stimulates the respiratory centers to increase ventilation by increasing tidal volume; the center is more sensitive to changes in PaCO2.
- Increase in tidal volume.
- No change in respiratory rate.
- Decreased in functional residual capacity due to elevated of diaphragm.
- Respiratory alkalosis.
- Dyspnea of pregnancy "air hunger": progesterone-induced stimulation of the respiratory drive.

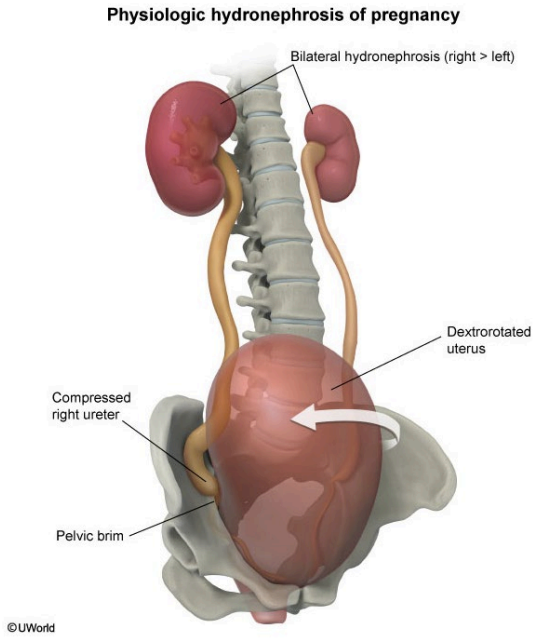
Clotting:

- Hypercoagulable state.
- Increased vWF.
- Increased factors 7, 8, and 10.
- Reduced protein C and S.
- Plasminogen activator inhibitor is increased.
- D-dimer normally elevated in pregnancy.
- Good to prevent hemorrhage.
- Bad because of the increased risk of DVT and PE especially in the case of IVC compression.
- Gestational thrombocytopenia.
    - Benign.
    - Responsible for the majority of cases of thrombocytopenia in pregnancy.
    - Repetition of test is of little value.
    - No cause for concern.
    - Look for a different cause if platelet count <100,000.

Renal:

Renal & urinary changes in normal pregnancy	
Physiologic changes	• ↑ Renal blood flow • ↑ Glomerular filtration rate • ↑ Renal basement membrane permeability
Laboratory findings	• ↓ Serum BUN • ↓ Serum creatinine • ↑ Renal protein excretion

- Creatinine lower than normal (0.4-0.8).
- Obstructive uropathy at pelvic brim.



Weight:

Weight gain in pregnancy		
Prepregnancy BMI (kg/m^2)	**Ideal weight gain**	**Complications**
<18.5	28-40 lb (12.7-18 kg)	Inadequate weight gain • Low birth weight • Preterm delivery Excessive weight gain • Gestational diabetes mellitus • Fetal macrosomia • Cesarean delivery
18.5-24.9	25-35 lb (11.4-15.9 kg)	
25-29.9	15-25 lb (6.8-11.4 kg)	
≥30	11-20 lb (5-9 kg)	

Gastrointestinal:

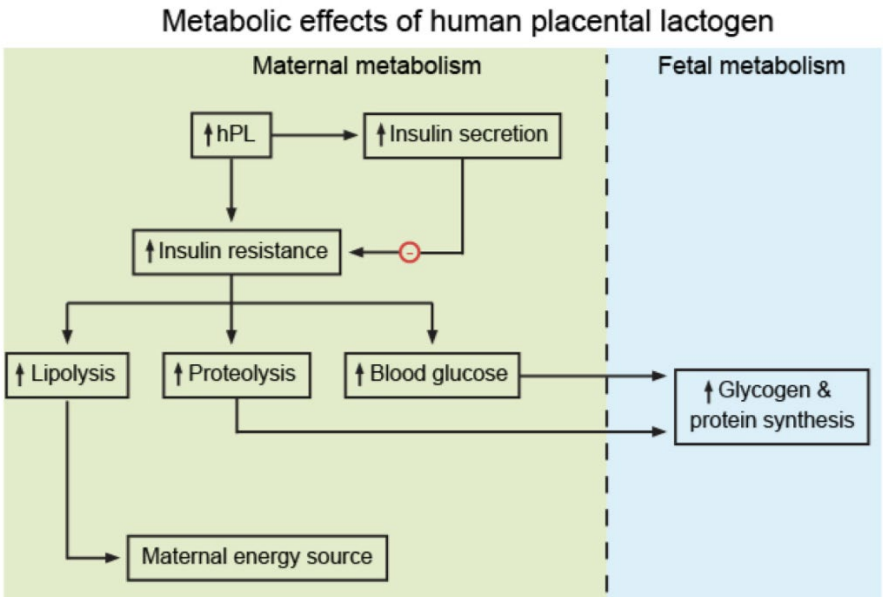
- GERD → PPI.
- Nausea → ondansetron.
- Constipation → stool softeners and motility agents.
- Iron deficiency → iron.
- Gallbladder disease.
    - Progesterone: gallbladder emptying decreased.
    - Estrogen: increased cholesterol production in the third trimester.

Endocrine:

Maternal thyroid testing in pregnancy, first trimester		
Hormone	**Change**	**Mechanism**
Total T4	Increased	• β-hCG stimulates thyroid hormone production in first trimester • Estrogen stimulates TBG; thyroid increases hormone production to maintain steady free T4 levels
Free T4	Unchanged or mildly increased	
TSH	Decreased	• Increased β-hCG & thyroid hormone suppress TSH secretion

β-hCG = β-human chorionic gonadotropin; TBG = thyroxine-binding globulin.

- Human placental lactogen causes pancreatic B-cell hyperplasia and leads to an increase in insulin and C-peptide secretion as well as insulin resistance. This ensures adequate glucose availability for the fetus. If maternal pancreatic function does not overcome insulin resistance → GDM.



Dermatology:

- Pruritis is common on the scalp, anus, vulva, and abdomen (during the third trimester).
  - Topical steroids, antihistamines, oatmeal baths, emollients, and UVB.
- Melasma: acquired hyperpigmentation in the sun-exposed areas of the face.
  - Estrogen and progresterone stimulates melanocyte proliferation.
  - Risk factors: darker skin color, thyroid dysfunction, medications (antiepileptics), and cosmetic use.

- C/P: irregularly shaped hyperpigmented macules of varying color that occur in a symmetric centrofacial, mandibular, or malar distribution.
- Clinical diagnosis.
- Treatment:
  - Sun avoidance and sunscreen use.
  - Resolves postpartum.
    - If it doesn't → skin-lightening agents or topical retinoids.

Exercise:

- Water-immersion exercises are recommended.
- 20-30 minutes of moderate-intensity exercise on most or all days of the week is recommended.
  - Moderate as in the mother is able to have a conversation throughout.
- Contraindicated in these cases:
  - At risk of preterm delivery:
    - Cervical insufficiency.
    - Preterm labor during current pregnancy.
    - PPROM.
  - At risk for antepartum bleeding:
    - Placenta previa.
    - Persistent second or third trimester bleeding.
  - With underlying conditions that could be exacerbated by exercise, such as:
    - Anemia.
    - Hypertensive disorders of pregnancy.
    - Restrictive lung disease.
    - Severe heart disease.

Pregnancy & exercise	
Absolute contraindications	• Amniotic fluid leak • Cervical insufficiency • Multiple gestation • Placenta abruption or previa • Premature labor • Preeclampsia/gestational hypertension • Severe heart or lung disease
Unsafe activities	• Contact sports (eg, basketball, ice hockey, soccer) • High fall risk (eg, downhill skiing, gymnastics, horseback riding) • Scuba diving • Hot yoga

Musculoskeletal:

- Nocturnal leg pain is due to muscle cramping from lactic and pyruvic acid accumulation.

Low back pain during pregnancy	
Etiology	• Enlarged uterus → exaggerated lordosis • Joint/ligament laxity from ↑ progesterone/relaxin • Weak abdominal muscles → decreased lumbar support
Risk factors	• Excessive weight gain • Chronic back pain • Back pain in prior pregnancy • Multiparity
Imaging	• Not indicated
Management	• Behavioral modifications • Heating pads • Analgesics

Pseudocyesis:

- Symptoms of early pregnancy plus believes she is pregnant.
- However, negative UPT and thin endometrial stripe.
- Risk factors: infertility and prior pregnancy loss.
- Somatization of stress.
- Psychiatric evaluation.

Lactation:

- Two stages:
    - Stage 1: secretory initiation.
        - In the second half of pregnancy
        - High levels of progesterone inhibit prolactin-induced milk production.
    - Stage 2: secretory activation.
        - Due to progesterone drop postpartum.
        - High levels of insulin, cortisol, and prolactin.

First-Trimester Evaluation

Pre-conception:

- Focus on safety:
  - Genetics.
  - Age of the mother and father.
    - Either one of the above → high risk pregnancy.
  - Domestic violence.
  - Abuse.
- Vitamins: folate.

Patient Status	Recommended Dose of Folic Acid
General population	0.4 mg/day for ≥1 month before conception through the first trimester
Women who take anticonvulsants or have had a child with a neural tube defect	4 mg/day for ≥1 month before conception through the first trimester

- Vaccines:
  - Up to date on flu, hepatitis B, and MMRV.
- Lifestyle:
  - Smoking and alcohol cessation.
  - Illicit drug cessation.
  - Teratogenic drugs cessation. (for e.g. ACE inhibitors, coumadin, and isotretinoin).
  - Radiation less than 5 rads.
  - Sleep.
  - Safe to have sex.
  - Reducing stress.
  - Plan maternity leave.
  - Avoid listeriosis containing food and mercury containing fish.

Nutrition in pregnancy	
Weight gain*	• <18.5 kg/m^2: 12.7-18 kg (28-40 lb) • 18.5-24.9 kg/m^2: 11.4-15.9 kg (25-35 lb) • 25-29.9 kg/m^2: 6.8-11.4 kg (15-25 lb) • ≥30 kg/m^2: 5-9 kg (11-20 lb)
Supplementation	• Daily prenatal vitamin • Additional specific supplements as indicated
Avoid harmful substances	• Substance abuse counseling • Avoidance of fish with high mercury levels • Moderate caffeine intake
Food safety	• Avoid undercooked meat, fish & eggs • Clean raw fruits & vegetables • Avoid unpasteurized dairy products

*Based on prepregnancy BMI.

- Optimization of disease: stop teratogenic drugs and start safer ones.
    - DM.
    - HTN.
    - Hypothyroidism.

At about week 10:

- Mum:
    - Desired pregnancy?
        - Offer termination.
        - Parenting.
        - Adoption.
    - Barriers to care?
    - Baselines: vital signs and weight.
    - Abuse/safety.

Illicit drug abuse in pregnancy	
Risk factors	• Adolescent pregnancy • Late/noncompliant prenatal care • Inadequate pregnancy weight gain
Obstetric complications	• Spontaneous abortion • Preterm birth • Preeclampsia • Abruptio placentae • Fetal growth restriction • Intrauterine fetal demise

- Pregnancy: take a history and perform a bimanual.
    - Age.
        - Adolescents are at a higher risk of perinatal morbidity, preterm labor, and low birth weight infants due to biological immaturity.
    - Gravidity.
    - Parity.

Short interpregnancy interval	
Definition	• <6-18 months from delivery to next pregnancy
Complications	• Maternal anemia • PPROM • Preterm delivery • Low birth weight

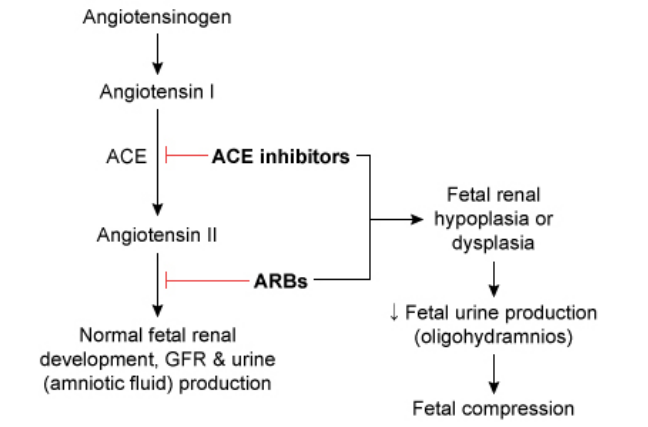
        - Offer interval contraception (progestin IUD).
    - Abortions:
        - Therapeutic.
        - Spontaneous.

- Term.
- Preterm.
- Living children.
- Social history.
- Medical history.
- Medications.

Recognizing medication nonadherence	
Suggestive features	• Unexpected loss of disease control • Poor understanding of drug indication & schedule • Frequent reports of adverse drug effects
Possible interventions	• Review schedule & dosing instructions • Educate patient on purpose & how to take medication • Reduce/consolidate medication list • Increase frequency of follow-up

Teratogenic medications	
Drug	**Adverse effects**
Phenytoin	Neural tube defects, microcephaly, orofacial clefts, dysmorphic facial features, distal digit/nail hypoplasia
Lithium	Ebstein anomaly, nephrogenic diabetes insipidus, hypothyroidism
Valproate	Neural tube defects
Isotretinoin	Microcephaly, thymic hypoplasia, small ears, hydrocephalus
Methotrexate	Limb & craniofacial abnormalities, neural tube defects, abortion
ACE inhibitors	Renal dysgenesis, oligohydramnios
Warfarin	Nasal hypoplasia, stippled epiphysis

Teratogenic effects of ACE inhibitors and ARBs



ARB = angiotensin II receptor blocker; **GFR** = glomerular filtration rate. ©UWorld

- Allergies.
- Family history.
- Retroverted uterus on bimanual: no increased risk of abortion. Repositions at 12 to 16 weeks of pregnancy. Manual repositioning if it persists to reduce the risk of uterine incarceration in the sacral region.
    - Only fix retroverted uterus if associated with dyspareunia.
- C/P:
    - Fatigue.
    - Nausea and vomiting.
    - Breast tenderness.
    - Gastritis.
    - Missed period.

- Diagnosis:
    - 1st step is urine pregnancy test.
        - B-HCG detected in urine after 14 days of conception.
        - Serum b-HCG can be positive 4 days after implantation.
    - Best test is US:
        - Confirms pregnancy.
        - Gives gestational age from the crown-rump length.
            - Accurate in first 14 weeks.
            - Afterwards we use biparietal diameter, head circumference, abdominal circumference, and femur length.

Ultrasound assessment of gestational age

Ultrasound parameter	Gestational age (weeks)	Accuracy (days)
Gestational sac diameter	4.5–6	+/- 5–7
Crown-rump length	7–10	+/- 3
	11–14	+/- 5
Biparietal diameter, head circumference, femur length	14–20	+/- 7
	21–30	+/- 14
	>30	+/- 21–28

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        - Assesses for multiple gestations.
    - If it's too small to be seen → B-Quant (B-HCG in the blood).
- Labs:
    - Blood:
        - Anemia.
            - Hemoglobin or hematocrit.
        - Type and match mum.
        - Rh antigen.

        - HIV. (opt out option)
            - Repeated in the third trimester for high-risk patients.
        - Hepatitis B.
        - RPR for syphilis.
        - Titer levels.
            - Varicella.
            - Rubella.

High-risk STI screening in pregnancy	
High-risk patients	• Age <25 • Prior STI • High-risk sexual activity (eg, multiple partners, commercial sex work)
Required screening	• Performed at initial PNV & 3rd trimester ◦ HIV ◦ Syphilis ◦ Hepatitis B virus ◦ Gonorrhea ◦ Chlamydia

PNV = prenatal visit; **STI** = sexually transmitted infection.

        - For high-risk patients → perform the tests again in the third trimester.
    - Urine:
        - Urine dipstick: albumin, glucose, or ketones.
        - Urinalysis.
        - Urine culture.
            - Asymptomatic bacteriuria has to be treated.
        - Proteinuria.
        - Screen for chlamydia or gonorrhea.
        - High-risk patients require a 24-hour urine collection for total protein at the initial prenatal visit.
    - Cytology:
        - Pap smear.
- Genetic:
    - Screens.
        - Cystic Fibrosis.
        - Sickle cell disease.
            - Acute pain episodes are more common due to increased metabolic demands and a hypercoaguable state.

Sickle cell disease in pregnancy	
Prenatal care	• Baseline 24-hr urine for total protein • Baseline chemistry panel • Serial urine culture • Pneumococcal vaccination • Folic acid supplement • Aspirin • Serial fetal growth ultrasound
Obstetric complications	• Spontaneous abortion • Preeclampsia, eclampsia • Abruptio placentae • Antepartum bleeding
Fetal complications	• Fetal growth restriction • Oligohydramnios • Preterm birth

- Give inactivated flu vaccine.
- If rubella non-immune → MMRV postpartum.

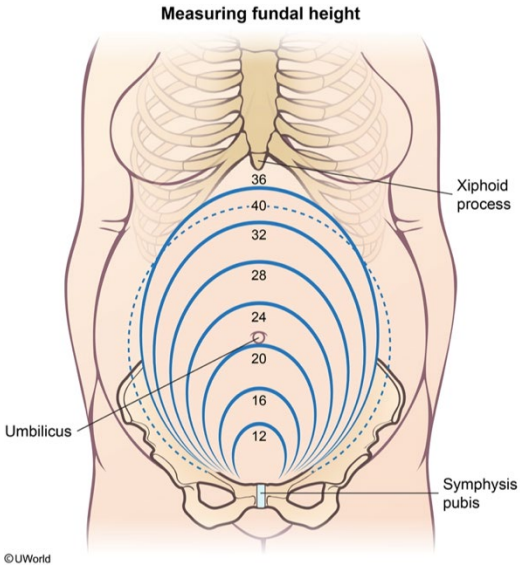
Vaccines during pregnancy	
Recommended	• Tdap • Inactivated influenza • Rho(D) immunoglobulin
Indicated for high-risk patients	• Hepatitis B • Hepatitis A • Pneumococcus • *Haemophilus influenzae* • Meningococcus • Varicella-zoster immunoglobulin
Contraindicated	• HPV • MMR • Live attenuated influenza • Varicella

HPV = human papillomavirus; **MMR** = measles-mumps-rubella; **Tdap** = tetanus toxoid–reduced diphtheria toxoid–acellular pertussis.

- Follow up:
    - Every 4 weeks until 28 weeks.
    - Every 2 weeks until 36 weeks.
    - Every week until delivery.

Routine prenatal care (at every visit): ((discovers 50% of fetuses with growth abnormalities, prevention of 70% of eclampsia episodes, and detection of 80% of breech presentation before the onset of labor))

- Weight.
- Blood pressure.
- Urine dipstick.
- Uterine fundus measurement.
    - Uterine size-date discrepancies can be due to improper dating, abnormal fetal growth, oligo/polyhydramnios (oligo due to ROM), multiple gestations, and many other causes.
- Fetal heart auscultation.
- Fetal presentation and activity.



Routine prenatal laboratory tests	
Initial prenatal visit	• Rh (D) type, antibody screen • Hemoglobin/hematocrit, MCV • HIV, VDRL/RPR, HBsAg • Rubella & varicella immunity • Pap test (if screening indicated) • Chlamydia PCR • Urine culture • Urine protein
24-28 weeks	• Hemoglobin/hematocrit • Antibody screen if Rh (D) negative • 50-g 1-hour GCT
35-37 weeks	• Group B *Streptococcus* culture

GCT = oral glucose challenge test; **HBsAg** = hepatitis B surface antigen; **MCV** = mean corpuscular volume; **PCR** = polymerase chain reaction; **RPR** = rapid plasma reagin.

Genetic Screening

Genetic screening is only offered if the mother is willing to go for confirmatory testing and then termination if it was positive.

Aneuploidy: risk increases as maternal age increases. (35+)

- TYPES:
  - Down syndrome (trisomy 21).
  - Edward syndrome (trisomy 18).
  - Patau syndrome (trisomy 13).
- C/P:
  - Asymptomatic screen:
    - Increased maternal age.
    - Previous pregnancy with aneuploidy.
- Diagnosis:
  - Screen tool (noninvasive).
  - Confirmatory test (invasive).
- Treatment:
  - Termination.

Mom wants screen:

- Screening test: only puts mum in risk categories.
  - Positive → high risk.
    - Invasive confirmatory test.
  - Negative → low risk.
    - Stop.
- Confirmatory test:
  - Positive→ genetic disease.
    - Terminate.

1st trimester screening: detection rate of 85% and a false positive rate of 1.2%. (best overall screening test)

- US for nuchal translucency (thickness of the neck):
  - Normal is less than 3 cm.
- PAPP-A.
- HCG.

2nd trimester screening: (blood levels)

- Triple screen.
  - Serum HCG.
  - AFP.
    - Increased AFP when >2.5 MoM (multiples of median).
    - MCC abnormal AFP is incorrect estimation of gestational age.
    - Other causes: spina bifida, anencephaly, fetal congenital hydronephrosis or benign obstructive uropathy.
      - Next step if suspecting NTD → obstetric ultrasound.
  - Estriol.
- Quad screen.
  - Add inhibin A.

Second-trimester quadruple screening				
Diagnosis	**MSAFP**	**β-hCG**	**Estriol**	**Inhibin A**
Trisomy 18	↓	↓	↓	Normal
Trisomy 21	↓	↑	↓	↑
Neural tube or abdominal wall defect	↑	Normal	Normal	Normal

Maternal serum alpha-fetoprotein screening	
↑ MSAFP	**↓ MSAFP**
• Open neural tube defects (eg, anencephaly, open spina bifida) • Ventral wall defects (eg, omphalocele, gastroschisis) • Multiple gestation	• Aneuploidies (eg, trisomy 18 & 21)

Neural tube defects	
Types	• Anencephaly • Encephalocele • Spina bifida, myelomeningocele
Risk factors	• Low folic acid intake • Methotrexate, antiepileptics • Diabetes mellitus • Prior pregnancy with neural tube defect
Prenatal screening	• 2nd-trimester ultrasound • Maternal serum alpha-fetoprotein
Prevention	• Average risk: 0.4 mg folic acid daily • High risk: 4 mg folic acid daily

Combined screen:

- First trimester screen and second trimester screen.
- No intervention until you have both.
- High sensitivity but limited options.

Sequential screen:

- First trimester screen and if negative follow it up with second trimester screen.
- If positive → confirmatory test.
- More others get exposed to invasive testing.
- More options. Earlier termination.

Cell free fetal DNA (non-invasive prenatal test):

- Fetal DNA in maternal blood.
- 10 weeks.
- Safer than accessing baby.
- Still have to confirm with an invasive test.
- **Right answer if the mother is 35 years or older.**

Cell-free fetal DNA testing	
Indications	• Maternal age ≥35 • Abnormal maternal serum screening test • Sonographic findings associated with fetal aneuploidy • Previous pregnancy with fetal aneuploidy • Parental-balanced Robertsonian translocation
Applications	• Screening for trisomy 21, 18, 13 & sex-chromosome aneuploidies • Fetal sex determination

Genetic test:

- Cystic Fibrosis for whites of European descents.
- Sickle cell disease for blacks of African descent.

Prenatal testing			
Test	**Timing (weeks)**	**Advantages**	**Disadvantages**
First-trimester combined test*	9-13	Early screening	Not diagnostic
Cell-free fetal DNA	≥10	High sensitivity & specificity for aneuploidy	Not diagnostic
Chorionic villus sampling	10-13	Definitive karyotypic diagnosis	Invasive; risk of spontaneous abortion
Second-trimester quadruple screen**	15-22	Screens for neural tube defects & aneuploidy	Not diagnostic
Amniocentesis	15-20	Definitive karyotypic diagnosis	Invasive; risk of membrane rupture, fetal injury & pregnancy loss
Second-trimester ultrasound	18-20	Measures fetal growth, evaluates fetal anatomy, confirms placenta position	Cannot identify all abnormalities; some findings are of uncertain significance

*Pregnancy-associated plasma protein, β-hCG, nuchal translucency.

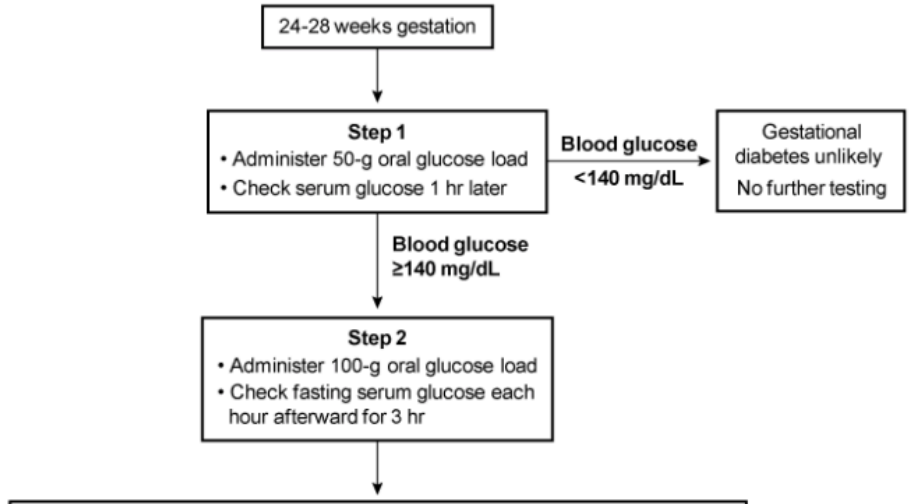
**Maternal serum alpha-fetoprotein, estriol, β-hCG, inhibin A.

Third-Trimester Labs

Between 20-28 weeks:

- Check for:
    - Gestational DM.
        - Diabetes that develops during pregnancy.
        - After 20 weeks.
        - Risk factors:
            - Obese.
            - History of GDM.
            - Pre-diabetic.
        - Diagnosis:
            - HbA1c useless since it reflects last 3 months.
            - 1-hour glucose tolerance test.
                - Give 50 grams of glucose.
                    - 140 or more is positive.
                - Do a 3-hour glucose tolerance test.
                    - Give 100 grams glucose.
                    - Measure fasting, 1-hour, 2-hour, and 3-hour.
                        - Positive if any 2 are:
                            - Fasting >95.
                            - 1-hour >180.
                            - 2-hour >155.
                            - 3-hour >140.
        - Treatment:
            - Exercise and diet.
            - Insulin or metformin (Glucophage)→ postprandial glucose should be below 180.
                - Insulin is the first-line pharmacotherapy because it does not cross the placenta, and its dosing is adjustable.
                - Insulin dosage: actual body weight in kg x 0.8 (first trimester) or 1.0 (second trimester) or 1.2 (third trimester).

2-step approach for screening & diagnosing gestational diabetes mellitus



Diagnosis of gestational diabetes mellitus (≥2 abnormal values)		
Blood glucose level	**Carpenter & Coustan**	**NDDG**
Fasting	≥95 mg/dL (5.3 mmol/L)	≥105 mg/dL (5.3 mmol/L)
1 hr	≥180 mg/dL (10 mmol/L)	≥190 mg/dL (10.6 mmol/L)
2 hr	≥155 mg/dL (8.6 mmol/L)	≥165 mg/dL (9.2 mmol/L)
3 hr	≥140 mg/dL (7.8 mmol/L)	≥145 mg/dL (8 mmol/L)

NDDG = National Diabetes Data Group criteria.

Gestational diabetes mellitus	
Pathophysiology	• Human placental lactogen secretion
Screening	• 24-28 weeks gestation • 1-hr 50 g GCT • 3-hr 100 g GTT
Management	• 1st-line: diet • 2nd-line: insulin, glyburide, metformin
Target blood glucose goals	• Fasting: <95 mg/dL • 1-hr postprandial: ≤140 mg/dL • 2-hr postprandial: ≤120 mg/dL
Postpartum management	• Fasting glucose at 24-72 hr • 2-hr 75-g GTT at 6- to 12-week visit
GCT = glucose challenge test; **GTT** = glucose tolerance test.	

- Alloimmunization.
  - Rh antigen status.
    - Mum is Rh- and her first baby was Rh+ thus mum became Rh antibody +.
    - If second baby is Rh+ → hemolytic anemia.
  - Target all Rh- mothers.
  - Diagnosis: check the antibodies.

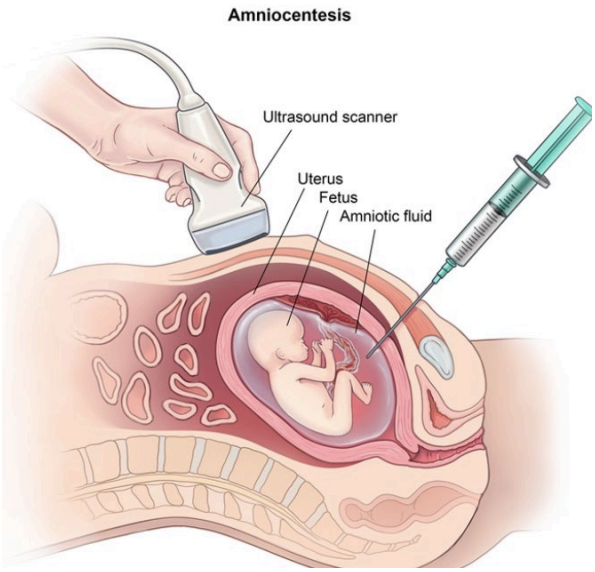
- If she's Rh antibody + → she has sufficient titers and the right type → transcranial doppler to assess for fetal anemia.
- If she's Rh antibody - → protect her immune system.
    - If baby could be Rh+ → give Rh(D) IgG give at 28 weeks and within 72 hours of delivery.

- Maternal anemia.
    - Check hemoglobin.
        - RBC count/plasma.
        - RBC count increases but plasma volume increases even more.
    - Normal hemoglobin at week 28 is 11.
        - Hematocrit=33.
    - Iron deficiency if less than 10.
    - C/P: asymptomatic screen.
    - Diagnosis when Hgb is less than 10.
        - Do iron studies.
            - Ferritin less than 12 is diagnostic.
    - Treatment with iron.
        - Give laxatives because it causes constipation.

Advanced Prenatal Evaluation

Risk of fetal loss with all of these (except US and TCD)!

Procedure	When	Goal	Risk	Extra
Ultrasound	Any gestational age.	1st trimester= IUP, GA, and multiple gestations. Oligo/polyhydramnios 3rd trimester= fetal well-being, confirm lie/orientation.	No fetal loss.	1st trimester= GA +/- 1 week. 2nd trimester= GA +/- 2 weeks. 3rd trimester= GA +/- 3 weeks.
Transcranial doppler	After 20 weeks.	Fetal anemia.	No fetal loss.	High sensitivity→ rules out. No diagnosis. No access.
Amniocentesis	After 16 weeks.	Genetic disorders. Fetal anemia. (no longer used) Lung maturity. (no longer used)	Risk is 1 in 900 for fetal loss.	>16 weeks: genetic screening. Quad test is now favored. >24 weeks: lily graph for fetal anemia. (no longer used) >30 weeks: Lecithin/sphingomyelin ratio. (no longer used)
Chorionic villus sampling	Weeks 10-13.	Genetic disorders.	Risk is 1 in 500 for fetal loss.	Early detection→ early termination.
Percutaneous umbilical blood sampling	20-34 weeks. Cause if anemia after 34 weeks → deliver baby.	Fetal anemia (after doppler) → to confirm diagnosis and fix it.	Highest risk of fetal loss.	Allows transfusions. And quantify baby's hemoglobin.



Chorionic villus sampling:

- Complications:
    - Transverse limb abnormality:
        - Risk depends on the age of gestation.
            - Risk is greatest when the age is less than 9 and greater than 11 weeks.

Medical Disease

UTI:

- Increase in progesterone causes ureteral smooth muscle relaxation → ureteral dilation; physiological hydronephrosis and stasis.
- Screen for asymptomatic bacteruria since there is increased risk for pyelonephritis and other obstetrical complications such as preterm labor and low birth weight.
- C/P:
    - Urgency.
    - Frequency.
    - Dysuria.
    - Fever.
    - Costovertebral angle tenderness.
- Diagnosis:
    - Urine dipstick.
    - Urinalysis; look for nitrates, leukocyte esterase, WBCs, and bacteria.
        - No symptoms + positive UA = asymptomatic bacteriuria.
            - Treat with amoxicillin or cephalexin.
                - Nitrofurantoin is backup.
                - TMP-SMX and ciprofloxacin are teratogenic.
        - FUD + positive UA = cystitis.
            - Treat with amoxicillin or cephalexin.
                - Nitrofurantoin is backup.
        - FUD + fever + CVA tender + positive UA = pyelonephritis.
            - WBC casts highly associated with it.
            - Treat with ceftriaxone and admit them.
            - Reassess after a couple of days: treat on culture and sensitivity.
                - If improved → pyelonephritis.
                - If not improved → abscess.
                    - Continue antibiotics for 14 days.
                    - Do an US.
    - Urine culture: sample should not have epithelial cells and >100,00 colonies.
- A test of cure (urine culture) is carried out a week after antibiotic treatment is completed.
- Prophylaxis:
    - For pregnant ladies who had one episode of pyelonephritis or two or more cystitis or ASB.
        - Give nitrofurantoin (Macrodantin) or TMP-SMX (Bactrim) nightly.
- High risk of sepsis.
    - Most common complication of sepsis in pregnant ladies → ARDS.

Asymptomatic bacteriuria	
Definition	• ≥100,000 CFU/mL bacteria
Risk factors	• Pregestational diabetes mellitus • History of urinary tract infection • Multiparity
Common pathogens	• *Escherichia coli* (most common) • *Klebsiella* • *Enterobacter* • Group B *Streptococcus*
First-line treatment	• Cephalexin • Amoxicillin-clavulanate • Nitrofurantoin • Fosfomycin

CFU = colony-forming units.

Pyelonephritis in pregnancy	
Risk factors	• Asymptomatic bacteriuria • Diabetes mellitus • Age <20
Common pathogens	• *Escherichia coli* (most common) • *Klebsiella* • *Enterobacter* • Group B *Streptococcus*
Complications	• Preterm labor • Low birth weight • Acute respiratory distress syndrome
Treatment	• Intravenous antibiotics • Supportive therapy

Cystitis & asymptomatic bacteriuria during pregnancy		
Condition	**Clinical features**	**Management**
Asymptomatic bacteriuria	• Positive urine culture (≥100,000 colony-forming units/mL) in asymptomatic patient • Screening usually done at 12-16 weeks gestation • Treatment reduces progression to UTI & complications (eg, preterm birth, low birth weight)	• Nitrofurantoin for 5-7 days • Amoxicillin or amoxicillin-clavulanate for 3-7 days • Fosfomycin as single dose • No fluoroquinolones in all trimesters • No trimethoprim-sulfamethoxazole in 1st & 3rd trimesters
Acute cystitis	• Symptomatic patient (eg, dysuria, urgency) with positive urine culture • Considered a complicated UTI	

UTI = urinary tract infection.

Kidney stones:

- Occurs during the second and third trimesters due to urinary stasis and increased urinary calcium excretion.
- C/P:
    - Intermittent obstruction: intermittent flank pain that radiates to the groin.
    - Hematuria.
    - Irregular contractions due to the proximity of the uterus to the inflamed ureter.
- Diagnosis:
    - US of the kidneys and ureters.
- Treatment:
    - Supportive.

- Complicated nephrolithiasis (sepsis or obstruction) → cystoscopy and stent placement.

Thyroid disorders:

- High levels of T_3 and T_4 → fetal demise.
- Low levels of T_3 and T_4 → cretinism.
- Diagnosis:
  - Starting with TSH.
  - Confirm with free T_4.
  - Can't do radioactive iodine uptake.
- Treatment:
  - Hyperthyroidism:
    - No radioactive ablation.
    - Propylthiouracil is used in the first trimester since methimazole is associated with aplasia cutis, choanal atresia, and tracheoesophageal fistula. Methimazole in the second and third trimester since PTU is hepatotoxic and agranulocytosis.
    - Resect thyroid in second trimester only.
  - Hypothyroidism: check antibodies (anti-TPO) due to increased risk of miscarriage.
    - Give levothyroxine.
      - Follow up with TSH every 4 weeks.
      - Start with a high dose.
    - If she is already known to have hypothyroidism → increase her dose once she is confirmed to be pregnant.

Heart disease:

Complications of cyanotic heart disease in pregnancy	
Maternal	• Thromboembolism • Fluctuations in systemic vascular resistance (heart failure, cerebral vascular changes)
Fetal	• Spontaneous abortion (20%-40%) • Premature labor • Intrauterine growth restriction • Perinatal mortality

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- Eisenmenger syndrome → offer elective termination in the first trimester due to high risk of mortality in the first week postpartum.
  - Contraception:
    - OCPs contraindicated due to risk of DVT/PE.

- Permanent: hysteroscopic sterilization.
- Temporary: progestin implant, injection, or pill.

Cardiovascular contraindications to pregnancy	
Highest risk conditions*	• Symptomatic mitral stenosis • Symptomatic aortic stenosis • Symptomatic heart failure with LVEF <30% • Pulmonary arterial hypertension • Bicuspid AV with ascending aorta enlargement >50 mm

* Pregnancy contraindicated unless condition is corrected.

AV = aortic valve; **LVEF** = left ventricular ejection fraction.

- Mitral stenosis complications during pregnancy:
  - Decompensated heart failure.
  - Atrial fibrillation.
  - Increased risk of thromboembolism.

Asthma:

Asthma in pregnancy	
Risk factors	• Severe asthma prior to pregnancy • Obesity; excessive first-trimester weight gain • Smoking during pregnancy
Clinical features	• Cough, wheezing, shortness of breath, chest tightness
Management	• Inhaled short-acting beta agonist (eg, albuterol) as needed • Inhaled corticosteroid (eg, fluticasone) for maintenance • Systemic corticosteroid (eg, prednisone) for acute exacerbation

- Wheezing may not be present on examination, outside an exacerbation.
- Complications:
  - Preterm delivery.
  - Low birth weight.

Seizures:

- All antiepileptics are teratogenic.
- Clinical diagnosis.
- Treatment:
  - Changes should not be initiated after the confirmation of pregnancy.
  - Levetiracetam and lamotrigine.
  - DO NOT USE VALPROIC OR PHENYTOIN OR CARBAMAZEPINE.
    - Should be stopped 6 months before.
  - Balance.

        - Seizures are too severe → switch to a single drug at the lowest possible dose in order to limit teratogenicity
        - Not severe → stop all drugs.
    - FOLATE supplementation.
- Active seizure:
    - Give phenobarbital.
- Breastfeeding is recommended because benefits outweigh risks.

Hypertension:

- Less than 130/80 is normal.
- Treatment:
    - Patient planning on becoming pregnant should be switched to extended release nifedipine.
        - Not immediate release cause it causes severe hypotension.
        - If after conception the bp drops more → decrease the dose or discontinue it.
    - Nifedipine or Labetalol.
    - Alpha methyldopa.
    - Hydralazine.
    - HCTZ.
- Tighter screening for eclampsia → more frequent urinalysis.

DM: (not GDM)

- Before pregnancy:
    - HbA1c value less than 7%.
    - Go for diet and exercise first then medications.
    - If she wants to get pregnant → change orals to insulin.
- During pregnancy:
    - Increased insulin requirement.
    - Basal-bolus strategy.
    - Target postprandial sugar <180.
    - Do not use HbA1c.
- During delivery:
    - Betamethasone for lung maturity.
- After pregnancy:
    - A massive reduction in insulin requirement.
- Uncontrolled DM: increased risk of congenital anomalies.

Hyperandrogenism:

Causes of hyperandrogenism in pregnancy	
Diagnosis	**Clinical features**
Placental aromatase deficiency	• No ovarian mass • High maternal & fetal virilization risk • Resolution of maternal symptoms after delivery
Luteoma	• Solid, unilateral/bilateral ovarian masses • Moderate maternal virilization risk; high fetal virilization risk • Spontaneous regression of masses after delivery
Theca lutein cyst	• Cystic, bilateral ovarian masses • Moderate maternal virilization risk; low fetal virilization risk • Spontaneous regression of masses after delivery
Sertoli-Leydig tumor	• Solid unilateral ovarian mass • High maternal & fetal virilization risk • Surgery required (2nd trimester or postpartum)

Wernicke Encephalopathy:

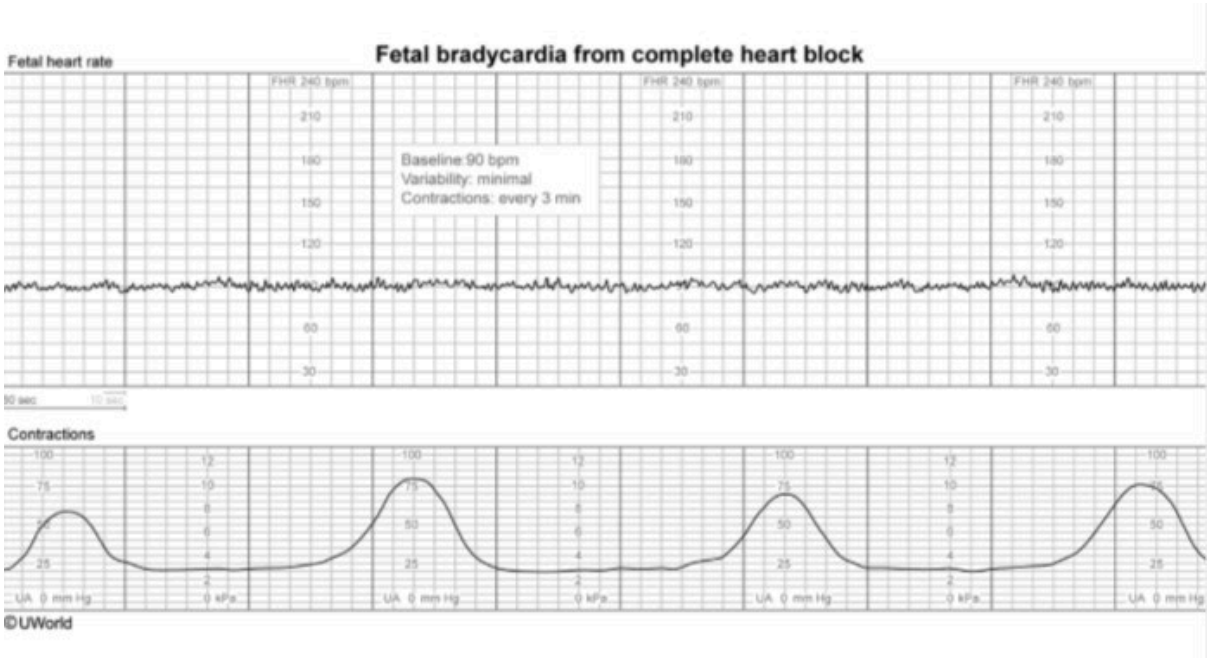
Wernicke encephalopathy	
Associated conditions	• Chronic alcoholism (most common) • Malnutrition (eg, anorexia nervosa) • Hyperemesis gravidarum
Pathophysiology	• Thiamine deficiency
Clinical features	• **Encephalopathy** • **Oculomotor dysfunction** (eg, horizontal nystagmus, bilateral abducens palsy) • Postural & gait **ataxia**
Treatment	• Intravenous thiamine followed by glucose infusion

SLE nephritis:

SLE nephritis in pregnancy	
Clinical Presentation	• Edema • Malar rash • Arthritis • Hematuria
Laboratory findings	• Nephritic range proteinuria • Urinalysis with RBC & WBC casts • ↓ Complement levels • ↑ ANA titers
Diagnosis	• Renal biopsy
Obstetric complications	• Preterm birth • Cesarean delivery • Preeclampsia • Fetal growth restriction • Fetal demise

ANA = antinuclear antibodies; **RBC** = red blood cells; **SLE** = systemic lupus erythematosus; **WBC** = white blood cells.

- Risk factors:
  - Discontinuation of hydroxychloroquine.
  - Active disease prior to conception.
- Passage of anti-SSA and anti-SSB through the placenta → irreversible injury to AV node of the baby → persistent fetal bradycardia.



Hepatitis C:

Hepatitis C in pregnancy	
Potential complications	• Gestational diabetes • Cholestasis of pregnancy • Preterm delivery
Maternal management	• Ribavirin is **teratogenic** & should be avoided • No indication for barrier protection in serodiscordant, monogamous couples • Hepatitis A & B vaccination
Prevention of vertical transmission	• Vertical transmission strongly associated with maternal viral load • Cesarean delivery not protective • Scalp electrodes should be avoided • Breastfeeding should be encouraged unless maternal blood present (eg, nipple injury)

Hepatitis E:

- Associated with high mortality during pregnancy due to fulminant hepatic failure.
- Anti-HEV IgM and IgG detected in the blood.
    - Presence of IgM indicated recent infection or current infection.

Intrahepatic cholestasis of pregnancy:

Intrahepatic cholestasis of pregnancy	
Clinical features	• Develops in 3rd trimester • Generalized pruritus • Pruritus worse on hands & feet • No associated rash • Right upper quadrant pain
Laboratory abnormalities	• ↑ Total bile acids (>10 µmol/L) • ↑ Transaminases (<2x normal) • ± ↑Total & direct bilirubin
Obstetric risks	• Intrauterine fetal demise • Preterm delivery • Meconium-stained amniotic fluid • Neonatal respiratory distress syndrome
Management	• Delivery at 37 weeks gestation • Ursodeoxycholic acid • Antihistamines

- Risk factors:
  - Prior ICP.
  - Maternal age >35 years.
  - Multiple gestation.

Liver disorders unique to pregnancy		
Disorder	**Presentation**	**Laboratory abnormalities**
ICP	• Intense pruritus	• Elevated bile acids • Elevated levels of liver aminotransferases • Diagnosis of exclusion
HELLP	• Preeclampsia • Right upper-quadrant pain • Nausea/vomiting	• Hemolysis • Moderately elevated liver aminotransferases • Thrombocytopenia
AFLP	• Malaise • Right upper-quadrant pain • Nausea/vomiting • Sequelae of liver failure	• Hypoglycemia • Mildly elevated liver aminotransferases • Elevated bilirubin • Possible disseminated intravascular coagulopathy

Cholelithiasis:

Symptomatic cholelithiasis in pregnancy	
Pathophysiology	• ↑ Biliary cholesterol excretion (estrogen) • ↓ Gallbladder motility (progesterone)
Clinical features	• Recurrent, postprandial epigastric/RUQ pain • RUQ ultrasound with echogenic foci (stones or sludge)
Management	• Conservative (eg, pain control) • Cholecystectomy (for complicated, recurrent cases)

RUQ = right upper quadrant.

- Cholecystectomy delayed to postpartum period.

Inflammatory bowel disease:

- Worsening UC disease activity during pregnancy leads to toxic megacolon.
- Fetal risks; preterm delivery and SGA.
- Fertility is lower in those with active UC.
- Medications are considered to use during pregnancy and breastfeeding (except sulfasalazine).

Thrombocytopenia in pregnancy:

Thrombocytopenia in pregnancy	
Gestational	• Isolated, mild (100,000-150,000/mm^3) • Asymptomatic • Diagnosis of exclusion
Preeclampsia with severe features/ HELLP syndrome	• Moderate to severe (<100,000/mm^3) • Hypertension ± headache/scotomata • ± ↑ Creatinine, ↑ AST & ALT
Immune-mediated thrombocytopenia (ITP)	• Isolated, moderate to severe (<100,000/mm^3) • Asymptomatic or mucosal bleeding/bruising • Normal PT, aPTT
Thrombotic thrombocytopenic purpura (TTP)	• Severe (<30,000/mm^3) • Neurologic symptoms (eg, confusion, seizure), fever, abdominal pain, petechiae • Normal PT, aPTT
Disseminated intravascular coagulopathy (DIC)	• Moderate to severe (<100,000/mm^3) • Bleeding (eg, oozing intravenous sites) ± thrombosis • ↑ PT, ↑ aPTT, ↓ fibrinogen

Thrombotic thrombocytopenic purpura:

- Pregnancy is a risk factor.
- Antibodies against ADAMTS13.
    - Normally cleaves vWF multimers.
- C/P:
    - Neurological symptoms.
        - Headache.
    - Fever.
    - Renal involvement.
        - Proteinuria and hematuria.
    - Microangiopathic hemolytic anemia.
        - Decreased hemoglobin, increased LDH, indirect hyperbilirubinemia, and schistocytes.
    - Thrombocytopenia.

Appendicitis:

- C/P:
    - Dull pain that gradually worsens.
    - Eventually localized to the right abdomen; right mid to upper quadrant or right flank.
    - Uterine irritability and contractions.
    - Fetal tachycardia.
- Appendix displaced to RUQ in pregnancy.
- Sterile pyuria.
- Diagnosis: US.
- Treatment: surgery.

Carpal tunnel syndrome:

- Compression of the median nerve.
- C/P:
    - Pain.
    - Paresthesia.
    - Numbness.
- Pregnancy is an important risk factor.
- Phalen's test is positive.

Supine hypotensive disorder:

- Compression of IVC → less VR → less CO and fetal hypoxia.
- Treatment: left lateral decubitus position.

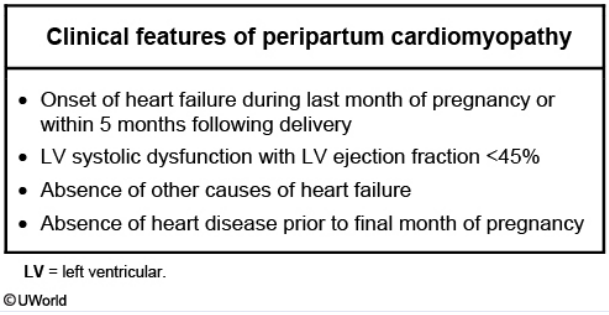
Dermatoses of pregnancy:

- Popular urticarial papules and plaues of pregnancy (PUPPP):
    - Pruritic erythematous papules within the striae gravidarum.
    - Can involve the extremities.
    - Treatment: corticosteroids and antihistamines.
- Herpes gestationis (pemphigoid gestationis):
    - Autoimmune disease of pregnancy.
    - Urticarial plaques, papules, and vesicles around the umbilicus.
        - Bullae can also form.
    - Starts during the 2nd or 3rd trimester, or postpartum period.
    - Treatment corticosteroids and antihistamines.
- Pustular psoriasis:
    - Erythematous plaques with surrounding pustules.

Bipolar mania:

- Treatment: haloperidol.
    - Unresponsive → electroconvulsive therapy.

Peripartum cardiomyopathy:



Clinical features of peripartum cardiomyopathy

- Onset of heart failure during last month of pregnancy or within 5 months following delivery
- LV systolic dysfunction with LV ejection fraction <45%
- Absence of other causes of heart failure
- Absence of heart disease prior to final month of pregnancy

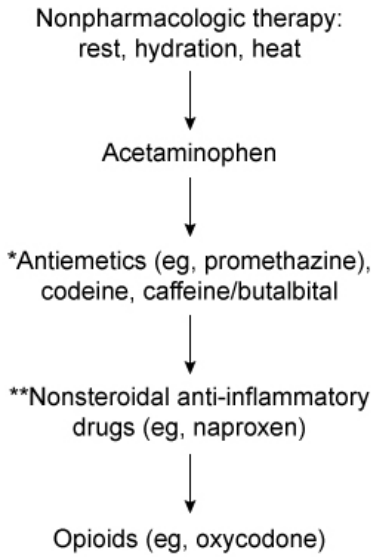
LV = left ventricular.

- Associated with mitral regurgitation.
- Diagnosis with transthoracic echocardiography.
- Urgent or immediate delivery for patients with advanced heart failure or hemodynamically unstable.

Migraine:

- Headaches with atypical features (AMS and neurological deficits) or in patients 20 weeks or more gestation require evaluation to exclude other etiologies such as preeclampsia and cerebral venous thrombosis due to high risk of complications.
- Management:
    - Parenteral metoclopramide are used acutely and are effective monotherapy.
    - Ergotamine is contraindicated due to risk of hypertonic uterine contractions and vasoconstriction.
    - Triptans should be avoided due to risk of uteroplacental vasoconstriction, increased uterotonic activity, preterm delivery, and low birth weight.

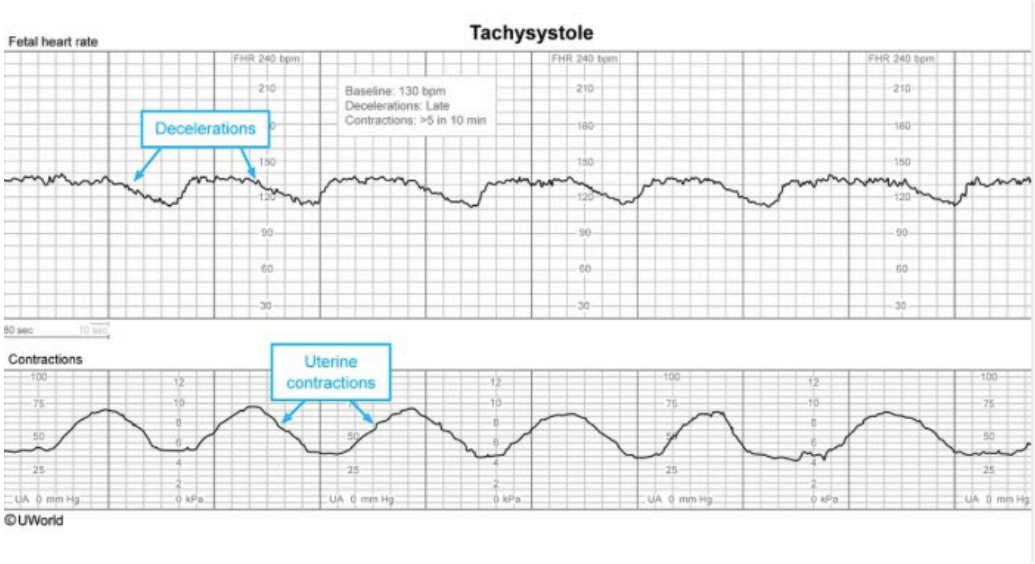
Management of migraines in pregnancy



*Can be used in conjunction with acetaminophen.
**2nd trimester only.

Normal Labor

- Labor begins with onset of contractions but no change in the cervical dilation.
    - But it is defined as both contractions and cervical dilation or effacement.
- Normal labor:
    - Spontaneous onset.
    - Term pregnancy.
    - Low risk pregnancy.
    - Single fetus.
    - Cephalic presentation.
    - No complications.
- Cervix dilates slowly until it reaches a point (which **is 6 cm (or 4 cm)**) and then it quickly dilates to 10 cm.
- First time mums take longer than normal.
- Normal contraction: 3 to 5 contractions in 10 minutes; lasts for 45 seconds.
    - Terbutaline (tocolytic) is given if it is more than that i.e. tachysystole or tetanic (>2min).
        - Other tocolytics: ritodrine, calcium channel blockers (nifedipine), magnesium, indomethacin, and atosiban (oxytocin antagonist).
        - Contraindications:
            - Ritodrine: poorly controlled DM and tachycardia-sensitive heart disease.
            - CCB: hypotension and heart disease.
            - NSAIDS: bleeding, hepatic disease, GI ulcer, renal disease, and asthma.
                - Contraindicated after 32 weeks because it closes PDA.
            - Magnesium: myasthenia gravis.
        - Note: difference between tachysystole and hyperstimulation: hyperstimulation associated with FHR abnormalities.

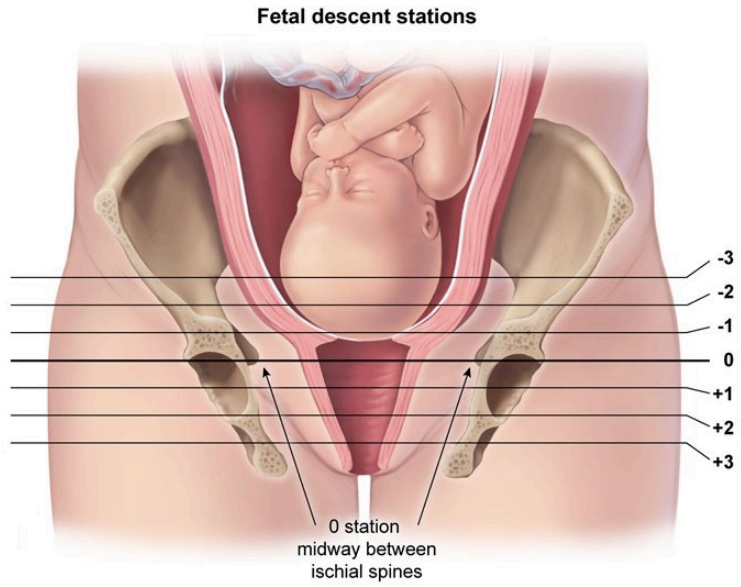


- Management of tachysystole: discontinuation of uterotonic agents, lateral decubitus positioning, and tocolysis.

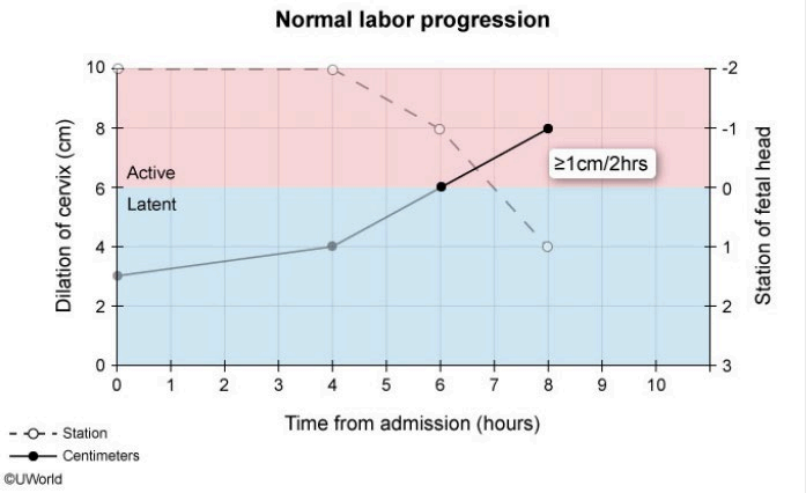
- Initial assessment:
  - History: leakage of fluid, bleeding, painful contractions every 5 minutes for 1 hour, and decreased fetal movement.
  - Assess maternal and fetal status:
    - Fetal heart monitor.
    - Assess presentation.
  - Sterile vaginal examination to assess the cervix:
    - Dilation.
    - Effacement; normal length is 4 cm.
    - Fetal station.
    - Cervical consistency.
    - Cervical position.

TABLE 4-1 The Bishop Score

Score	0	1	2	3
Cervical (cm)	Closed	1–2	3–4	<5 dilation
Cervical (%)	0–30	40–50	60–70	<80 effacement
Station	−3	−2	−1, 0	<+1
Cervical consistency	Firm	Medium	Soft	
Cervical position	Posterior	Mid	Anterior	



        - A bishop score greater than 8 indicates that the cervix is favorable for spontaneous or induced labor.
- Stages of labor:
    - Stage 1:
        - Fetal station is in the negative.
        - Fetal head engagement occurs during this phase.
        - Divided into latent phase and active phase.
        - Latent phase from 0 to 6 cm.
            - Takes less than 20 hours in nulliparous.
            - Takes less than 14 hours in multiparous.
        - Active phase is from 6 to 10 cm.
            - 1.2 cm/hr for nulliparous.
            - 1.5 cm/hr for multiparous.



    - Stage 2:
        - From 10 cm dilation to delivery of the fetus.

        - Duration depends on the parity and use of neuraxial anesthesia.
        - Takes 3 hours for a nulliparous with epidural.
            - Without → 2 hours.
        - Takes 2 hours in a multiparous with epidural.
            - Without → 1 hour.
        - What to do during this stage?
            - When the baby crowns → apply perineal pressure and maintain flexion of its head.
            - Restitution.
            - Anterior shoulder delivery.
            - Posterior shoulder delivery.
    - Stage 3:
        - Delivery of fetus to placenta.
        - Using controlled cord traction (Brandt-Andrews).
        - Less than 30 minutes regardless.
        - Signs of placenta separating:
            - Gush of blood.
            - Lengthening of the umbilical cord.
            - Globular uterus.
            - Enlargement of uterus.
    - Stage 4: the end.
        - Two hours postpartum.
- Cardinal movements of labor:

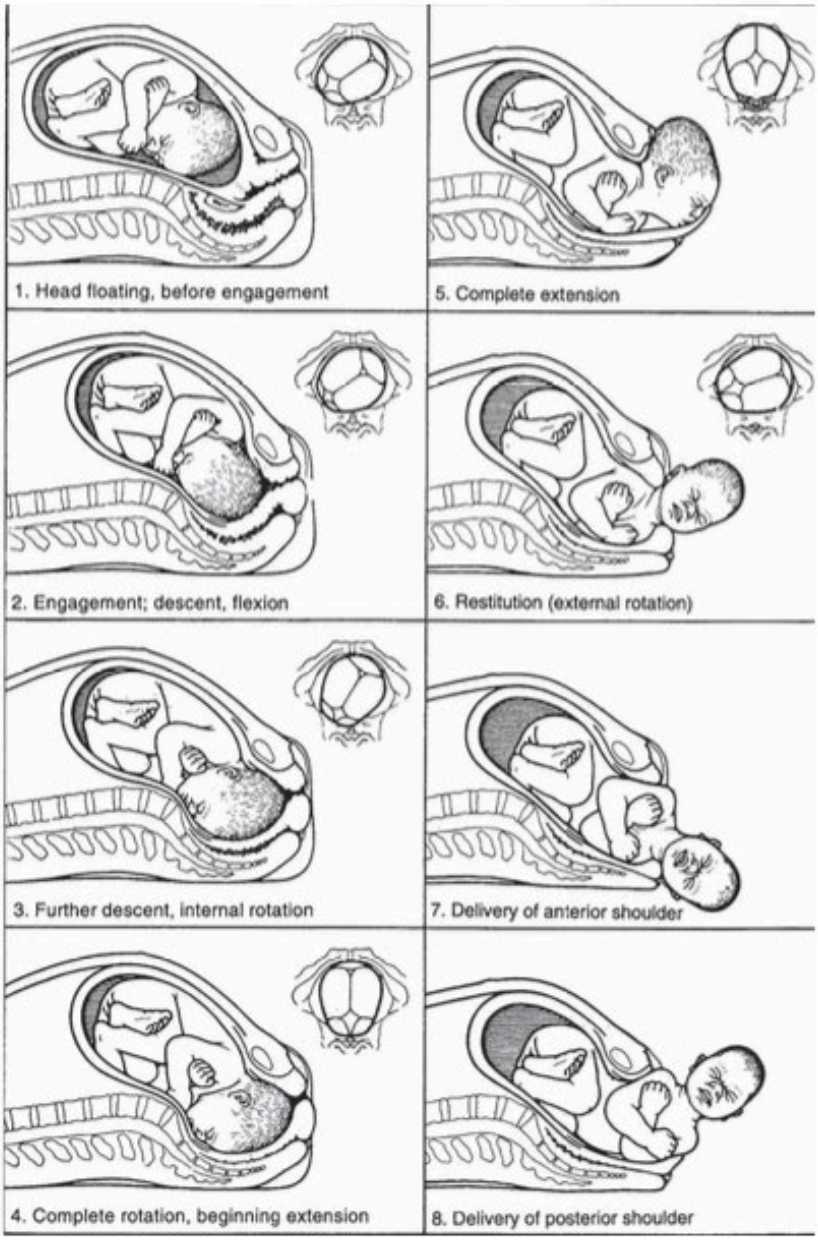


FIGURE 5-6. Cardinal movements of labor.

(Reproduced, with permission, from Cunningham FG, Leveno KJ, Bloom SL, et al. *Williams Obstetrics*, 22nd ed. New York: McGraw-Hill, 2005: 418.)

- Cervical change:
  - Due to breakage of disulfide bond into water.
  - Changes:
    - Softening.
    - Effacement.
    - Dilation.
    - Position.
  - They happen due to fetal head engagement.

- Simulate this process in abnormal labor with a balloon or medications such as prostaglandins or help out contractions with oxytocin.

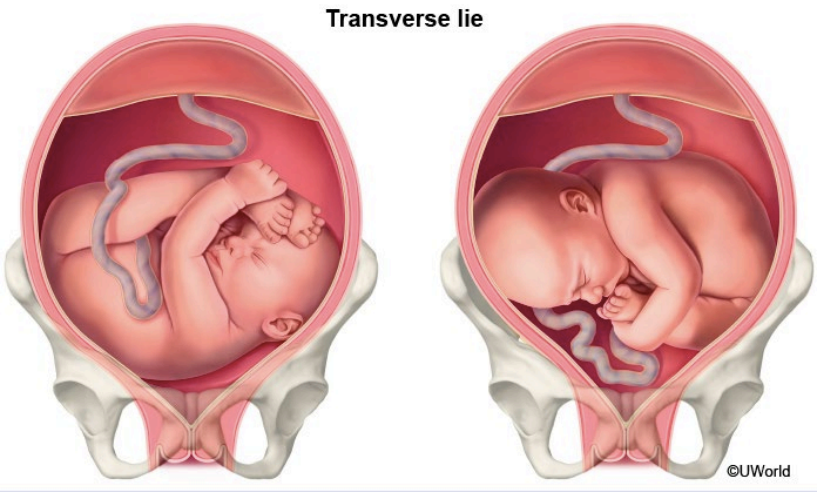
- Fetal lie: determined by leopold maneuver.
  - Clinical diagnosis using leopold maneuver.
  - Confirmed using ultrasound.
  - Lie:
    - Longitudinal cephalic is the right way.
      - Longitudinal as in alignment with mum.
      - Cephalic means head first.
        - Can be either occiput(vertex), brow, or face (mentum).
    - Longitudinal breech.
      - Breech birth → C-section.
      - External cephalic version can be done to twist the baby's position at 37 weeks or more.
        - Before that → there is a chance they will turn on their own.
        - Cannot be performed once active labor begins.
        - Classical C-section: vertical incision.

External cephalic version	
Procedure	• Manual rotation of fetus to cephalic presentation • Decreases cesarean delivery rate
Indications	• Breech/transverse presentation • ≥37 weeks gestation

Absolute contraindications	• Contraindication to vaginal delivery
	  ○ Prior classical cesarean delivery
	  ○ Prior extensive uterine myomectomy
	  ○ Placenta previa

Complications	• Abruptio placentae • Intrauterine fetal demise

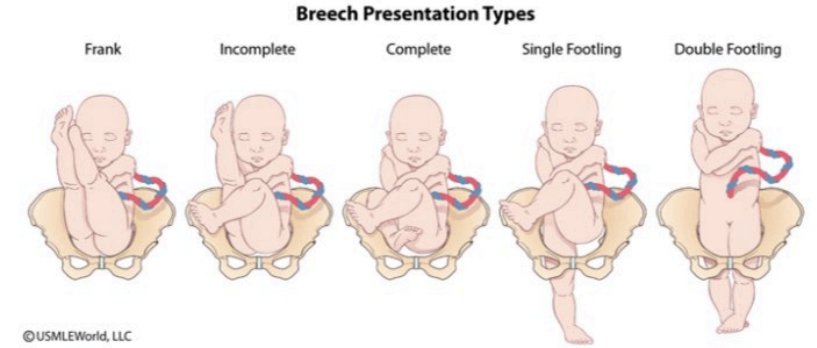
  - Transverse.



- Oblique.

- Breech positions:
  - Vaginal delivery can be attempted for frank or complete breech but contraindicated in footling or incomplete.

Breech presentation	
Breech types	• Frank: hips flexed & knees extended (buttock presenting) • Complete: hips & knees flexed • Incomplete: 1 or both hips not flexed (feet presenting)
Risk factors	• Advanced maternal age (≥35) • Multiparity • Uterine didelphys, septate uterus • Uterine leiomyomas • Fetal anomalies (eg, anencephaly) • Preterm (<37 weeks gestation) • Oligohydramnios/polyhydramnios • Placenta previa
Management	• External cephalic version • Cesarean delivery



- Fetal presentation:

- Normal is vertex which means the occiput is the first presenting part.
    - Other cephalic presentations: mentum or brow.
        - Mentum anterior delivers easily.
- If shoulder or breech → prolonged second stage of labor.
- Can be determined by digital cervical examination.
    - Unless there is a bulging bag making it difficult → transabdominal ultrasound.

- Fetal position:
    - Normal: Occiput anterior.
        - Left occiput anterior.
        - Right occiput anterior.
    - Malposition:
        - Occiput transverse.
        - Occiput posterior.
- Operative vaginal delivery (vacuum or forceps):
    - When the cervix is dilated more than 10 cm.

Operative vaginal delivery (vacuum/forceps)	
Indications	• Protracted 2nd stage of labor • Fetal heart rate abnormalities • Maternal contraindications to pushing
Fetal complications	• Laceration • Cephalohematoma • Facial nerve palsy • Intracranial hemorrhage • Shoulder dystocia
Maternal complications	• Genitourinary tract injury • Urinary retention • Hemorrhage

Vacuum-assisted vaginal delivery

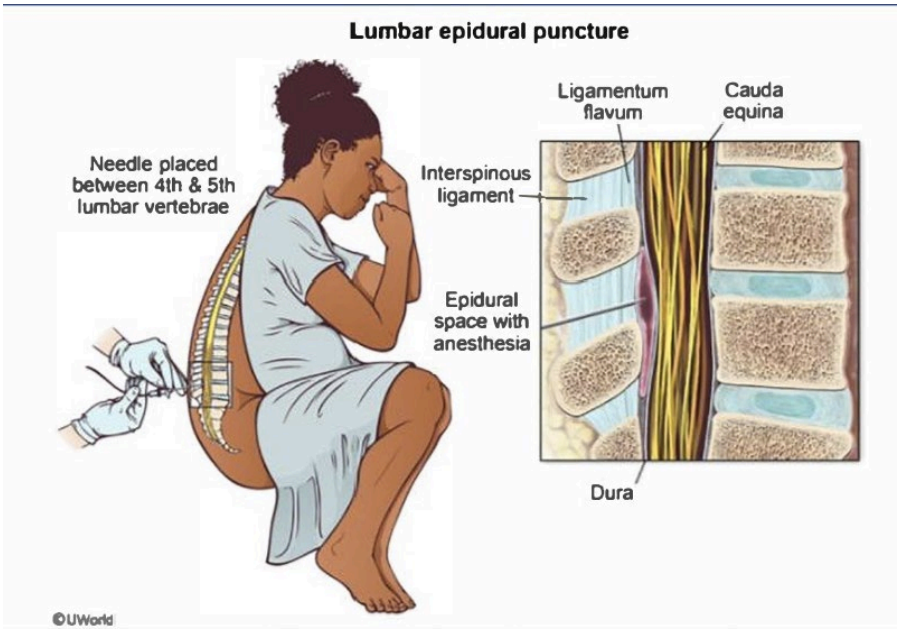
    - If PPH occurs after operative vaginal delivery → do a genital tract inspection to look for any laceration that was unrecognized at time of delivery.
- False labor is Braxton Hicks contraction.
    - Reassure and discharge.

False labor versus latent labor		
Contractions	**False labor**	**Latent labor**
Timing	Irregular, infrequent	Regular, increasing frequency
Strength	Weak	Increasing intensity
Pain	None to mild	Yes
Cervical change	No	Yes

Epidural anesthesia:

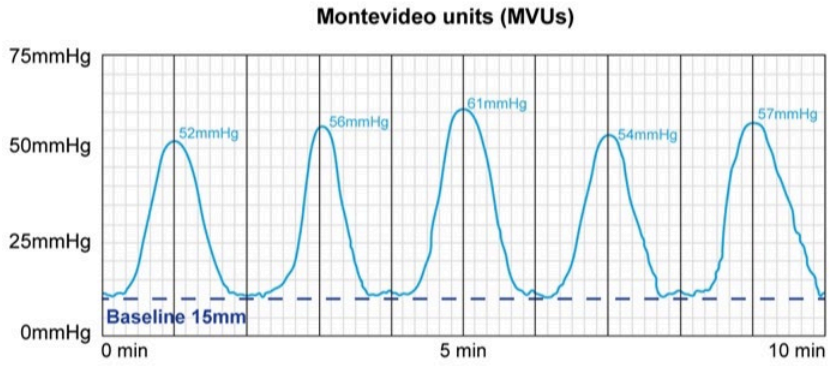
- Injection of low concentration of **local** anesthetic into the epidural space between L2-L5 level blocking nerves responsible for labor pain.
- ADRs:
    - When sympathetic nerve fibers are blocked → hypotension due to decrease of vascular tone leading to venodilation → decreased VR → decrease CO.
        - Hypotension can lead to fetal acidosis.
        - Prevent by large volume infusion before epidural.
        - Treatment: left uterine displacement, IV fluids, and vasopressors.
    - Epidural analgesia gets into the epidural vessels → systemic toxicity.
        - CNS overreactivity: tinnitus, perioral numbness, and metallic taste.
        - Generalized tonic-clonic seizures.
        - Cardiovascular collapse.
    - High spinal or total spinal: a dangerous complication.
        - Depression of cervical spinal cord and brainstem activity.
        - C/P:
            - Hypotension.
            - Bradycardia.
            - Respiratory difficulty.
            - Diaphragmatic paralysis → cardiopulmonary resuscitation.
    - Postdural puncture headache:

Postdural puncture headache	
Clinical features	• After lumbar puncture or neuraxial anesthesia • Positional (worse when upright, improves when supine) • Neck stiffness • Photophobia, diplopia • Hearing loss, tinnitus
Management	• Typically self-limited • Epidural blood patch



Abnormal Labor

- Engagement of fetal head occurs at stage 1 latent phase.
  - If it's not happening → use balloon catheter.
  - If water didn't break →amniotomy.
  - You can use medications → misoprostol.
    - Oxytocin is usually the correct answer.
- In stage 1 active and stage 2:
  - If passenger or pelvis are the problem → C-section.
  - If power is the problem → oxytocin.
    - Adequate contractions: 200 monteVideo units in 10 mins. Measure using an IUPC if suspecting arrest of labor.
      - If less than 200 → give oxytocin.

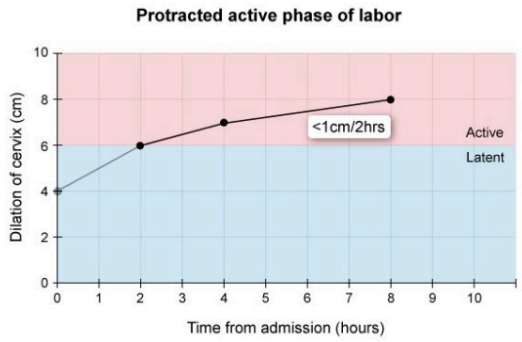


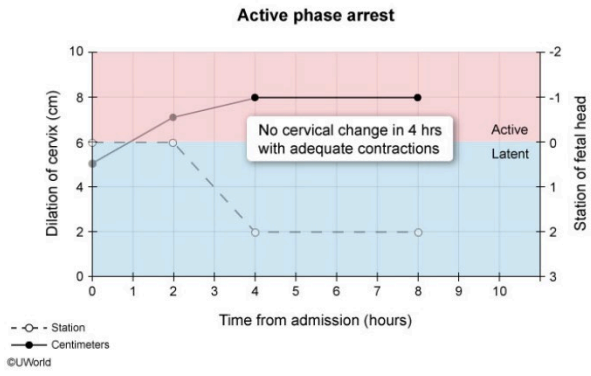
- Calculating Montevideo units (MVUs)*: subtract uterine resting pressure (baseline mmHg) from peak intensity (peak mmHg) of each contraction in 10-minute period; add these number together
- Contraction strength*: subtract uterine resting pressure (baseline mmHg) from peak intensity (peak mmHg)
- Adequate labor*: 200-250 MVUs

' Must have intrauterine pressure catheter in place

- Inadequate contractions: less than 200 mV units in 10 mins → oxytocicn.
  - If no response → C-section.
- Prolonged stage 1 active → oxytocin → fails → C-section.
  - Total arrest → C-section.

Disorders of the active phase of labor		
Diagnosis	**Clinical features**	**Treatment**
Protraction	• Cervical change slower than expected • ± Inadequate contractions	Oxytocin
Arrest	• No cervical change for ≥4 hours with adequate contractions OR • No cervical change for ≥6 hours with inadequate contractions	Cesarean delivery

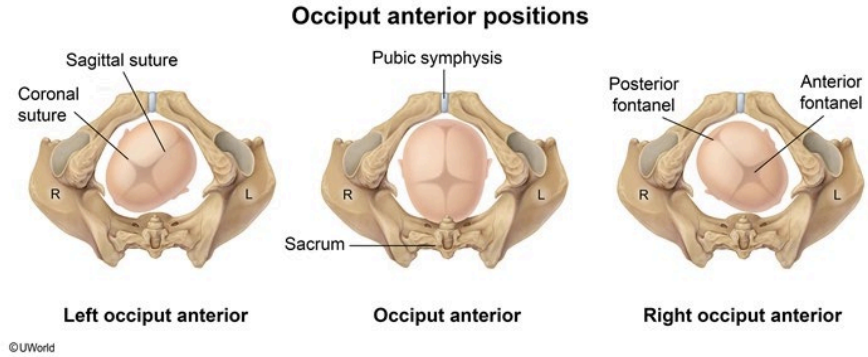


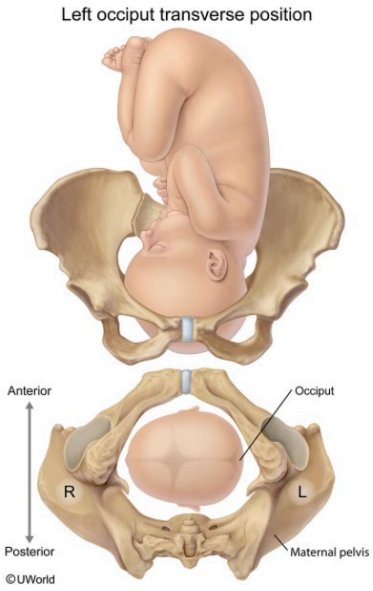


- Prolonged stage 2 → oxytocin → fails → C-section or forceps/vacuum.
  - C-section if fetal station is negative.
  - Forceps or vacuum if fetal station is positive.

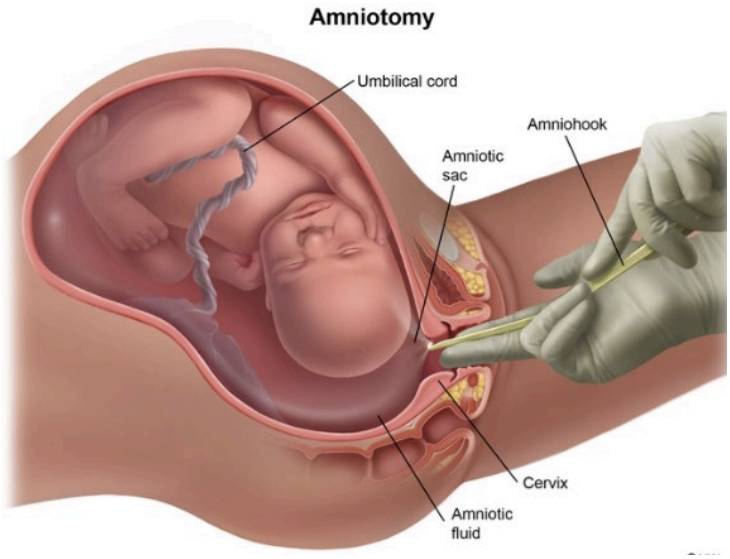
Second stage arrest of labor	
Definition	Insufficient fetal descent after pushing for: • ≥3 hours if nulliparous • ≥2 hours if multiparous
Risk factors	• Maternal obesity • Excessive pregnancy weight gain • Diabetes mellitus
Etiology	• Cephalopelvic disproportion • Malposition • Inadequate contractions • Maternal exhaustion
Management	• Operative vaginal delivery • Cesarean delivery

- Malposition is the MCC of protracted second stage of labor.
  - Normal is occiput anterior.
  - Abnormal → occiput transverse or posterior.
- Cephalopelvic disproportion:
  - Molding + arrest of stage 2 → is due to cephalopelvic disproportion.
  - More common in late-term pregnancies (41 weeks or more) or in cases of fetal anomaly or malposition (occiput posterior).
  - Other risk factors: obesity, excess weight gain, nulliparity, advanced maternal age, and inadequate contractions.





- In stage 3:
  - Always is the power.
  - Use something other than oxytocin if oxytocin was already used.
    - It is even the cause of a prolonged stage 3.
  - Treatment: Uterine massage and controlled cord traction → fails → oxytocin → fails → manual extraction → piece still inside → surgery (D&C).



L and D Path

- Pregnancy:
    - From conception till 24 weeks → abortion.
    - From 24 to 37 weeks → preterm.
    - From 37 to 42 weeks → term.
    - After 42 weeks → post-term.
- Rupture of membranes:
    - Definitions:
        - Only normal if occurs in a term baby and if it's accompanied with contractions.
        - Prelabor ROM: if term but no contractions.
        - Duration between ROM and delivery should not exceed 18 hours.
            - More than 18 hours → prolonged ROM.
        - Preterm prelaborROM: in the preterm period without contractions.
            - Preterm ROM: in the preterm period with contractions.
    - Physiology: "breaking of water"
        - Sac around fetus opens and birthing process happens.
            - Usually spontaneous.
        - Sometimes ROM doesn't happen, and delivery takes place.
            - We can facilitate it artificially.
        - Pathological: infection (GBS, vaginal flora, or STI).
        - When ROM happens → increased risk of ascending infection.
    - C/P:
        - Rush of fluid:
            - Meconium.
            - Clear.
            - Bloody.
        - Amount depends on the amount of amniotic fluid.
    - Diagnosis:
        - Digital exam is contraindicated.
        - Speculum exam → pooling.
            - Nitrazine turns sample blue.
            - Under slide → ferning.
            - Other tests: amnisure and tampon test.
        - Ultrasound → confirmation.
    - Treatment:
        - Deliver at term.
        - Below 24 weeks → abortion.
        - In between → balance the risk and benefits.
            - Benefit: lung maturation.
                - More benefit if younger fetus.

- Risk: ascending infection.
    - More risk if older fetus.

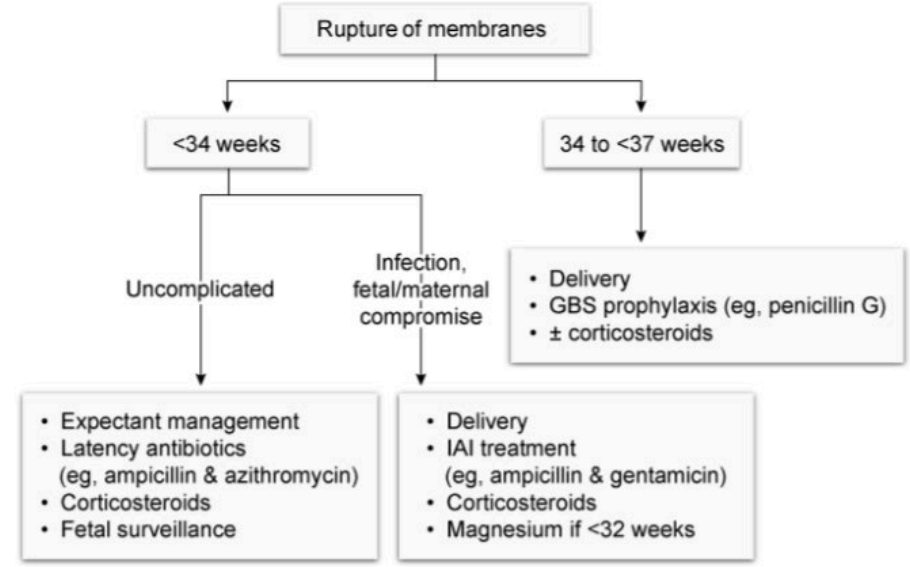
- Prelabor ROM:
    - Bacteria from a nearby source migrates to the uterus and the intrauterine bacterial enzymatic activity may cause contractions or increase membrane fragility → preterm labor or PPROM.
    - C/P:
        - ROM.
        - Term.
        - No contractions.
    - Diagnosis by clinical presentation and GBS status.
    - Treatment based on GBS status.
        - Deliver since term. How? Depends on severity.
            - Either induction, C-section or just wait (90% will go into spontaneous labor)!
        - Ampicillin if GBS + or unknown.
            - Other antibiotics: azithromycin or erythromycin.
                - Penicillin allergy → cefazolin.
                - Penicillin anaphylaxis: clindamycin.
            - If negative → watchful waiting.
            - The purpose of antibiotics in this setting is to prolong the time till labor not for the infection.

- Preterm prelabor ROM:
    - C/P:
        - ROM.
        - Preterm.
        - No contractions.
    - Diagnosis by clinical presentation.
    - Treatment: weigh risk and benefits based on gestational age.
        - Inpatient management due to complications.
        - More than 34 weeks → deliver.
        - Less than 24 weeks → abortion.
        - In between → steroids for fetal lung maturation.
    - Can lead to prolonged ROM.

Preterm prelabor rupture of membranes (PPROM)	
Definition	• Membrane rupture at <37 weeks prior to labor onset
Risk factors	• Prior PPROM • Genitourinary infection (eg, ASB, BV) • Antepartum bleeding
Diagnosis	• Vaginal pooling or fluid from cervix • Nitrazine-positive (blue) fluid • Ferning on microscopy
Management	• <34 weeks (reassuring): latency antibiotics, corticosteroids • <34 weeks (nonreassuring): delivery • ≥34 weeks: delivery
Complications	• Preterm labor • Intraamniotic infection • Placental abruption • Umbilical cord prolapse

ASB = asymptomatic bacteriuria; **BV** = bacterial vaginosis; **PPROM** = preterm prelabor rupture of membranes.

Management of preterm prelabor ROM



GBS = group B streptococcal; **IAI** = intra-amniotic infection; **ROM** = rupture of membranes.

- Prolonged ROM:
  - Entrance of vaginal flora into the mother.
  - Check GBS status.
  - C/P:
    - ROM.
    - No delivery.
    - More than 18 hours.
  - Treatment:

- C-SECTION.; prolonged ROM is a contraindication to vaginal delivery.
- GBS positive or unknown → ampicillin.
- GBS negative → watchful waiting.
    - Risk for endometritis and chorioamnionitis.

- Endometritis/chorioamnionitis (also known as intraamniotic fever) (intrapartum fever):
    - Vaginal flora ascends into mum's sterile uterus.
    - Risk increases the longer the duration lasts.
    - Most important risk factor: route of delivery (risk higher with c-section).
    - If baby is still in → chorioamnionitis.
    - If baby is delivered → endometritis.
    - C/P:
        - Prolonged ROM.
        - Fever/toxic.
    - Diagnosis:
        - Criteria:
            - Fever.
            - One or more of the following:
                - Fetal tachycardia >160/min for at least 10 minutes.
                - Maternal leukocytosis.
                - Maternal tachycardia.
                - Purulent amniotic fluid.
                - Uterine fundal tenderness.
        - Rule out other infections.
            - Urinalysis.
            - Blood cultures.
            - CXR.
    - Treatment:
        - Empirical with ampicillin + gentamicin +/- clindamycin.
        - Treatment continues until patient is afebrile for 24 hours.
        - Metronidazole contraindicated in postpartum endometritis in breastfeeding mothers.
        - DELIVER: (regardless of GA)
            - Augmentation of labor. (to remove source of infection)
            - C-section done for nonreassuring fetal heart rate, breech position, and prior uterine surgeries.
        - Antipyretics and IV fluids are administered to reduce maternal fever, which in turn improves fetal tachycardia.

Intraamniotic infection (chorioamnionitis)	
Risk factors	• Prolonged rupture of membranes (>18 hours) • Preterm premature rupture of membranes • Prolonged labor • Internal fetal/uterine monitoring devices • Repetitive vaginal examinations • Presence of genital tract pathogens
Diagnosis	Maternal fever PLUS ≥1 of the following: • Fetal tachycardia (>160/min) • Maternal leukocytosis • Purulent amniotic fluid • Maternal tachycardia (>100/min) • Uterine fundal tenderness
Management	• Broad-spectrum antibiotics • Delivery
Complications	• Maternal: Postpartum hemorrhage, endometritis • Neonatal: Preterm birth, pneumonia, encephalopathy

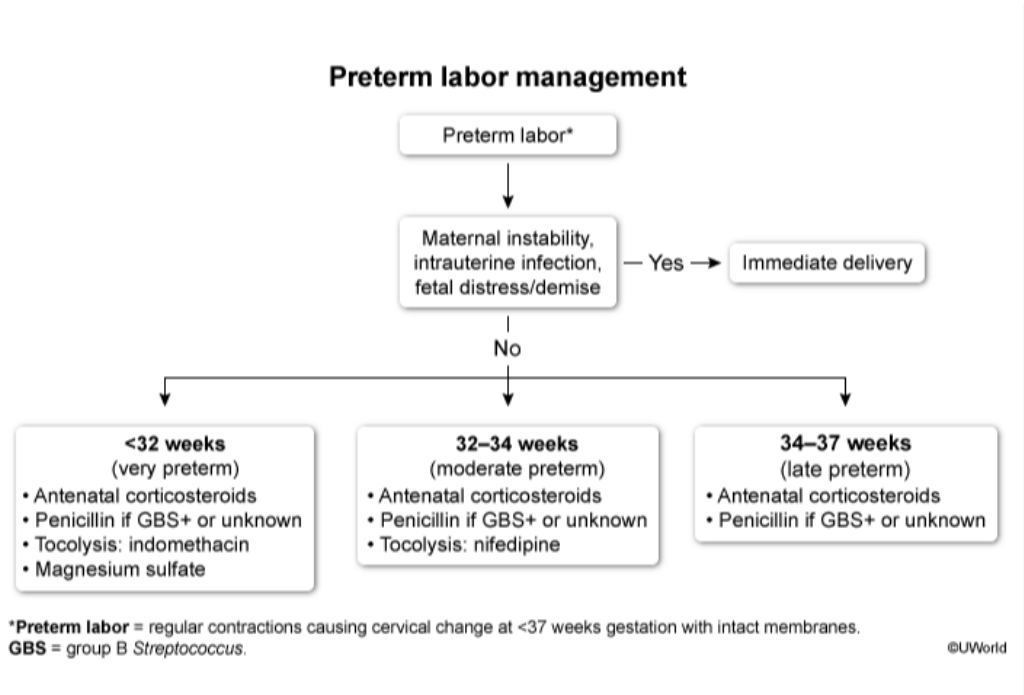
Postpartum endometritis	
Risk factors	• Cesarean delivery • Chorioamnionitis • Group B *Streptococcus* colonization • Prolonged rupture of membranes • Operative vaginal delivery
Clinical features	• Fever >24 hr postpartum • Uterine fundal tenderness • Purulent lochia
Etiology	• Polymicrobial infection
Treatment	• Clindamycin & gentamicin

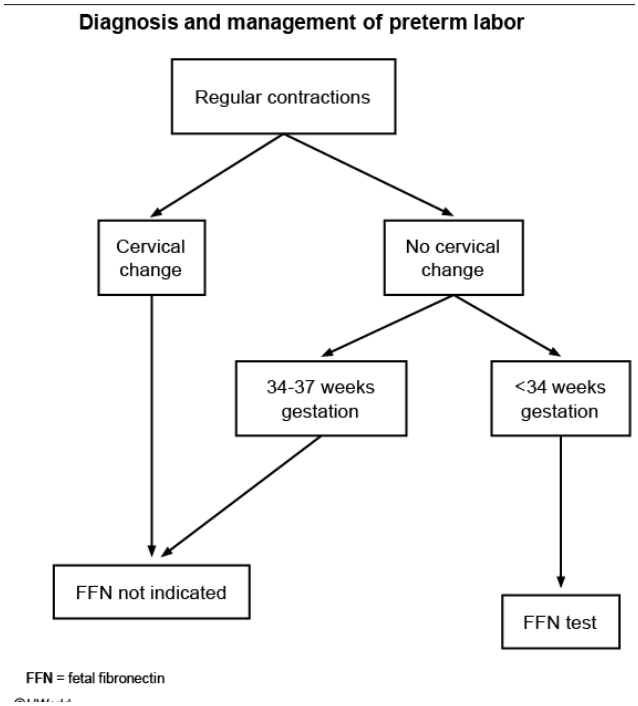
- Preterm labor:
  - MCC is idiopathic.
  - Three or more contractions in 30 mins and cervical dilation of 2 cm or more.
  - Risk factors:
    - History of preterm labor → most important risk factor.
    - Smoking.
    - Young maternal age.
    - Multiple gestations.
    - Preterm ROM.
    - Uterine anatomical defects.
  - Progesterone reduces the risk due to a decrease in cervical ripening and reduction of myometrial contractility.

- Diagnosis is by presence of contractions and MUST have cervical change and preterm.
    - If no cervical change and less than 34 weeks → fetal fibronectin.
- Treatment based on gestational age:
    - Steroids reduce the risk of RDS and intraventricular hemorrhage.
        - Either IM betamethasone or dexamethasone.
        - Oral dexamethasone increases the risk of IVH.
    - More than 34 weeks → deliver. (Type depending on severity)
        - No role for dexamethasone after 34 weeks.
    - Less than 24 weeks → abortion.
    - In between → steroids plus tocolytics to delay labor for 48 hours.
    - Tocolysis: indomethacin preferred <32 weeks. Nifedipine between 32 and 34 weeks.
        - Indomethacin associated with fetal vasoconstriction → decreased renal perfusion → oligohydramnios. Therefore patients should receive indomethacin for 48 hours or less.

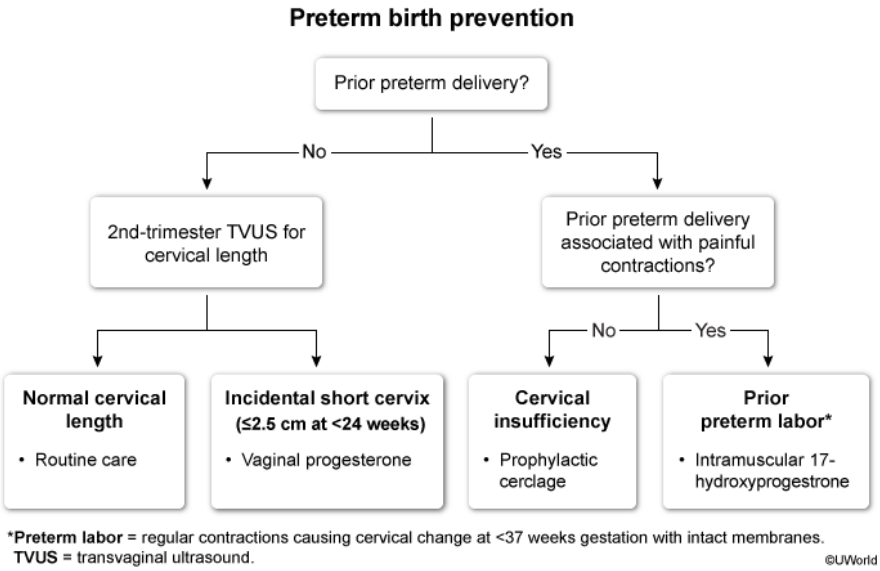
Preterm labor	
Risk factors	• Prior spontaneous preterm delivery • Multiple gestation • Short cervical length • Cervical surgery (eg, cold knife conization) • Cigarette use
Screening & prevention	• Cervical length measurement by TVUS • Progesterone administration • Cerclage placement

TVUS = transvaginal ultrasound.





- FFN used to determine whether a patient <34 weeks with regular contraction and no cervical change is in labor or not:
  - If FFN is positive → betamethasone.



- Short cervix is <2 cm.
  - Considered less than 2.5 if there is history of preterm labor.
- **It is recommended to perform a TVUS-CL for all pregnant women at 16-24 weeks.**

- Post-term:
  - C/P:
    - Oligohydramnios due to redistribution of blood into the brain rather than peripheral tissue such as renals.
      - Uteroplacental insufficiency signs: oligohydramnios on US and/or late decelerations on NST.
    - Macrosomia.
    - Dysmaturity due to age-related placental changes and uteroplacental insufficiency → small for gestational age, thin body, loose skin, and meconium stained amniotic fluid.
    - >40 weeks by conception and >42 weeks by gestational age.
  - Diagnosis by clinical presentation.
  - Treatment based on how sure you are of the dates and the cervical position.
    - If you are sure and cervix favorable → induction.
    - If you are sure and cervix unfavorable → induction or C-section.
    - If you are not sure regardless of cervix → assess how well baby is doing by US to order a biophysical profile.
      - Doing well → leave.
      - Not doing well → deliver.
    - Indications of immediate delivery: oligohydramnios or an abnormal NST.

Late- & post-term pregnancy	
Definition	• Late-term: ≥41 weeks gestation • Post-term: ≥42 weeks gestation
Risk factors	• Prior post-term pregnancy • Nulliparity • Obesity • Age ≥35 • Fetal anomalies (eg, anencephaly)

Complications	• Fetal/neonatal
	  ◦ Macrosomia
	  ◦ Dysmaturity syndrome
	  ◦ Oligohydramnios
	  ◦ Demise
	• Maternal
	  ◦ Severe obstetric laceration
	  ◦ Cesarean delivery
	  ◦ Postpartum hemorrhage

Management	• Frequent fetal monitoring (eg, nonstress test) • Delivery prior to 43 weeks gestation

GBS positive:

- If allergic to penicillin → cefazolin.
- If anaphylactic to penicillin → clindamycin.
- Resistant to clindamycin → vancomycin.

Notes:

- Tocolysis indicated before 34 weeks.
- Indomethacin is contraindicated after 32 weeks due to risk of closure of PDA.
- Magnesium sulfate indicated for fetal neuroprotection before 32 weeks.

Intrapartum bleeding:

- Evaluated by:
  - Hemodynamic instability.
  - Fetal stability.
  - Labor progression and contraction pattern.

Eclampsia

A history of preeclampsia in previous pregnancies increases the risk of preeclampsia in the current pregnancy up to 7 times. If it occurred before 33 weeks in the previous pregnancy → risk increased by 15 times. If it occurred between 33 and 36 weeks → 10 times more likely to get it.

Disease	Blood pressure	Timing	Urinalysis	Signs and symptoms	Treatment	Follow up
Transient HTN	More than or equal to 140/90	Nonsustained.	-	-	-	Ambulatory BP
Chronic HTN	More than or equal to 140/90; 2 measurements 4 hours or more apart.	Sustained. Onset before 20 weeks.	-	-	Methyldopa → labetalol → hydralazine.	High risk of developing pre-eclampsia. Get more frequent urinalysis and ultrasound assessing for IUGR.
Gestational HTN	More than or equal to 140/90	Sustained. After 20 weeks.	-	-	Methyldopa → labetalol → hydralazine.	Can progress to pre-eclampsia.
Mild pre-eclampsia (PEC without severe features)	More than or equal to 140/90	Sustained. After 20 weeks.	>300 mg/dl or albumin to creatinine ratio 0.3 or more	No severe symptoms.	>37 weeks → deliver. <37 weeks → wait. Onset before 34 weeks of gestation is a significant risk factor for developing	More frequent follow ups.

					severe features → admit and monitor.	
Severe pre-eclampsia (PEC with severe features= SPEC)	More than or equal to 160/110	Sustained. After 20 weeks.	>5 g/dl.	Onset of alarm symptoms.	Give magnesium and deliver; vaginal by induction. (regardless of GA) Give anti-hypertensives to decrease DBP to less than 100-90 mmHg. (reducing the arterial might jeopardize uteroplacental blood flow)	
Eclampsia	More than or equal to 160/110 Can present up till 6 weeks after delivery	Sustained. After 20 weeks.	>5g/dl.	Seizures.	Give magnesium, anti-hypertensives and deliver; induction or C-section.	

Hypertensive disorders of pregnancy	
Chronic hypertension	• Systolic pressure **≥140 mm Hg** &/or diastolic pressure **≥90 mm Hg** prior to conception or 20 weeks gestation
Gestational hypertension	• New-onset elevated blood pressure at ≥20 weeks gestation • No proteinuria or end-organ damage
Preeclampsia	• New-onset elevated blood pressure at ≥20 weeks gestation **AND** • Proteinuria **OR** signs of end-organ damage
Eclampsia	• Preeclampsia **AND** • New-onset grand mal seizures
Chronic hypertension with superimposed preeclampsia	Chronic hypertension **AND** 1 of the following: • New-onset proteinuria or worsening of existing proteinuria at ≥20 weeks gestation • Sudden worsening of hypertension • Signs of end-organ damage

- Gold standard: 24-hour urine protein collection.

Preeclampsia	
Risk factors	• Nulliparity • Obesity • Preexisting medical condition (eg, SLE, chronic hypertension) • Multiple gestation • Advanced maternal age
Definition	• New-onset hypertension* (SBP ≥140 or DBP ≥90 mm Hg) at ≥20 weeks AND • Proteinuria OR signs/symptoms of other end-organ damage
Severe features	• Severe-range hypertension (SBP ≥160 or DBP ≥110 mm Hg) • Platelets <100,000/mm^3 • Creatinine >1.1 mg/dL or 2x normal • Elevated transaminases >2x upper limit of normal • Pulmonary edema • Vision or cerebral symptoms (eg, headache)
Management	• <37 weeks & no severe features: expectant • ≥37 weeks (or ≥34 weeks with severe features): delivery • Severe-range blood pressure: IV labetalol, IV hydralazine, PO nifedipine • Seizure prophylaxis: magnesium sulfate

*On 2 measurements ≥4 hr apart.

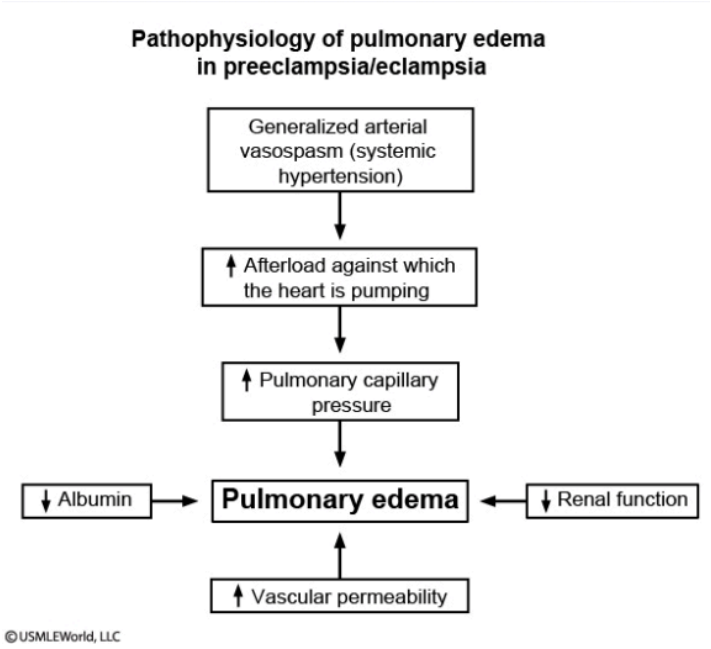
DBP = diastolic blood pressure; **IV** = intravenous; **PO** = by mouth; **SBP** = systolic blood pressure; **SLE** = systemic lupus erythematosus.

- High-risk patients require a 24-hour urine collection for total protein at the initial prenatal visit.

Hey Dustyn, here's a mnemonic for the severe features with pre-eclmapsia (PEC):
Mnemonic: ABCDE & P°2
A: ALT/AST 2x ULN
B: BP > 160/ > 110
C: Cr > 1.1 OR 2X BASELINE
D: DISTURBANCES (HEADACHE OR VISUAL)
E: EPIGASTRIC OR RUQ PAIN
P: PULMONARY EDEMA
P: PLATELETS < 100 000

Eclampsia (preeclampsia + new-onset seizure)	
Clinical features	• Hypertension, typically severe (ie, SBP ≥160 or DBP ≥110 mm Hg) • Seizure, typically tonic-clonic with postictal phase • Severe headache • Visual disturbances (ie, scotoma) • Hyperreflexia • Proteinuria
Diagnosis	• Mainly clinical • Bilateral frontal lobe edema on CT scan of the head
Management	• Magnesium sulfate infusion • Antihypertensive agent for severe hypertension • Delivery

- Placental hypoperfusion, hypoxia, and ischemia trigger the release of antiangiogenic factors causing maternal endothelial cell damage → multiple organ damage; liver, kidneys, brain:
    - Liver → epigastric pain from the stretching of the hepatic capsule.
    - Kidneys → acute kidney injury.
    - Acute stroke:
        - Activation of the coagulation cascade, platelet aggregation, and vascular microthrombi → ischemic stroke.
        - Dysregulated cerebral blood flow → cerebral vasospasm → severely elevated perfusion pressure → ruptured intracerebral vessels → hemorrhagic stroke.



- Management: supplemental oxygen, fluid restriction, and diuresis in severe cases.
    - Fluid restriction and diuresis should be done with caution as plasma volume is effectively decreased through third-spacing and placental perfusion can be compromised.

Pregnancy-related risks due to hypertension	
Maternal	• Superimposed preeclampsia • Postpartum hemorrhage • Gestational diabetes • Abruptio placentae • Cesarean delivery
Fetal	• Fetal growth restriction • Perinatal mortality • Preterm delivery • Oligohydramnios

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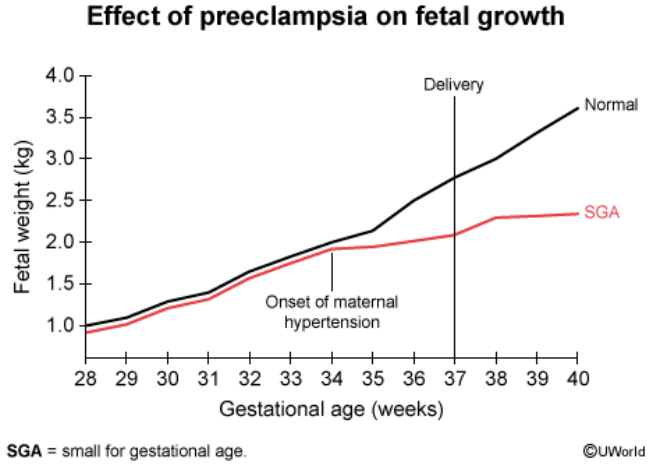


Severe hypertension in pregnancy: (hypertensive crisis)

- SBP >160 and DBP >110 for at least 15 minutes.
- Management:
    - IV hydralazine -vasodilator.
    - IV labetalol – beta blocker so can further reduce HR so avoid in bradycardia.
    - Oral nifedipine.

Treatment of preeclampsia	
Drug	**Indication**
Hydralazine IV, labetalol IV or nifedipine PO	Lower blood pressure acutely to decrease stroke risk
Magnesium sulfate IV or IM	Prevent or treat eclamptic seizures

IM = intramuscular; **IV** = intravenous; **PO** = by mouth.

Postpartum seizure → IV magnesium sulfate → fails → lorazepam and phenytoin.

Antihypertensives during pregnancy	
First line	• Beta blockers (labetalol) • Calcium channel blockers (nifedipine) • Hydralazine • Methyldopa
Second line	• Clonidine • Thiazide diuretics
Contraindicated	• ACE inhibitors • Angiotensin II receptor blockers • Direct renin inhibitors • Nitroprusside • Mineralocorticoid receptor antagonists (spironolactone)

Hydralazine causes tachycardia, peripheral edema and headache.

Hypertension associated with oligohydramnios, abruptio placenta, and increased risk of preterm labor.

HELLP syndrome:

- Most women have hypertension and proteinuria → not required for diagnosis of HELLP cause some women present without them.
- Can be confused with TTP ☹.

HELLP syndrome*	
Clinical findings	• Nausea/vomiting • Right upper quadrant pain • Headache • Visual changes • Hypertension
Laboratory abnormalities	• Microangiopathic hemolytic anemia • Elevated liver enzymes • Thrombocytopenia • ± Proteinuria
Treatment	• Delivery • Magnesium sulfate for seizure prophylaxis • Antihypertensives (eg, hydralazine)
Complications	• Abruptio placentae • Subcapsular liver hematoma • Acute renal failure • Pulmonary edema • Disseminated intravascular coagulation

Mag and deliver?

- Magnesium:
  - Magnesium is used to prevent seizures.
  - In myasthenia gravis patients → valproate instead.
  - Mag checks is assessing for decreased DTRs.
  - If we give more magnesium → respiratory depression.
  - So, if decreased DTRs → give calcium.
- Magnesium toxicity: common risk factor → renal insufficiency.
  - Therapeutic level (4.8 -8.4), which are 2-4 times higher than normal concentrations, are required to prevent eclampsia.
  - High levels inhibit presynaptic acetylcholine release → neuromuscular inhibition.

Magnesium toxicity	
Clinical features	• Mild: nausea, flushing, headache, hyporeflexia • Moderate: areflexia, hypocalcemia, somnolence • Severe: respiratory paralysis, cardiac arrest
Treatment	• Stop magnesium therapy • Give IV calcium gluconate bolus

- Deliver:
  - Balance the risk and the benefit.
  - The greater the number of severe features tips decision towards deliver.
  - Type of delivery depends on stability of mum and baby.

- >37 weeks baby → deliver.
- <24 weeks baby → abortion.
- Between 24 and 37 → closer to 24 the baby would benefit from staying, closer to 37 the baby should be delivered.

Preeclampsia prevention:

Preeclampsia prevention	
Definition	• New-onset hypertension & proteinuria &/or end-organ damage at >20 weeks gestation
High risk	• Prior preeclampsia • Chronic kidney disease • Chronic hypertension • Diabetes mellitus • Multiple gestation • Autoimmune disease
Moderate risk	• Obesity • Advanced maternal age • Nulliparity
Prevention	• Low-dose aspirin at 12 weeks gestation

- Aspirin inhibits platelet aggregation and helps prevent placental ischemia.
- Should be started before 16 weeks; continued until delivery.

Fetal Growth Restriction:

Fetal growth restriction		
	Symmetric	**Asymmetric**
Definition	• Ultrasound estimated fetal weight <10th percentile for gestational age	
Onset	• 1st trimester	• 2nd/3rd trimester
Etiology	• Chromosomal abnormalities • Congenital infection	• Utero-placental insufficiency • Maternal malnutrition
Clinical features	• Global growth lag	• "Head-sparing" growth lag
Management	• Weekly biophysical profiles • Serial umbilical artery Doppler sonography • Serial growth ultrasounds	

- Hypertension and pregestational DM cause asymmetric FGR.
  - HTN: due to the underdevelopment of the spiral arteries of the placenta →uteroplacental insufficiency.

Multiple Gestations

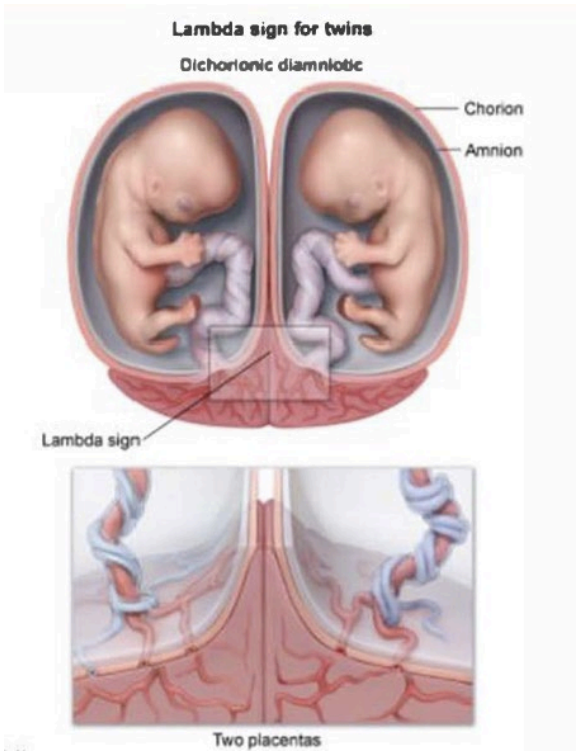
Twin pregnancy	

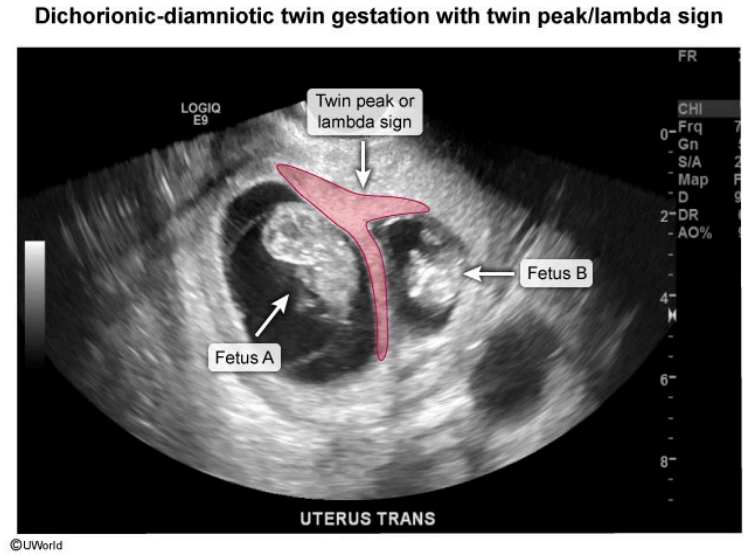
Types	• Monochorionic, monoamniotic
	  ○ 1 placenta, 1 amniotic sac
	• Monochorionic, diamniotic
	  ○ 1 placenta, 2 amniotic sacs
	  ○ "T-sign" at intertwin membrane
	• Dichorionic, diamniotic
	  ○ 2 placentas, 2 amniotic sacs
	  ○ "Lambda sign" at intertwin membrane

Maternal complications	• Hyperemesis gravidarum • Preeclampsia • Gestational diabetes mellitus • Iron-deficiency anemia

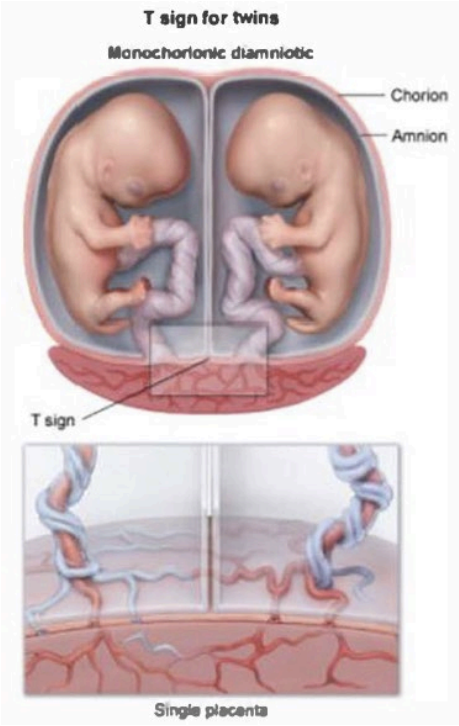
Fetal complications	• Congenital anomalies
	• Fetal growth restriction
	• Preterm delivery
	• Malpresentation (eg, breech)
	• Monochorionic twins
	  ○ Twin-twin transfusion syndrome
	• Monoamniotic twins
	  ○ Conjoined twins
	  ○ Cord entanglement

- Twins considered as 1; G1P1.
- Risk factors: increased maternal age, increased parity, fertility-enhancing therapies, and family history.
- Look at gender:
    - Separate genders → dizygotic → dichorionic diamniotic.
        - Risk:
            - Preterm labor (for every 1 gestation → 4 weeks earlier)
                - Spontaneous due to uterine crowding and uterine overdistention.
                - Induced due to increased risk of maternal and fetal complications.
            - Malpresentation → 50% C-section.
            - Multiple placenta → increased risk for postpartum hemorrhage.

- Same gender can either be monozygotic or dizygotic. (here we assume they're monozygotic)
  - The earlier the split the more separate they will be.
  - Two placentas → monozygotic dichorionic diamniotic. (split at days 0 to 3)
    - Identified by a thickened intertwin membrane and a placental projection where the intertwin membrane meets the placenta (lambda-sign) on ultrasound.
    - 

    - 

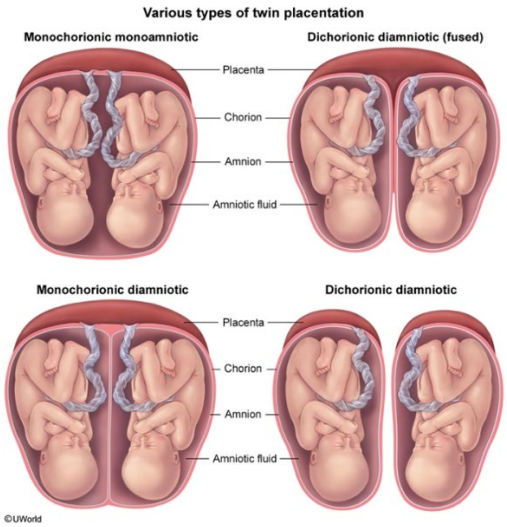
  - One placenta → look at septum and number of sacs.
    - A septum and 2 sacs → monozygotic monochorionic diamniotic. (split at days 4 to 8) → 75% of monozygotic twin pregnancies.
      - Thin intertwin membrane meeting the placenta at a 90-degree angle (T-sign) on ultrasound.



- Risk for twin-twin transfusion. (twin who received does worse than twin who gave)

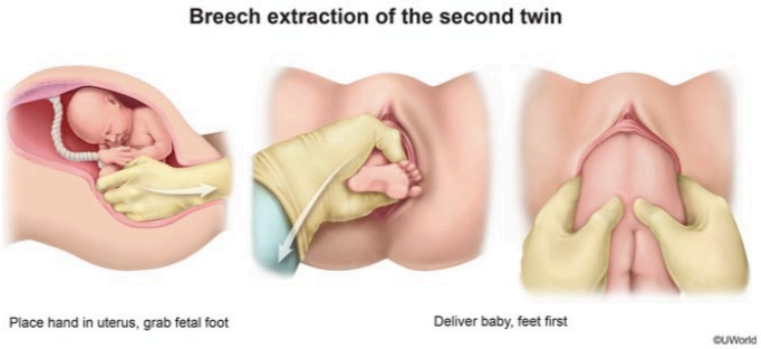
- A septum and a sac → monozygotic monochorionic monoamniotic. (split at days 9 to 12)
  - Risk for twin-twin transfusion.
  - Risk for conjoined twins. (if split occurred after days 9 till 12)
  - Risk for cord entanglement.
  - Monitor with weekly nonstress test starting at 28 weeks and steroid administration.
  - Deliver at 32-34 weeks.

- Heterotopic pregnancy → one intrauterine and one ectopic pregnancy.



Delivery:

- Vertex-vertex: vaginal delivery.
- Vertex-breech: vaginal delivery.
    - Use internal podalic version for the second twin.



- Breech-vertex: C-section.
- Breech-breech: C-section.

Delivery mode for diamniotic twin gestation	
Presentation	**Mode of delivery**
Vertex/vertex	Vaginal
Vertex/breech	Vaginal* or cesarean based on physician's experience/comfort with breech extraction
Breech/vertex or breech/breech	Cesarean

*A cesarean delivery is recommended if the estimated weight of the non-presenting twin is <1500 g (3 lb 5 oz) or ≥20% the estimated fetal weight of the presenting twin.

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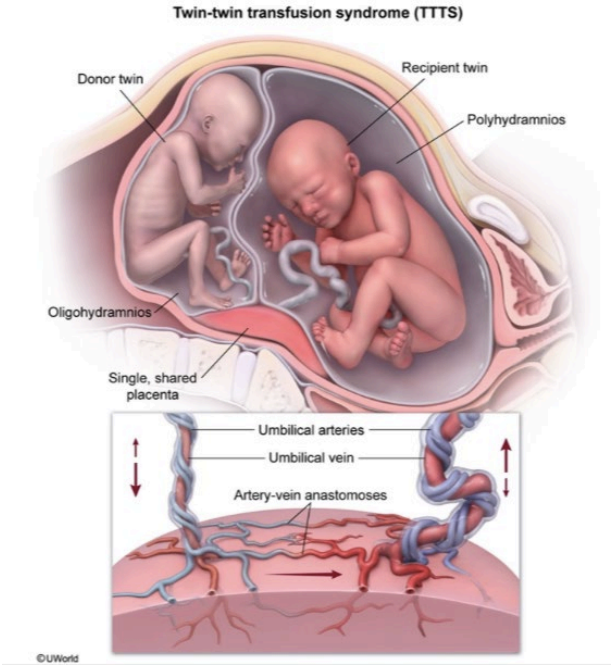
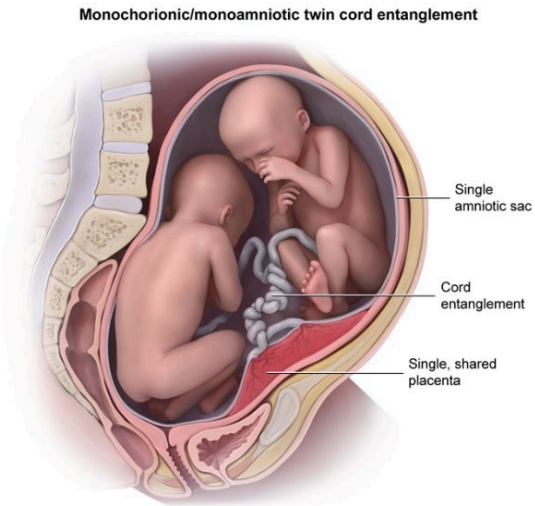
Twin-twin transfusion syndrome:

- Blood from the placental arteries of one twin is shunted into the placental veins of the other twin.
- Donor twin:
    - Renal failure.
    - Oligohydramnios.
    - Low-output heart failure.
    - Fetal growth restriction.
- Recipient twin:
    - Polycythemia.
    - Polyhydramnios.

    - Cardiomegaly.
    - High-output heart failure.
    - Hydrops fetalis.
- Both twins: intrauterine and neonatal death.
- Management:
    - Mild → serial US.
    - Moderate to severe → laser coagulation of the placental anastomosis.



Cord entanglement:



Postpartum Hemorrhage

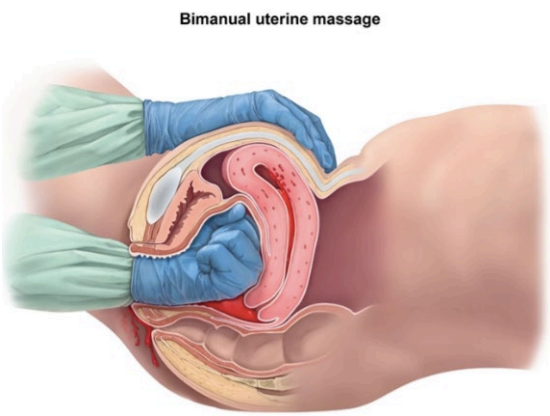
Loss of 500 cc in NVD and 1000 cc in C-section in the first 24 hours postpartum (primary). Secondary is from 24 hours till 12 weeks.

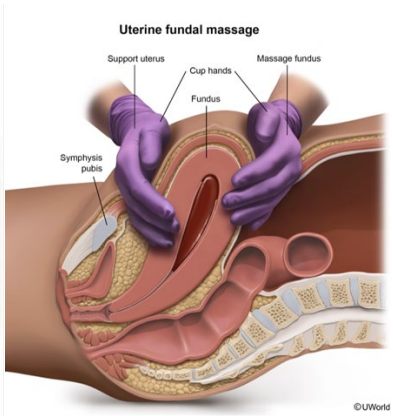
Postpartum hemorrhage	
Definition	• >500 mL after vaginal delivery • >1,000 mL after cesarean delivery
Risk factors	• Prolonged or induced labor • Chorioamnionitis • Multiple gestation • Polyhydramnios • Grand multiparity • Operative delivery
Causes	• Uterine atony (most common) • Retained placenta • Genital tract laceration • Uterine rupture • Coagulopathy
Treatment	• Bimanual uterine massage, oxytocin • Intravenous fluids, oxygen • Uterotonics (methylergonovine, carboprost, misoprostol) • Intrauterine balloon tamponade • Uterine artery embolization • Hysterectomy

- Check the state of the uterus:
    - Absent: uterine inversion.
        - Manually fix it.
            - Sometimes tocolytics are going to be required.
            - After its done→ use uterine tonics.
    - Boggy (soft): uterine atony.
        - Massage the uterus.
        - Give oxytocin
    - Firm:
        - Retained placenta → D&C? → hysterectomy.
    - Normal:
        - Vaginal laceration.
            - Vagina supplied by branches of uterine artery.
            - Corrected with sutures.
        - No laceration → think about DIC.

- If you can't find a cause or it is ongoing despite intervention:
    - ABC:
        - 2 large bore IV cannulas.
        - Bolus IV fluids.
        - Transfuse as needed.
        - Call surgeons.
    - You can try IV estrogen; however, if structural it's going to be useless.
    - Surgery:
        - Uterine artery ligation (done by OB).
            - Preferred during C-section.
        - Uterine artery embolization (done by IR).
            - Preferred if NVD.
        - Total abdominal hysterectomy (done by OB).

Differential diagnosis of postpartum hemorrhage			
Diagnosis	**Risk factors**	**Examination**	**Management**
Uterine atony	• Prolonged labor • Chorioamnionitis • Uterine overdistension (multiples, fetal macrosomia, polyhydramnios)	• Enlarged, boggy uterus	• Bimanual uterine massage • Uterotonic medications
Retained products of conception	• Succenturiate placenta • Manual extraction of placenta • History of previous uterine surgery	• Enlarged, boggy uterus • Placenta missing cotyledons • Retained placental fragments on ultrasound	• Manual extraction
Genital tract trauma	• Operative vaginal delivery	• Laceration of cervix or vagina • Enlarging hematoma	• Laceration repair
Inherited coagulopathy	• History of abnormal bleeding in patient or family members	• Continued bleeding despite contracted uterus	• Correction of coagulopathy



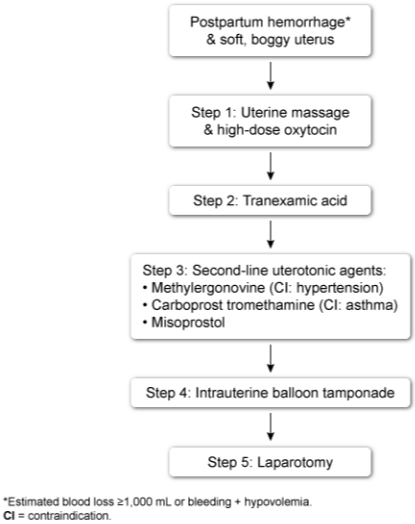


Uterine atony:

- Atonic uterus.
- Causes:
  - Happens in prolonged labor.
  - Stopping oxytocin.
  - Tocolytics.
- C/P:
  - PPH.
  - Boggy (soft) uterus.
- Diagnosis by clinical presentation.
- Tranexamic acid: antifibrinolytic; should be administered within 3 hours of delivery.
- Carboprost: prostaglandin F2a. Misoprostol: prostaglandin E1 analog.

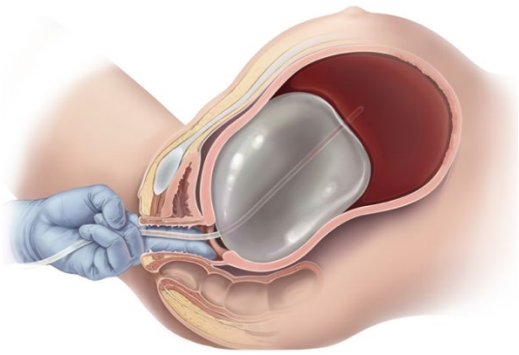
Postpartum uterine atony	
Risk factors	• Uterine fatigue from prolonged, induced, or precipitous labor • Intraamniotic infection • Uterine overdistension (multiple gestation, macrosomia, polyhydramnios) • Retained placenta • Grand multiparity (≥5 prior deliveries)
Clinical features	• Most common cause of postpartum hemorrhage • Enlarged, soft, boggy, poorly contracted uterus
Interventions	• Bimanual uterine massage • Correction of bladder distension • High-dose oxytocin, misoprostol • Tranexamic acid • Carboprost, methylergonovine • Intrauterine balloon tamponade • Possible surgical intervention (if atony unresolved)

Management of postpartum hemorrhage due to uterine atony



*Estimated blood loss ≥1,000 mL or bleeding + hypovolemia.
CI = contraindication.

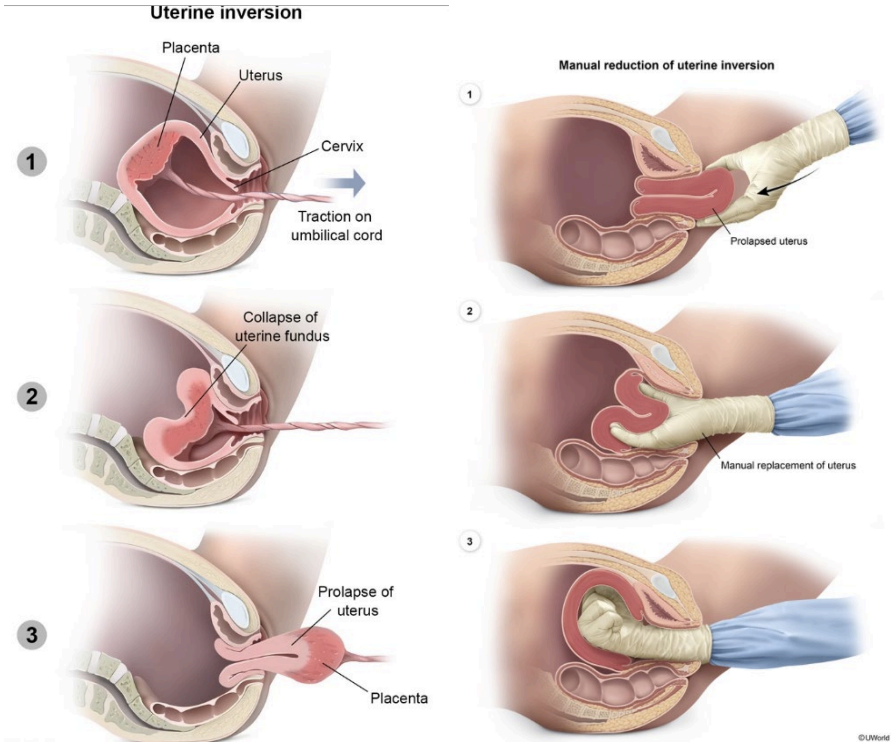
Intrauterine balloon tamponade



Uterine inversion:

- Uterus births itself.
- Happens during a delivery of oxytocin or traction.
- C/P:
    - PPH.
    - Absent uterus.
- **Neurogenic shock can take place due to the traction effect on the surrounding peritoneum resulting in paradoxical bradycardia.**
- Diagnosis: clinical presentation and speculum.
- Treatment:
    - Don't delay it since it will become more difficult due to uterine edema and cervix contraction.
    - Stop uterotonics. Relaxants used only if initial attempts don't work.

Uterine inversion	
Pathophysiology	• Excessive fundal pressure • Excessive umbilical cord traction
Presentation	• Lower abdominal pain • Round mass protruding through cervix • Uterine fundus not palpable transabdominally • Hemorrhage shock
Management	• Aggressive fluid replacement • Manual replacement of the uterus • Placental removal & uterotonic drugs after uterine replacement



Vaginal laceration:

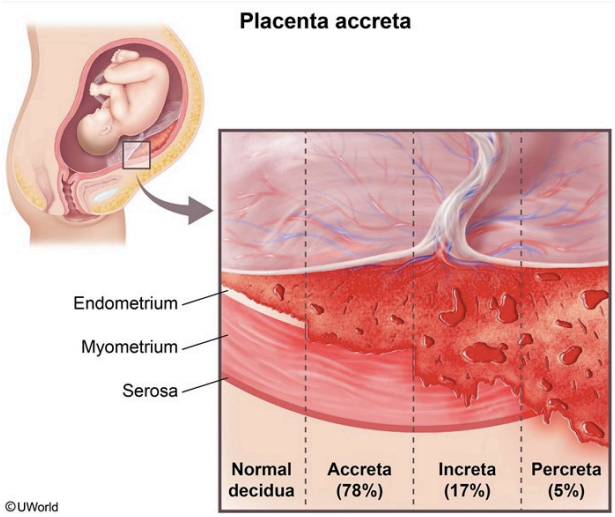
- Tear is in cervix and vagina.
- C/P:
    - Precipitous delivery.
    - Macrosomia.
    - Episiotomy.
- C/P:
    - PPH.
    - Normal uterus.
- Diagnosis is by clinical presentation and speculum.
- Treatment:
    - Pressure.
    - Suture (use anesthesia).

Retained placenta:

- Pathology: placenta burrows deeply.
    - Placenta accreta: a little deeper.
    - Placenta increta: into the myometrium.
    - Placenta percreta: all the way through.
- C/P:
    - PPH.
    - Firm uterus.
- Diagnosis by seeing placental blood vessels at the edge.
- Treatment:
    - D&C and manual extraction are unsuccessful and cause profuse vaginal bleeding due to disruption of highly vascular adhesions between the uterus and placenta.
- Follow up B-HCG to make sure you removed all placenta and development of choriocarcinoma.

Placenta accreta	
Definition	• Morbidly adherent placental attachment to the myometrium
Risk factors	• Placenta previa + prior uterine surgery (eg, cesarean delivery, D&C, myomectomy)
Clinical features	• Prenatal diagnosis: US with placenta previa, numerous placental lacunae, myometrial thinning • Postpartum diagnosis: adherent placenta, postpartum hemorrhage
Management	• Cesarean hysterectomy with placenta in situ

D&C = dilation & curettage; **US** = ultrasound.

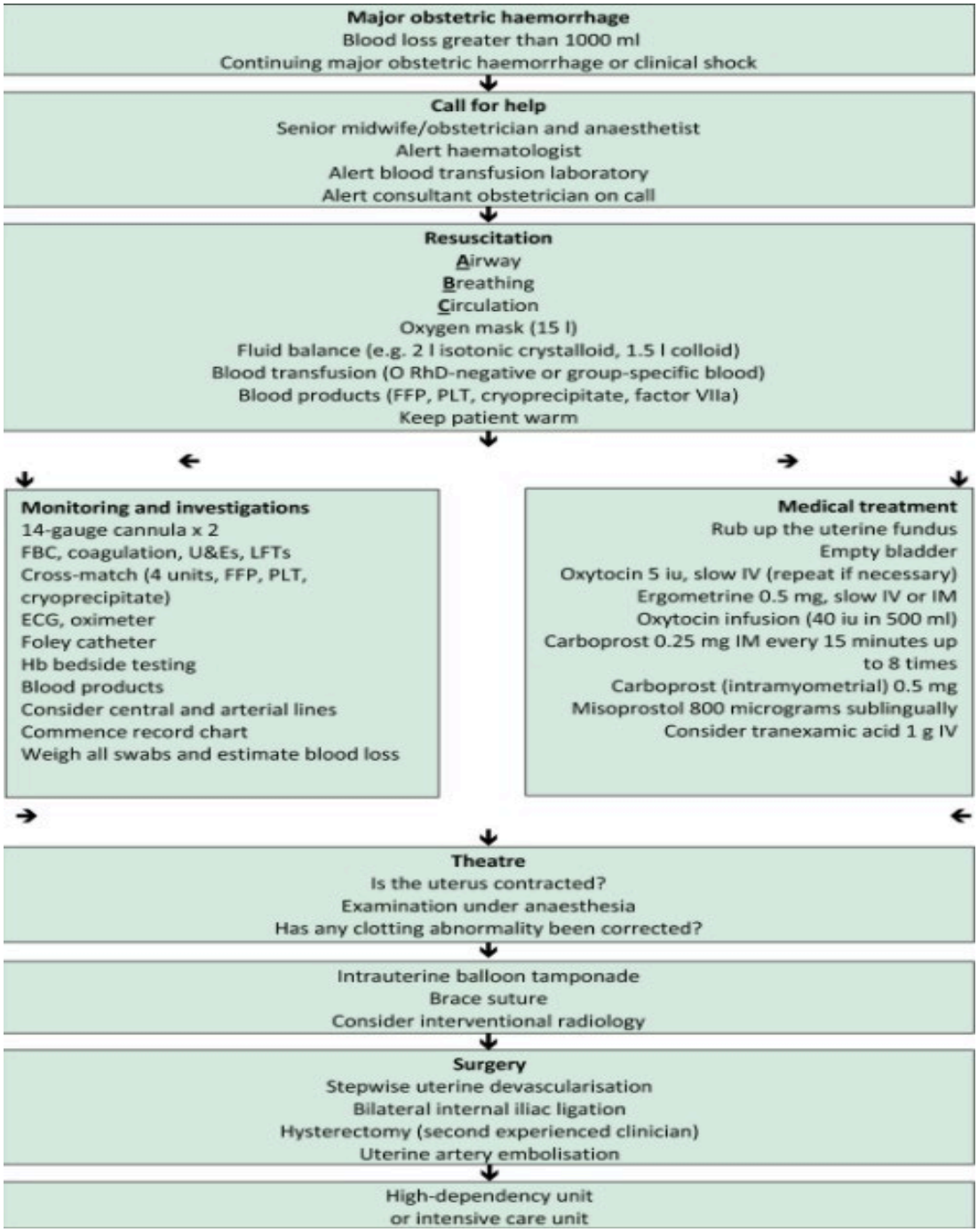


DIC:

- Thromboplastin in maternal circulation.
- Consumption coagulopathy→ overactivity of coagulation and fibrinolytic system.
- Decreased platelets, decreased hemoglobin, schistocytes on blood smear, decreased fibrinogen, decreased clotting factors (elevated INR).
- Normal fibrinogen during delivery is abnormal since it has to be increased during delivery.
- Treatment:
    - Give platelets.
    - Give packed RBCs.
    - Give cryoprecipitate.
    - FFP for the factors.

Disseminated intravascular coagulation	
Major causes	• Sepsis • Severe traumatic injury • Malignancy • Obstetric complications
Pathophysiology	• Procoagulant excessively triggers coagulation cascade → • Formation of fibrin-/platelet-rich thrombi & fibrinolysis → • Bleeding & organ damage (eg, kidneys, lungs)
Laboratory findings	• Thrombocytopenia • Prolonged PT & PTT • ↓ Fibrinogen • ↑ D-dimer • Microangiopathic hemolytic anemia (schistocytes)

Flowchart: (next page)



- Transexamic acid prevents fibrinolysis.
- Carboprost contraindicated in asthma patients.
- Methergine contraindicated in heart and hypertensive patients.

Oxytocin toxicity:

- Oxytocin used in the management of PPH is an analog to antidiuretic hormone.
- High doses of oxytocin → excessive water retention and hyponatremia.

- Hyponatremia → tonic-clonic seizures.
- Management: hypertonic saline to normalize sodium levels.

Oxytocin	
Indications	• Induction or augmentation of labor • Prevention & management of postpartum hemorrhage
Adverse effects	• Hyponatremia • Hypotension • Tachysystole

Secondary postpartum hemorrhage:

Secondary (late) postpartum hemorrhage		
Cause	**Clinical features**	**Management**
Retained POCs	• Heavy bleeding • ± Uterine atony	• Dilation & curettage
Placental site subinvolution	• Heavy bleeding • Uterine atony	• Uterotonics (eg, oxytocin, methylergonovine, carboprost)
Postpartum endometritis	• Fever • Uterine tenderness • Purulent lochia	• Broad-spectrum IV antibiotics (eg, clindamycin & gentamicin)

Antepartum Testing

Performed to assess how baby is doing or trying to find out if more time in mum is going to benefit the baby and what is the risk of the baby staying.

We do this in acute obstetric conditions (suspected PPROM, vaginal bleeding, and decreased fetal movement) and prophylactically for high-risk pregnancy.

Indications:

- Oligohydramnios.
- GDM.
- Preeclampsia.
- Fetal heart defects.
- IUGR.

Algorithm:

1. Non-stress test:
    a. If reassuring: there are accelerations (2 or more) → offer reassurance.
        i. Stop for decreased fetal movements.
        ii. Repeat every week in high-risk pregnancies.
    b. If not reassuring repeat the test by doing vibroacoustic stimulation.
        i. If reassuring: offer reassurance.
        ii. If not reassuring ultrasound based biophysical profile.
2. US-based biophysical profile:
    a. If 8-10 → reassurance.
    b. If 0-2 → baby already dead or fetal demise → delivery depends on mum's preference.
    c. If equivocal → decision based on gestational age.
        i. GA > 37 weeks → high risk pregnancy → delivery.
        ii. GA < 37 weeks → contraction stress test.
3. Contraction stress test:
    a. Done when mum's having contractions.
    b. Very rarely you induce contractions.
    c. Absence of deceleration and the absence of bradycardia → reassuring (give time).
    d. Positive bradycardia or positive late deceleration → deliver ASAP.

Antepartum fetal surveillance			
Test	**Description**	**Normal result**	**Abnormal result**
Nonstress test	External fetal heart rate monitoring for 20-40 minutes	• Reactive: ≥2 accelerations • 2 points	• Nonreactive: <2 accelerations • Recurrent variable or late decelerations • 0 points

Biophysical profile	• Nonstress test plus ultrasound assessment of the following:
	  ◦ Amniotic fluid volume
	  ◦ Fetal breathing movement
	  ◦ Fetal movement
	  ◦ Fetal tone
	• 2 points per category if normal
	• 0 points if abnormal (maximum 10/10)
		8 or 10 points	• Equivocal: 6 points
			• Abnormal: 0, 2, or 4 points
			• Oligohydramnios

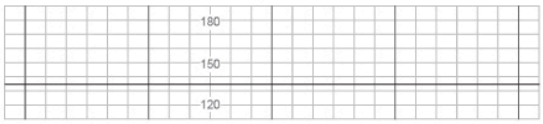
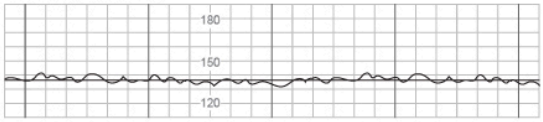
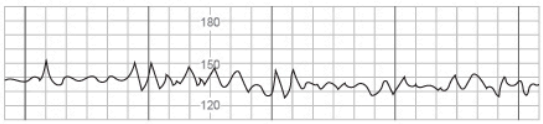
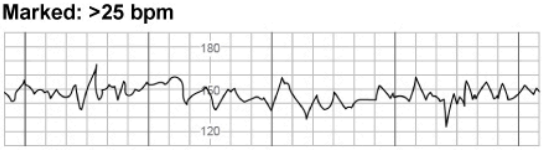
Contraction stress test	External fetal heart rate monitoring during spontaneous or induced (eg, oxytocin, nipple stimulation) uterine contractions	No late or recurrent variable decelerations	Late decelerations with >50% of contractions
Doppler sonography of the umbilical artery	Evaluation of umbilical artery flow in fetal intrauterine growth restriction only	High-velocity diastolic flow in umbilical artery	Decreased, absent, or reversed end-diastolic flow

Non-stress test:

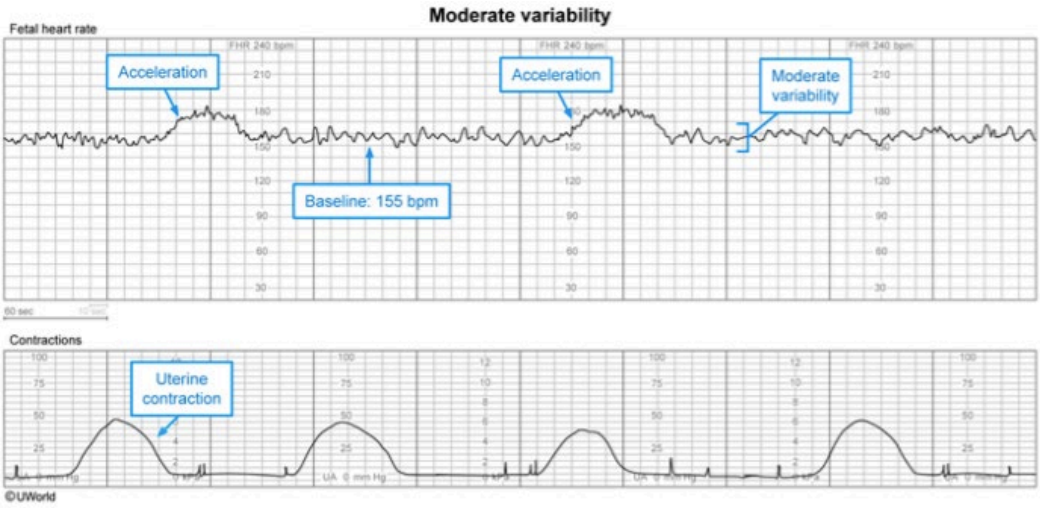
- Evaluates fetal acid-base status and risk for fetal hypoxemia.
- Useless if no FHR is detected on doppler US.
- No contractions.
- A typical NST is 20 minutes.
    - Done for 40 minutes to account for fetal sleep which might cause a false negative.
        - Fetal sleep is the MCC of nonreactive NST.
- Looking at fetal heart rate.
    - Variability.
        - Should be consistent variability (6-25/min).
        - Flat line is bad.
        - Too much variability is also bad.
        - Morphine and other opioids can reduce fetal heart rate variability due to CNS depression.
    - Acceleration.

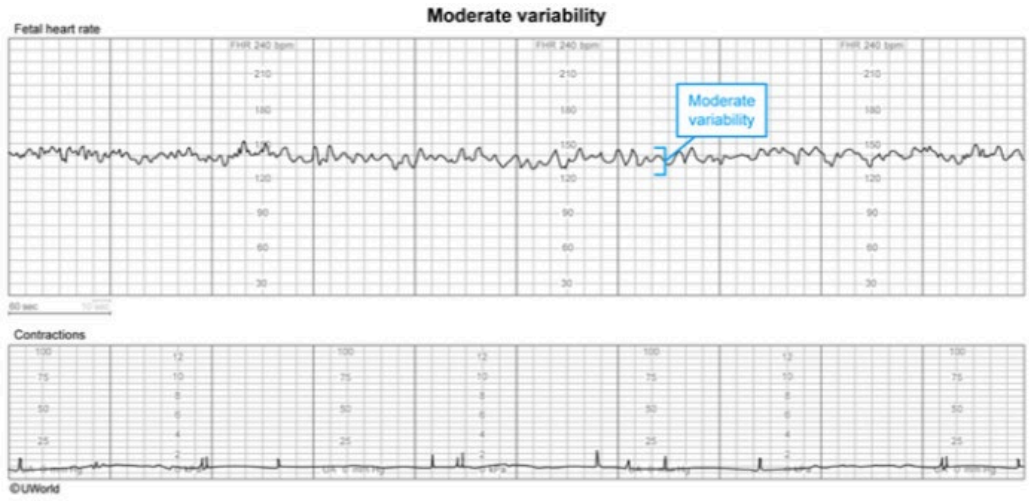
        - Increase in HR sustained in a certain amount of time.
            - >32 weeks = 15/15, 2 in 20 = reassuring.
                - Rises twice in 20 minutes.
                - Rise of 15 in HR.
                - Lasts for 15 seconds.
            - <32 weeks = 10/10, 2 in 20 = reassuring
- Fetal bradycardia <110. Fetal tachycardia >160.
    - Should be between 110-160.
- Treatment:
    - For decreased fetal movements and its reassuring = STOP.
    - For high-risk pregnancies and its reassuring = repeat next week.
    - If non-reassuring = repeat non-stress test with VAS.

Nonstress test	
Reactive	• Baseline of 110-160/min • Moderate variability (6-25/min) • ≥2 accelerations in 20 minutes, each peaking ≥15/min above baseline & lasting ≥15 seconds
Nonreactive	• Does not meet criteria for reactivity

Fetal heart rate variability	Clinical significance
Absent: Undetectable amplitude 	**Abnormal or intermediate pattern** Etiology: • CNS depressants (narcotics, alcohol, illicit drugs) • Temporary fetal sleep • Prematurity • Fetal hypoxia
Minimal: ≤5 bpm 	
Moderate: 6-25 bpm 	**Normal pattern**
Marked: >25 bpm 	**Unclear significance**

Baseline fetal heart rate	
Fetal tachycardia (>160/min)	• Maternal fever (eg, intraamniotic infection) • Medication side effect (eg, beta agonists) • Fetal hyperthyroidism • Fetal tachyarrhythmia
Fetal bradycardia (<110/min)	• Maternal hypothermia • Medication side effect (eg, beta blockers) • Fetal hypothyroidism • Fetal heart block (eg, anti-Ro/SSA, anti-La/SSB)





US-based biophysical profile:

- Done without contractions.
- Just like APGAR score but uses different elements.

- Used when there's a failed NST.
- Diagnosis:
    - Use the NST. (0-2)
    - Amniotic fluid index. (0-2)
        - Divide mum into 4 quadrants.
        - Get maximum depth amniotic fluid.
        - Sum all of it together = you will get a number.
        - Normal >5.
        - Reassuring is 8-25.
        - Oligo is less than 5.
        - Poly is more than 25.
    - Baby:
        - Breathing. (0-2)
        - Movement. (0-2)
        - Tone. (0-2)
- Score interpretation:
    - 0→4: fetal hypoxia due to placental dysfunction (insufficiency).
- Treatment:
    - 8-10 = reassurance.
    - 0-2 = C-section or induce labor.
    - In between = depends on gestational age.
- Gestational hypertension requires weekly biophysical profile starting at 32 weeks.

Biophysical profile*	
Component	**Normal finding**
Nonstress test	Reactive fetal heart rate monitoring
Amniotic fluid volume	Single fluid pocket ≥2 × 1 cm or amniotic fluid index >5
Fetal movements	≥3 General body movements
Fetal tone	≥1 Episodes of flexion/extension of fetal limbs or spine
Fetal breathing movements	≥1 Breathing episode for ≥30 seconds
Maximum score = 10: 0 = abnormal, 2 = normal for each component. *Performed continuous observation for ≥30 minutes.	

- Decreased fetal activity indicates either hypoxemic or acidemic fetus that shifted blood flow to CNS.

Polyhydramnios:

- Amniotic fluid index 24 cm or more or deepest vertical pocket of 8 cm or more.
- Imbalance of fluid production and removal.

- Most cases are idiopathic; other causes are DM (fetal hyperglycemia → polyuria and osmotic diuresis), fetal TEF, etc.
- C/P:
    - Abdominal discomfort.
    - Dyspnea.
    - Preterm contractions (due to increase IUP).
    - Asymptomatic.
- Management:
    - Severe or symptomatic are at an increased risk of preterm labor and PPROM → amnioreduction.
    - Mild, asymptomatic at term →expectant management.

Amniotic fluid index (AFI)		
	Oligohydramnios (AFI <5 cm)	**Polyhydramnios (AFI ≥24 cm)**
Causes	• Preeclampsia • Abruptio placentae • Uteroplacental insufficiency • Renal anomalies • NSAIDs	• Esophageal/duodenal atresia • Anencephaly • Multiple gestation • Congenital infection • Diabetes mellitus
Complications	• Meconium aspiration • Preterm delivery • Umbilical cord compression	• Fetal malposition • Umbilical cord prolapse • Preterm labor • Preterm premature rupture of membranes

Oligohydramnios:

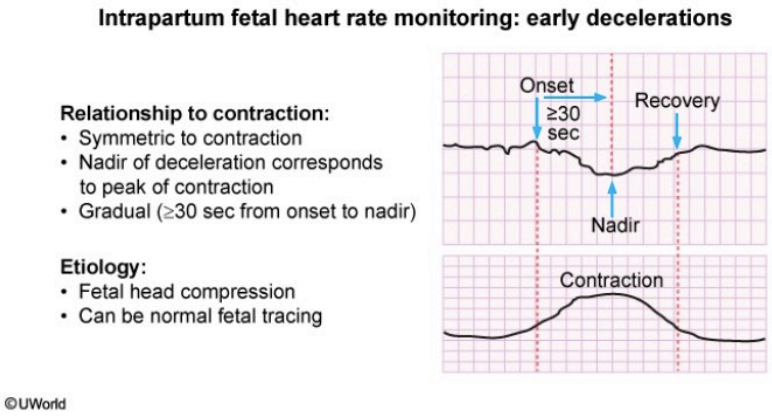
- Amniotic fluid index 5 cm or less. Single deepest pocket of amniotic fluid <2 cm.
- Etiology:
    - Early-gestation oligohydramnios: aneuploidy, renal agenesis, posterior urethral valves → amniotic fluid volume is dependent on normal fetal urine production.
    - Second & third trimester: uteroplacental insufficiency or maternal causes such as ROM or dehydration.

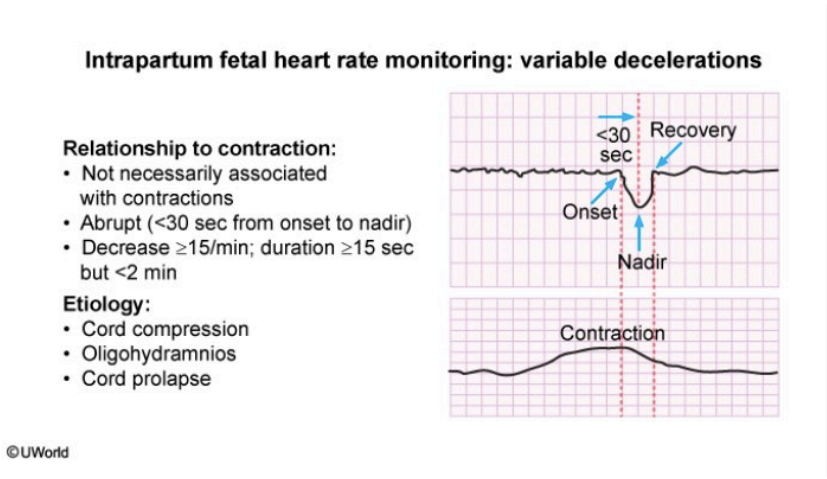
Contraction stress test:

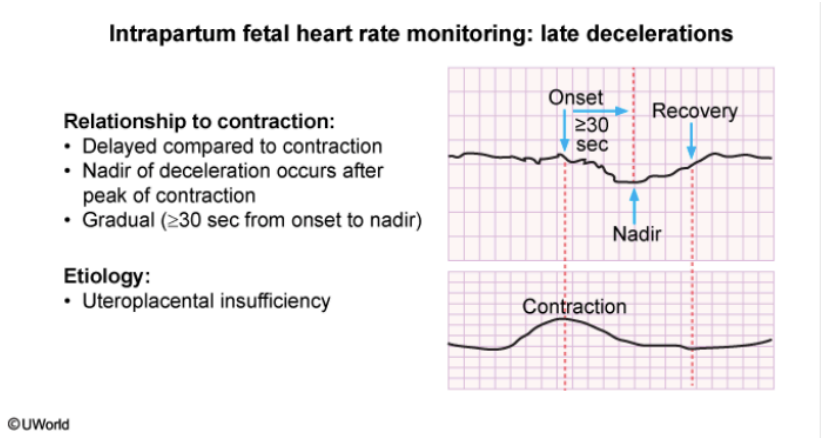
- Done in the setting of labor when there are contractions (3 contractions in 10 minutes, 200 mV) or can be induced by oxytocin or nipple stimulation.
- Look for decelerations and bradycardia.
- **Contraindicated in those who can't go into labor (e.g. placenta previa, prior myomectomy)**
- C/P:
    - Labor.
    - Failed biophysical profile.
    - Three decelerations we need to identify:
        - Early decelerations: decelerations mirror contractions.

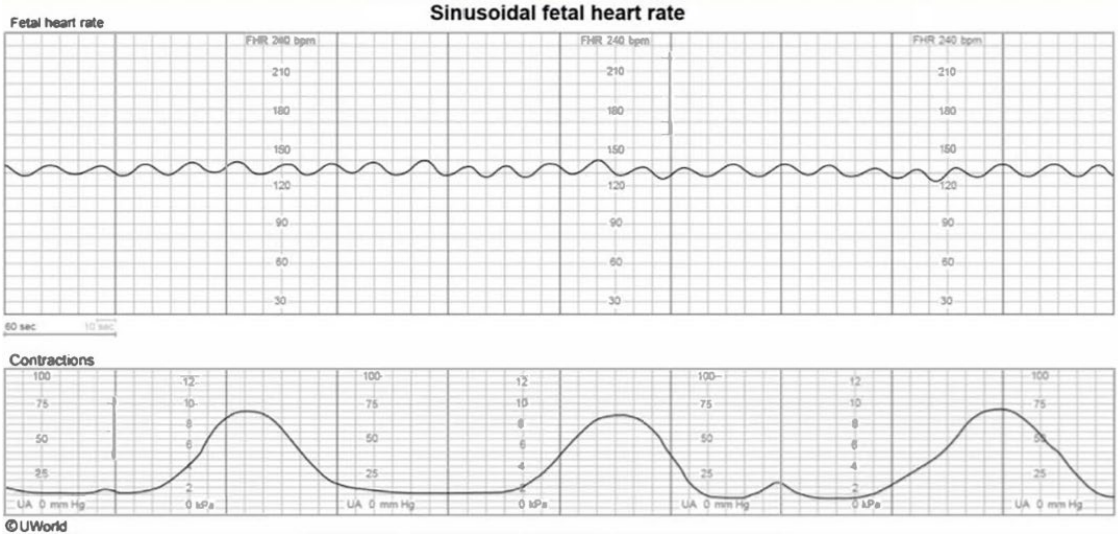
- Slow onset (>=30 seconds).
- Pathophysiology: contraction of the cervix → narrowing of the fetal anterior fontanelle → vagal response → slows HR.
- Head compression. (most benign) → Do nothing.

- Variable decelerations: fetal heart tracings that has nothing to do with contractions.
  - Early onset (<30 seconds).
  - Do a speculum examination to rule out umbilical cord prolapse.
  - Cord compression. → do nothing if variable deceleration occurs with <50% of contractions.
  - Variable decelerations occur as a response to changes in pressure, as compression and occlusion of the umbilical vessels cause an increase in fetal SVR and BP → reflexive rapid decrease in FHR.
  - Intermittent umbilical cord compression → no need for intervention.
  - If recurrent variable decelerations (>50% of contractions) → change position (left lateral or all fours) and oxygen and IV fluids or amnioinfusion.
    - Amnioinfusion contraindicated if history of uterine surgery.
    - If persists → c-section.
- Late decelerations: look like they start when contractions peak.
  - Slow onset (>=30 seconds).
  - Cause: uterine tachysystole → interrupts intervillous blood flow → fetal compromise and inadequate recovery time between contractions.
  - Uteroplacental insufficiency & impending hypoxemia and acidemia→ get baby out immediately.









- Sinusoidal fetal heart rate indicates fetal anemia (due to ABO/Rh incompatibility or vasa/placenta previa).
    - Vasa previa will present as both sinusoidal and bradycardia.
    - Smpoth, wave-like oscillation with fixed amplitude and frequency.
- Management:

- Category III: maternal repositioning and other intrauterine resuscitative interventions (administer oxygen, IV fluids, discontinuing uterotonics) to improve blood flow and oxygenation.
    - Patients remote from delivery (not completely dilated) → immediate cesarean delivery.
    - Recurrent variable decelerations → amnioinfusion.

Fetal heart rate tracing patterns	
Category I	Requires all the following criteria: • Baseline 110-160/min • Moderate variability (6-25/min) • No late/variable decelerations • ± Early decelerations • ± Accelerations
Category II	• Not category I or III (indeterminate pattern)
Category III	≥1 of the following characteristics: • Absent variability + recurrent late decelerations • Absent variability + recurrent variable decelerations • Absent variability + bradycardia • Sinusoidal pattern

For Fetal HR tracings on NST/CST, my resident taught me a mnemonic for exactly what you described:

VEAL = CHOP

V ariable decel = C ord compression
E arly decel = H ead compression
A ccelerations = O kay
L ate decel = P lacental insufficiency

Intrauterine fetal demise:

- No identifiable cause in up to 50% of the cases.
- C/P:
    - Decreased or absent fetal movements.

Intrauterine fetal demise	
Definition	Fetal death at ≥20 weeks
Diagnosis	Absence of fetal cardiac activity on ultrasound
Management	20-23 weeks • Dilation & evacuation OR • Vaginal delivery* ≥24 weeks • Vaginal delivery*
Complication	Coagulopathy after several weeks of fetal retention

*Cesarean delivery by maternal choice if history of prior classical cesarean/myomectomy

Evaluation of fetal demise	
Fetal	• Autopsy • Gross & microscopic examination of placenta, membranes & cord • Karyotype/genetic studies
Maternal	• Kleihauer-Betke test for fetomaternal hemorrhage • Antiphospholipid antibodies • Coagulation studies*

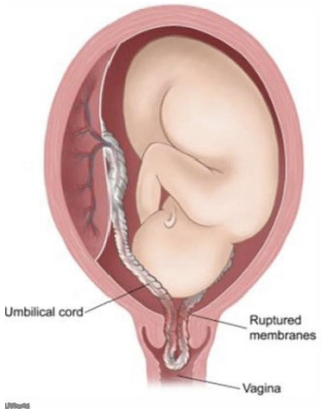
*For history of recurrent pregnancy loss, family or personal history of venous thrombosis, fetal growth restriction

Delivery planning for a nonviable fetus	
Fetal diagnosis	• Acardia • Anencephaly • Bilateral renal agenesis • Holoprosencephaly • Intrauterine fetal demise • Pulmonary hypoplasia • Thanatophoric dwarfism
Obstetric management	• Vaginal delivery • No fetal monitoring
Neonatal management	• Palliative care if not stillborn

- Counseling the patient:
  - Empathic listening combined with verbal and nonverbal expressions of emotional support.
  - Clear statement that it is not their fault.
  - Avoid prematurely changing the focus of discussion to medical management and reassurance about future pregnancies.
  - Referring to the fetus as their "baby" and avoiding medical terminology are helpful.

Umbilical cord prolapses:

- Occurs after ROM.
- Feared complication of amniotomy.
- Abrupt onset of variable decelerations or severe bradycardia.
- Umbilical cord palpated below the cervix in the vagina.
- Management:
    - Push fetus head back into cavity to reduce pressure on cord.
    - Manually return the umbilical cord.
    - Hand stays in place until C-section.



Fetal scalp stimulation:

- Performed to evaluate fetal acidosis in patients who have no accelerations on FHR monitoring.

Third-Trimester Bleeding

Mostly normal or benign.

Normal 3rd trimester bleeding:

- Cervical lesions like polyps or cervicitis.
- Cervix dilates.
- Bloody show (ROM).
- WHAT TO DO?
    - Physical exam and bimanual.
    - Check vitals and hemoglobin.
    - Platelets and coagulation.
    - Assess baby.
        - NST and CST.
    - Diagnosis by US.
    - Treatment:
        - Surgery based on fetal heart rate.
        - Either reassurance, induction, C-section, and crash section.
            - Decision depends on stability of mother and baby!!!

Abnormal 3rd trimester bleeding:

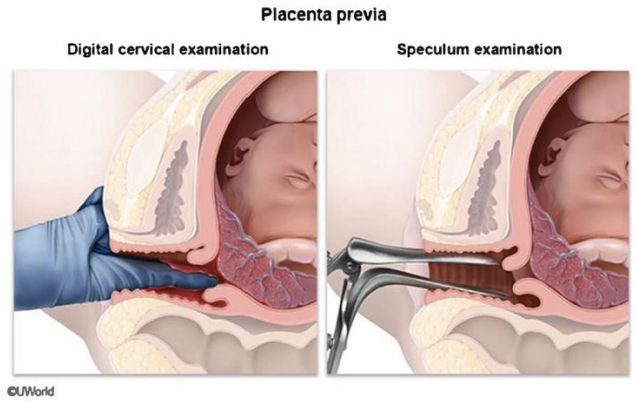
- Painless bleeding:
    - From the placenta → baby's blood.
    - Usually a disease that has "previa" in it.
- Painful bleeding:
    - From the uterus → mum's blood.
    - Not the previa diseases.

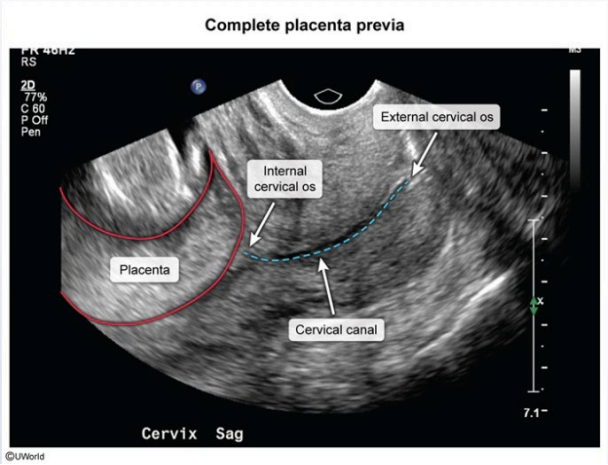
Placenta previa:

- The placenta grows across the os.
    - Marginal: a little bit not even half-way.
    - Partial: if it makes to midline.
    - Complete: covers the entire os.
- As the placenta is stretching → bleeding occurs.
- Happens in multigravida women and in multiple gestations. Major risk factor is prior cesarean delivery.

- Most resolve spontaneously by the third trimester due to physiologic lower uterine segment lengthening and/or placental growth toward the fundus.
    - Repeat US on the 28th week.
- Can be associated with placenta accreta.
    - Diagnosed prenatally by US: irregularity or absence of placental-myometrial interface and intraplacental villous lakes.
    - Plan a cesarean hysterectomy.
- C/P:
    - Painless bleeding.
- Diagnosis:
    - Ultrasound.
        - Transverse lie.
        - Transvaginal US is safe since it is usually an inch away from cervical os.
    - NST and CST.
        - Fetal distress.
- Treatment: urgent C-section.
- Management:
    - No intercourse nor digital cervical examination.
        - Speculum can be carried out as it does not enter the cervical canal.
    - Pelvic rest restrictions.
    - Inpatient admission for bleeding episodes.
    - Schedule C-section at 36-37 weeks.
        - If there's placenta accrete → schedule at 35-36 weeks.

Placenta previa	
Risk factors	• Prior placenta previa • Prior cesarean delivery • Multiple gestation
Clinical features	• Painless vaginal bleeding >20 weeks gestation
Diagnosis	• Transabdominal followed by transvaginal sonogram
Management	• No intercourse • No digital cervical examination • Inpatient admission for bleeding episodes

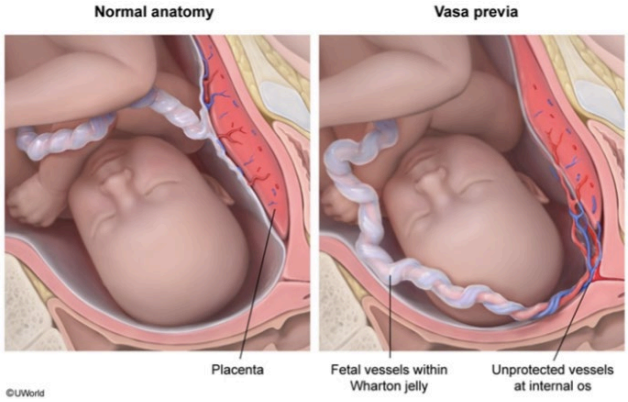




Vasa previa:

- Same pathogenesis.
- Placenta on the right side and extra on the left side and there is vessel connection between the two.
- Stretch → bleed.
- C/P:
    - Painless bleeding.
- Diagnosis:
    - US doesn't show anything.
    - NST and CST:
        - Fetal distress.
- Treatment: urgent C-section.

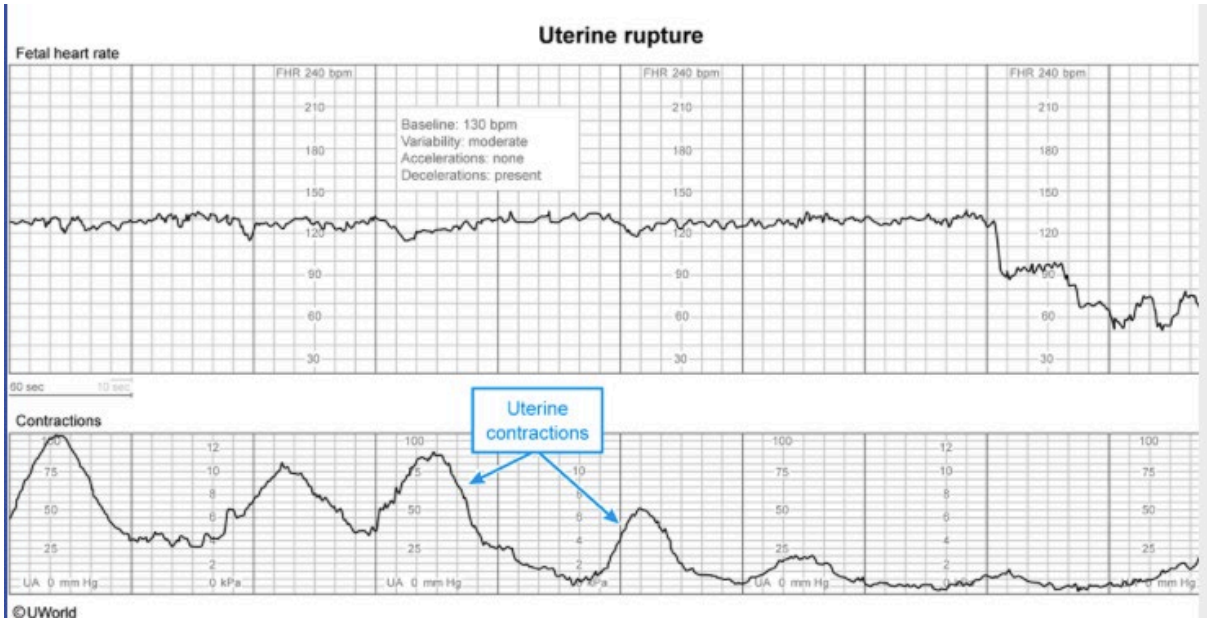
Vasa previa	
Definition	• Fetal vessels overlying the cervix
Risk factors	• Placenta previa • Multiple gestations • In vitro fertilization • Succenturiate placental lobe
Clinical presentation	• Painless vaginal bleeding with ROM or contractions • FHR abnormalities (eg, bradycardia, sinusoidal pattern) • Fetal exsanguination & demise
Management	• Emergency cesarean delivery

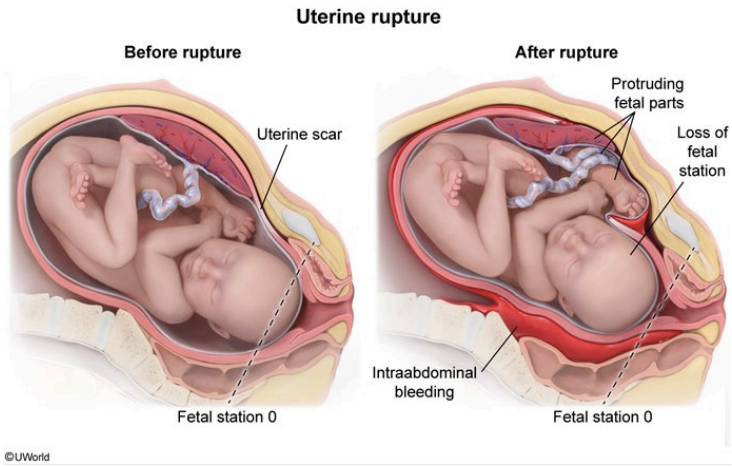


Uterine rupture:

- Mother has a uterus that has a scar.
- Attempting vaginal birth after C-section.
- Baby goes the path of least resistance → into the uterus. If you get lucky → membrane prevents that.
- Can be incomplete (not including the peritoneum) or complete (including the peritoneum).
- C/P:
    - Contractions.
    - Painful bleeding. Increased with contractions.
    - Loss of fetal station.
    - Abnormal FHR is often the first sign or rupture.

Uterine rupture	
Risk factors	• Prior uterine surgery (eg, cesarean delivery, myomectomy) • Induction of labor/prolonged labor • Congenital uterine anomalies • Fetal macrosomia
Clinical presentation	• Vaginal bleeding • Intraabdominal bleeding (hypotension, tachycardia) • Fetal heart decelerations • Loss of fetal station • Palpable fetal parts on abdominal examination • Loss of intrauterine pressure
Management	• Laparotomy for delivery & uterine repair





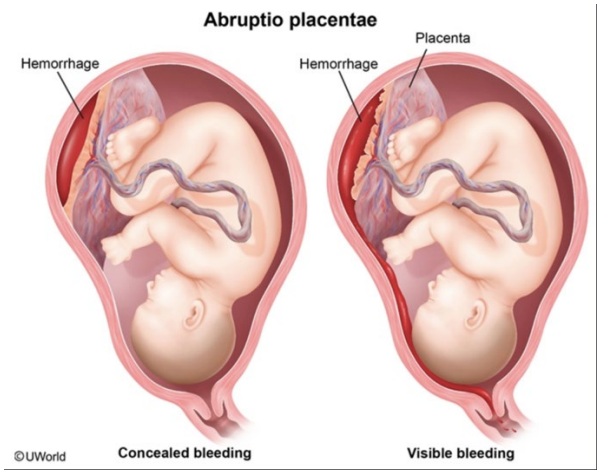
Placental abruption:

- Placenta tears off the endometrial lining.
- Two types: concealed or revealed.
    - Revealed presents with bleeding.
    - Concealed presents with very little or no bleeding and increased fundal height.
- C/P:
    - Painful bleeding.
    - Check vitals.
    - Mentation.
    - High frequency contractions aka tachysystole (>5/10min).
    - Nonreassuring fetal heart rate tracing.
- Diagnosis:
    - US.

- NST or CST.

- Treatment:
  - Hemorrhagic shock → rapid resuscitation with crystalloids and blood products and left lateral decubitus position.
    - If severe → massive transfusion protocol → 1:1:1 packed RBCS: platelets: FFP.
  - If no fetal distress → normal vaginal delivery.
  - If fetal distress → emergency C-section.
- Complication: maternal hemorrhage, fetal hypoxia and demise, and DIC.

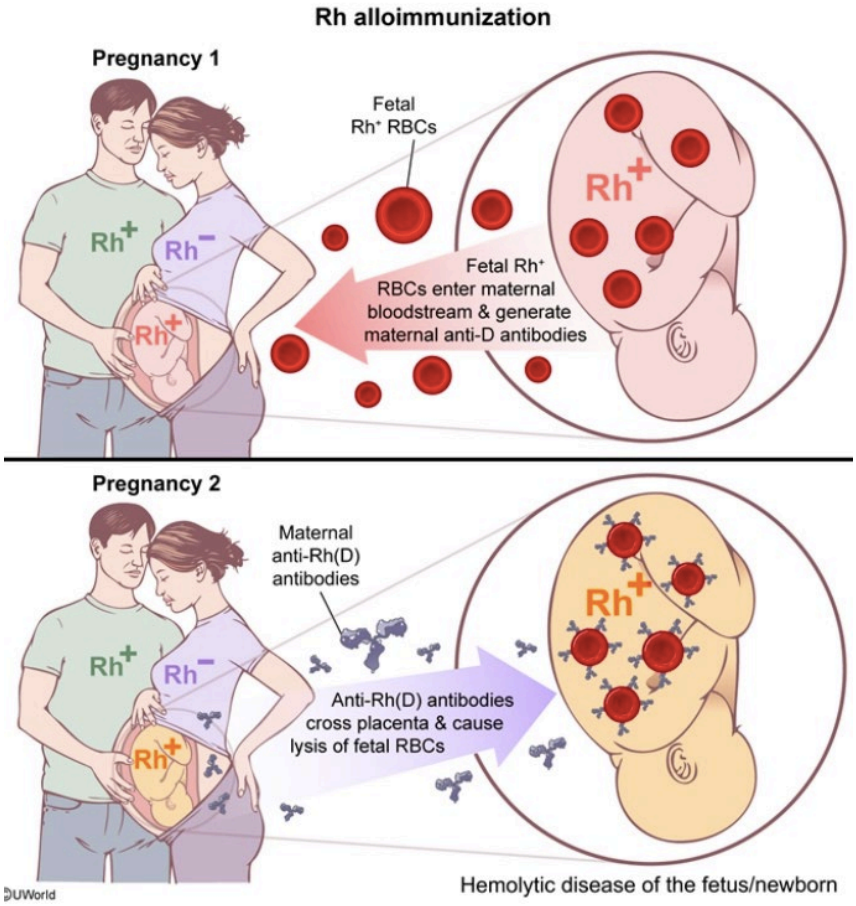
Abruptio placentae	
Definition	• Placental detachment from the uterus before fetal delivery
Risk factors	• Hypertension, preeclampsia • Abdominal trauma • Prior abruptio placentae • Cocaine & tobacco use
Clinical presentation	• Sudden-onset vaginal bleeding • Abdominal or back pain • High-frequency, low-intensity contractions • Rigid, tender uterus
Diagnosis	• Clinical • Ultrasound: ± Retroplacental hematoma
Complications	• Fetal hypoxia, preterm birth, mortality • Maternal hemorrhage, disseminated intravascular coagulation



Management:

- Resuscitation.
- Left lateral decubitus position to reduce compression of the aortocaval vessels.

Alloimmunization

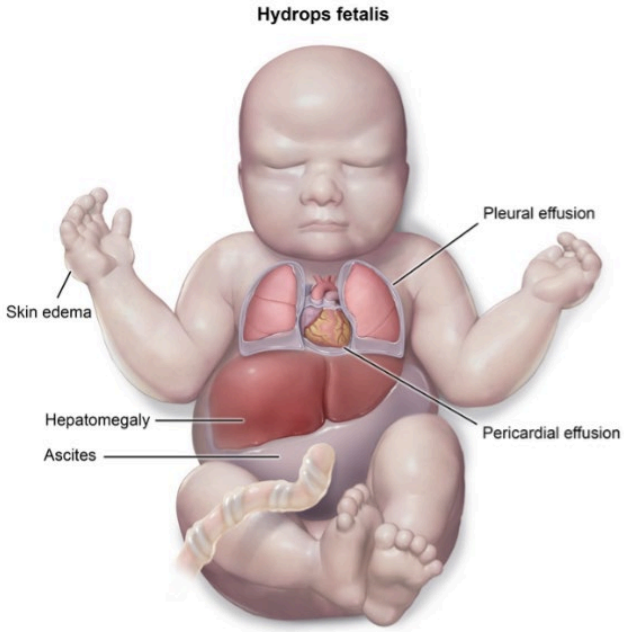


Rh status:

- Mother is antigen negative and antibodies are negative. Dad is antigen positive.
    - 1st baby is antigen positive → Mother builds immune response against the antigen aka making antibodies when she gets exposed which usually occurs at delivery.
    - 2nd baby is antigen positive → mother is already primed → for hemolytic anemia to occur the mother should have the correct type and sufficient titers.
        - Types:
            - L: lewis lives.
            - D: duffy dies. (not the actual duffy; just to remember)
                - Causes fetal anemia.
                - Treatment is RhoGam (D).
            - K: kell kills.
        - Titers greater than 1:8.
- Protective factor: anti-A and anti-B antibodies rapidly lyse foreign RBCs before maternal lymphocytes are stimulated to produce active antibodies.

What to do?

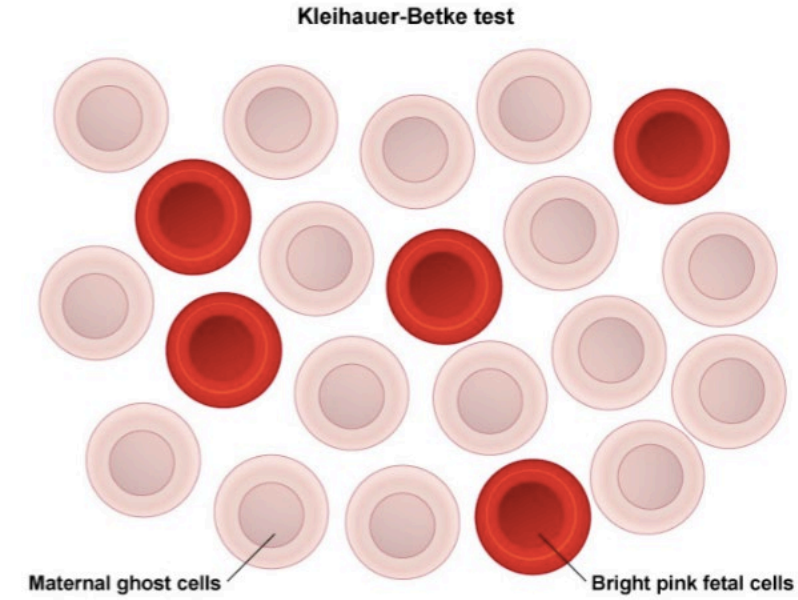
1. Check Rh status.
    a. If positive→ nothing.
    b. If negative→ check the dad's.
        i. If negative → nothing.
        ii. If positive or unknown→ baby's at risk.
            1. Don't do amnio PCR.
2. Check antibodies status via indirect Coombs test.
    a. If negative → prophylaxis.
    b. If positive → check amount.
        i. If <1:8 → prophylaxis.
        ii. If >1.8 → Transcranial (MCA) doppler. (increased flow due to anemia)
            1. Does not show increased flow → prophylaxis.
            2. Shows increased flow → based gestational age.
                a. Weigh out risks and benefits.
                    i. If over 32 weeks → deliver.
                    ii. If less than 32 weeks → percutaneous umbilical blood sampling (from umbilical vein).
                        1. To check fetus hemoglobin and allow transfusion.



Prophylaxis:

- Antigen – mother exposed to antigen + baby.
- At the time of maternal fetal mixing.
    - Delivery or PPH or C-section or obstetric procedure.

- Give Rh(D) IgG at 28 weeks and at within 72 hours of delivery if the baby is Rh+.
    - 300 micrograms at 28 days.
        - 28 to 32 weeks to cover the next 6 weeks to cover any potential risk of exposure to fetal RBCs.
    - Higher dose will be required after delivery, placental abruption, or procedures.
        - Determined by the rosette and Kleihauer-Betke test.
            - Rosette: initial test to assess potential fetal-maternal hemorrhage in Rh-positive fetal RBCs.
                - Negative → standard dose.
                - Positive → Kleihauer-Betke test.
            - Kleihauer-Betke: to determine the appropriate dose.



1. Red blood cells from maternal circulation fixed to a slide
2. Slide exposed to acidic pH solution
3. Maternal hemoglobin (A) lyses and fetal hemoglobin (F) remains
4. Lab technician reports % of fetal cells
5. Anti-D immune globulin dose is calculated using % of remaining fetal cells

Indications for prophylactic administration of anti-D immunoglobulin for Rh(D)-negative patients*

- At 28-32 weeks gestation
- <72 hours after delivery of Rh(D)-positive infant
- <72 hours after spontaneous abortion
- Ectopic pregnancy
- Threatened abortion
- Hydatidiform mole
- Chorionic villus sampling, amniocentesis
- Abdominal trauma
- 2nd- & 3rd-trimester bleeding
- External cephalic version

*Antepartum prophylaxis is not indicated if the father is Rh(D) negative.

Prenatal Infections

Group B strep:

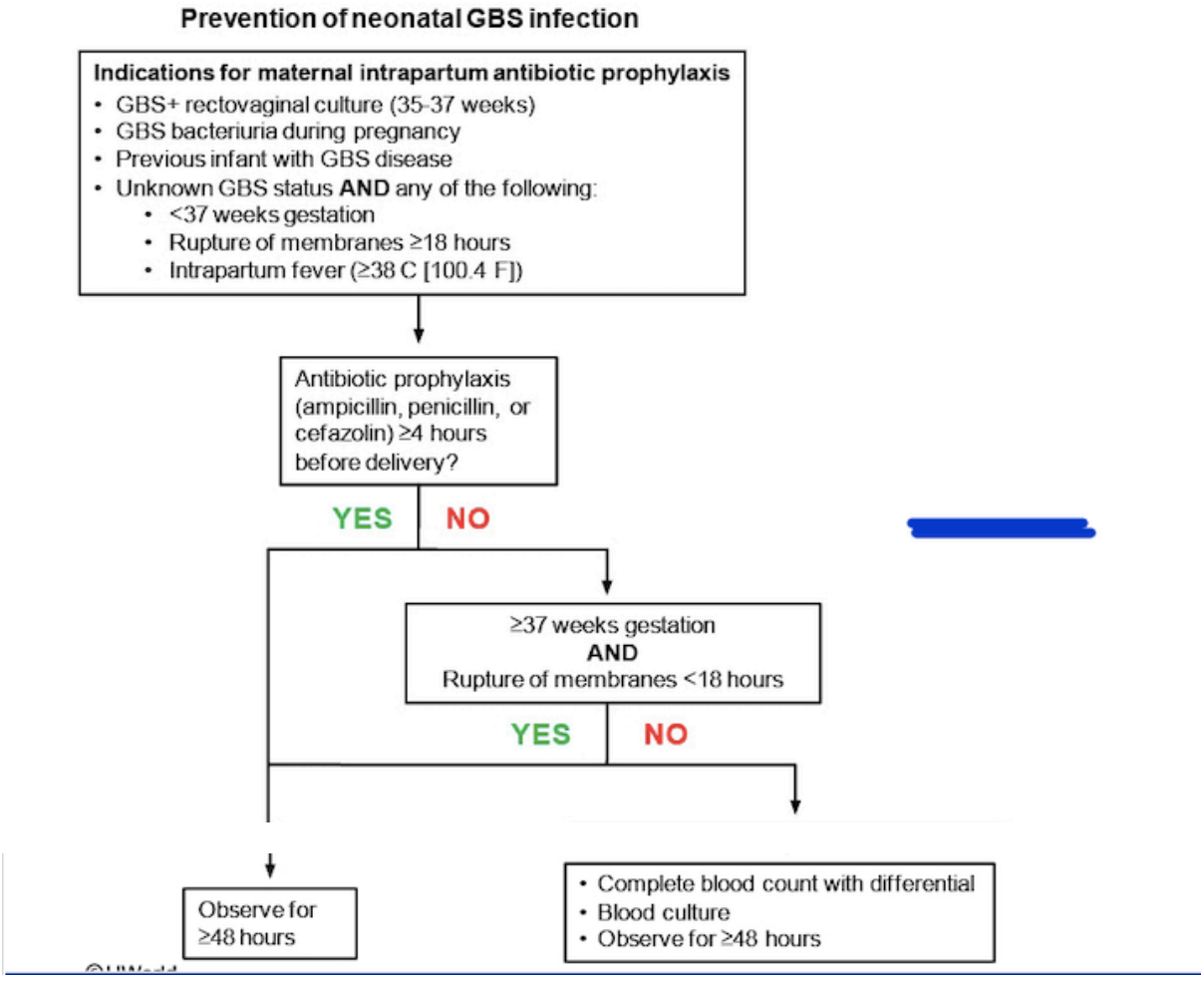
- For the mum its benign.
- For the baby its devastating.
- C/P:
    - Women undergoing prenatal screen.
        - Asymptomatic screen; urinalysis at week 10.
            - If bacteruria/UTI → heavily colonized → give intrapartum penicillin at the time of delivery even if cured.
            - If negative → screen at week 35 → positive → treat.
    - Women not undergoing prenatal screen.
        - Healthy normal delivery with a healthy normal baby → toxic baby on the 2nd day.
- Diagnosis:
    - Urinalysis as an asymptomatic screen.
    - Rectovaginal culture at 35-37 weeks; most sensitive test
    - Clinical (baby crashing).
    - Risk factor positive.
        - If the baby was GBS + in the first pregnancy.
        - Prolonged ROM.
        - Intrapartum fever.
        - Delivery <37 weeks (cause GBS status is unknown).
- Treatment: ampicillin.
    - If penicillin allergy → cefazolin.
    - If penicillin anaphylactic → dual sensitivity testing of GBS isolates to both clindamycin and erythromycin is performed because erythromycin resistance is associated with inducible clindamycin resistance.
        - Sensitive to both → IAP is with clindamycin.
        - Resistant to clindamycin or erythromycin or for whom sensitive are unavailable → IAP is with vancomycin.
    - Last resort → vancomycin.
- Prophylaxis given 4 hours before delivery.
- No need to provide prophylaxis for mothers having C-section without labor or ROM.

Preventing neonatal group B *Streptococcus* infection	
Antenatal screening	• Rectovaginal culture at 36-38 weeks gestation

Indications for intrapartum prophylaxis	• GBS bacteriuria or GBS urinary tract infection in current pregnancy (regardless of treatment)
	• GBS-positive rectovaginal culture in current pregnancy
	• Unknown GBS status PLUS any of the following:
	  ○ <37 weeks gestation
	  ○ Intrapartum fever
	  ○ Rupture of membranes for ≥18 hours
	• Prior infant with early-onset neonatal GBS infection

Intrapartum prophylaxis	• Intravenous penicillin

- If ROM and GBS-ve → no need for prophylaxis.



Hepatitis B:

- Vertical transmission from asymptomatic mother.

- C/P:
    - Asymptomatic.
    - Screen at 10 weeks.
- Diagnosis:
    - Presence of HepB surface antibody → either vaccine or exposure.
    - Presence of HepB core antibody → exposure.
    - Presence of HepB s antigen → infected.
    - Presence of HepB e antigen → infective.
- Treatment:
    - C-section protective but not evidence supported.
    - Give baby IVIG and Hep B vaccine.
- Prophylaxis: vaccinate mum before she gets pregnant.

Perinatal hepatitis B virus infection	
Epidemiology	• 90% risk of vertical transmission without prophylaxis • <2% risk after prophylaxis • Chronic infection in 90% of perinatally infected infants
Risk factors	• High maternal viral load • Maternal HBeAg+
Transmission	• Perinatal exposure to genital secretions (most common) • Transplacental (rare) • Not transmitted by breastfeeding
Prevention	• HBV vaccine (active immunization) AND • HBIG (passive immunization)

HBIG = hepatitis B immune globulin; HBV = hepatitis B vaccine.

HIV:

- Worry about CD_4 count and mother's risk of opportunistic infections.
- Increase in the viral load → increased risk of infections.
- C/P:
    - Asymptomatic screen in the case of prenatal care.
    - No prenatal care.
- Diagnosis:
    - Mother: ELISA and the best is western blot.
        - Check viral load and CD_4 count.
- Treatment:
    - 2 NRTI and 1 NNRTI or protease inhibitor.
        - NRTI: tenofovir and emtricitabine.
        - Older NRTI: zidovudine and lamivudine.
        - NNRTI: nevirapine.
        - Protease inhibitor: atazanavir.

HIV management during pregnancy	
Antepartum	• HIV RNA viral load at initial visit, every 2-4 weeks after initiation or change of therapy, monthly until undetectable, then every 3 months • CD4 cell count every 3-6 months • Resistance testing if not previously performed • ART initiation as early as possible • Avoid amniocentesis unless viral load ≤1,000 copies/mL
Intrapartum	• Avoid artificial ROM, fetal scalp electrode, operative vaginal delivery • Viral load ≤1,000 copies/mL: ART + vaginal delivery • Viral load >1,000 copies/mL: ART + zidovudine + cesarean delivery
Postpartum	• Mother: Continue ART • Infant (maternal viral load ≤1,000 copies/mL): Zidovudine • Infant (maternal viral load >1,000 copies/mL): Multi-drug ART

ART = antiretroviral therapy; **ROM** = rupture of membranes.

TORCHES:

- Toxoplasmosis:
  - Caused by T. gondii.
  - Methods of acquiring:
    - Cat feces.
    - Undercooked meat (MCC).
    - Cysts in soil.
  - C/P:
    - Mono-like illness: fever, malaise, anterior cervical LDN and HSM.
    - Baby: intracranial calcifications, ventriculomegaly (macrocephaly), seizure disorders, and chorioretinitis.
  - Diagnosis:
    - Check the mother's antibody status:
      - Antibody positive → reassurance.
      - Antibody negative→ counsel on antibodies.
- Others: Syphilis:
  - Caused by T. pallidum.
  - An STI.

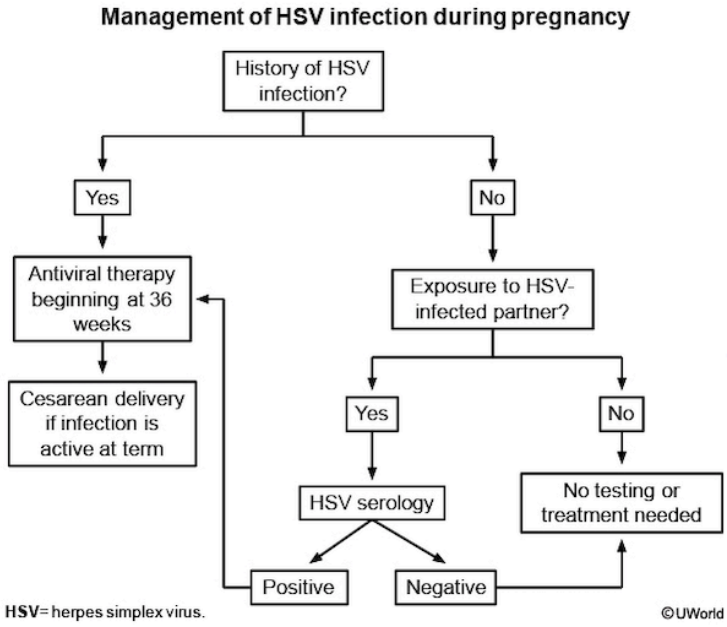
Syphilis manifestations	
Primary	• Painless genital ulcer (chancre)
Secondary	• Diffuse rash (palms & soles) • Lymphadenopathy (epitrochlear) • Condyloma latum • Oral lesions • Hepatitis
Latent	• Asymptomatic
Tertiary	• CNS (tabes dorsalis, dementia) • Cardiovascular (aortic aneurysm/insufficiency) • Cutaneous (gummas)

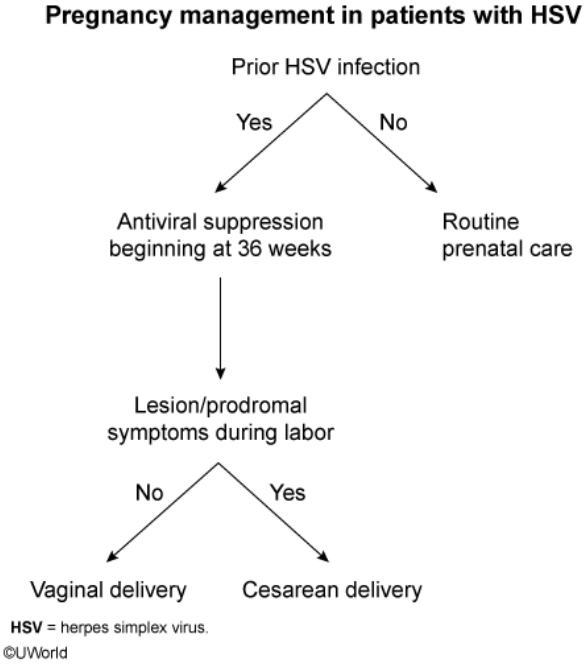
- Diagnosis:
  - Primary: dark field microscopy.
  - Secondary: VDRL/RPR → FTA-Abs.
  - Tertiary: CSF.
  - Latent: same as secondary.
- Treatment:
  - Penicillin for all stages. (single IM injection except late latent: IM injection every week for 3 weeks and tertiary: IV penicillin every 4 hours for 7-10 days)
  - Allergic: desensitize and give penicillin.
- Baby:
  - 1st trimester: dead.
  - 2nd and 3rd trimester: snuffles, saber shins, saddle nose, and hutchinson's teeth.

Syphilis in pregnancy	
Screening	• Universal at first prenatal visit • Third trimester & delivery (if high risk)
Serologic tests	• Nontreponemal (RPR, VDRL) • Treponemal (FTA-ABS)
Treatment	• Intramuscular penicillin G benzathine
Pregnancy effects	• Intrauterine fetal demise • Preterm labor
Fetal effects	• Hepatic (hepatomegaly, jaundice) • Hematologic (hemolytic anemia, ↓ platelets) • Musculoskeletal (long bone abnormalities) • Failure to thrive
FTA-ABS = fluorescent treponemal antibody absorption; **RPR** = rapid plasma reagin; **VDRL** = Venereal Disease Research Laboratory test.	

- Rubella:
  - Contraction of virus during pregnancy will affect baby.
  - C/P:
    - Prenatal care but not vaccinated.
    - No prenatal care.

    - MMRV should be given 3 months before pregnancy, if she took it during pregnancy it will lead to primary viremia.
    - Baby:
        - Blueberry muffin rash.
        - Cataracts.
        - PDA.
        - Sensorineural deafness.
        - If she acquires in 1st trimester → IUGR and death.
    - Treatment:
        - Avoidance.
        - Supportive management.
    - Prophylaxis:
        - MMRV 3 months before pregnancy.
- CMV:
    - C/P:
        - Mono-like illness.
- HSV:
    - An STI.
    - Primary viremia is the cause of transmission.
        - Secondary reactivation: infected wherever you touch the lesion.
    - C/P:
        - Painful burning prodrome.
        - Vesicles on erythematous base.
    - Diagnosis:
        - HSV PCR from scraping.
    - Treatment:
        - (Val)acyclovir.
        - C-section for all women who are in labor with:
            - Active genital HSV lesions or prodromal symptoms.
        - Pregnant with history of genital HSV → suppressive therapy at 36 weeks.
        - If first episode of genital herpes within last 6 weeks of delivery → C-section.
    - Baby:
        - Congenital IUGR, preterm delivery, and blindness.





Varicella zoster:

- High risk of developing varicella and complications from it such as encephalitis and pneumonia.
- Prevent infection with varicella zoster immune globulin (VZIG) for those who have negative serologies or never been exposed before.
    - Should be given within 72 to 96 hours of exposure but can also be given as late as 10 days after exposure.
- Neonatal varicella:

- C/P:
  - Pox-like rash.
  - Pneumonia.
  - Encephalitis.
  - Bacterial superinfection.

Listeria monocytogenes:

- Gram positive and catalase positive grows at 4 degree Celsius.
- Found in deli meats, poultry, and unpasteurized milk (soft cheeses).
- C/P:
  - Fever.
  - Malaise.
  - Abdominal pain.
  - Diarrhea.
  - Fetus: transplacental transmission
    - First or second trimester: granulomatosis infantiseptica (disseminated abscesses/granulomas).
    - Third trimester: fetal distress, preterm delivery, or early-onset neonatal sepsis.
- Prevention: proper handwashing after handling soil or decaying vegetation.

Listeria monocytogenes	
Pathogenesis	• Foodborne transmission • Bacterial invasion of intestinal epithelial cells • Transplacental passage to fetus
Clinical features	• Febrile gastroenteritis in immunocompetent host • Invasive disease (eg, sepsis, meningitis) in neonates, pregnant women, elderly, immunocompromised
Laboratory findings	• Gram-positive rods on culture (eg, stool, blood, CSF)
Treatment	• Supportive care for gastroenteritis in normal host • Parenteral antibiotics for invasive disease

OB Operations

Procedure	Benefit	Risk	Bonus/Pearl
C-Section "hysterotomy"	Elective (either breech position or desired). Urgent (prolonged or arrest of labor or eclampsia). Emergent (maternal hemodynamic instability or fetal distress).	Risk if mother wants a vaginal birth after C-section (VBAC). Scar. Permanent sterilization and bilateral tubal ligation.	VBAC: prior c-section and mother is pregnant again. What to do? Ask about type of C-section and risk of attempting vaginal births. If less than 2 C-sections and both are low transverse cuts → low risk → attempt vaginal delivery → if successful it's called VBAC but if it failed → TOLAC and do unplanned C-section. Anything else → high risk→ plan C-section.
Vacuum or forceps delivery	Fetal distress or prolonged or arrest of labor. Criteria for use: Full effacement of cervix and 2+ station.	Denudation of vagina. Forceps cause cephalohematoma and bell's palsy.	
Episiotomy (laceration)	Indicated when baby is macrosomic in a small vagina (1st time mum)→to prevent dystocia.	Laceration → PPH.	
Cerclage	To preserve an incompetent cervix (caused by repeated STI and PID or repeated dilations (D&C)).	Done on week 14; rupture of amniotic sac. Cervical lacerations and rupture might take place if it wasn't removed by week 36.	

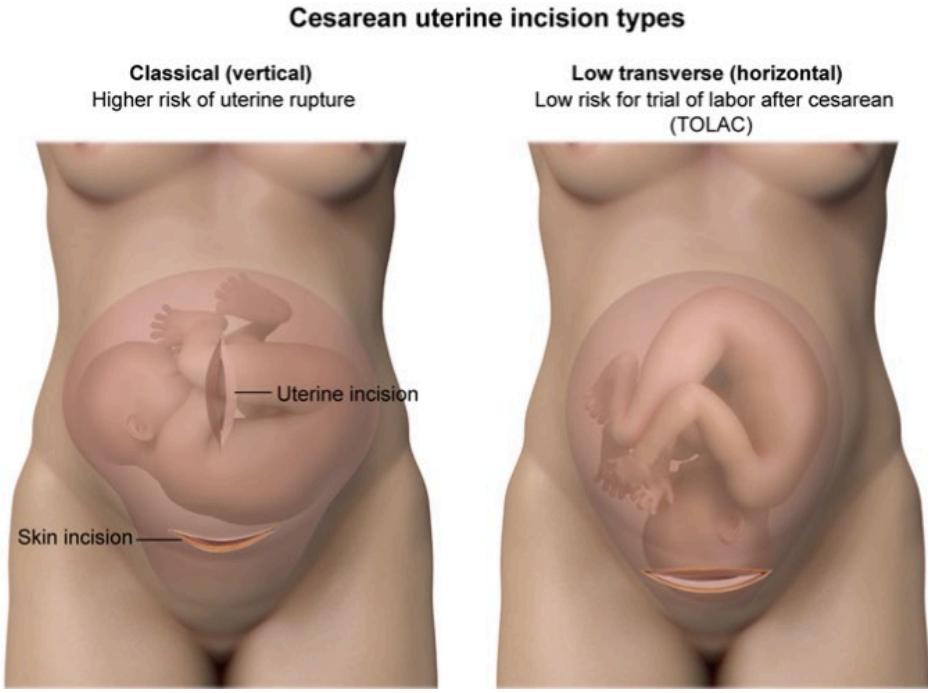
	C/P: multiple 2nd trimester losses.		

Uterine surgical history & vaginal birth	
Surgery	**Trial of labor contraindicated?**
Low transverse cesarean delivery (horizontal incision)	No
Classical cesarean delivery (vertical incision)	Yes
Abdominal myomectomy with uterine cavity entry	Yes
Abdominal myomectomy without uterine cavity entry	No

C-section:

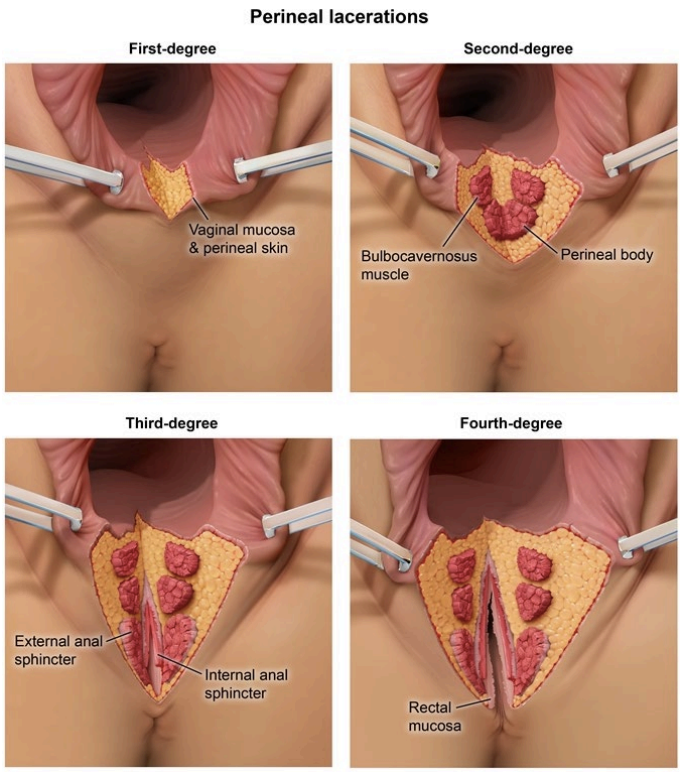
- Slow controlled planned elective:
  - To preserve aesthetics.
  - A bikini cut on the abdomen and low transverse incision on the uterus.
- Crash section:
  - Incision from xyphoid to pubis.
- Indications:
  - Absolute:
    - Maternal: previous 2 or more C-sections, placenta previa, abruptio placenta, contracted pelvis.
    - Fetal: fetal distress, macrosomia, and breech.
  - Relative:
    - Maternal: pre-eclampsia, prolonged labor, or elderly.
    - Fetal: fetal distress and multiple gestations.
- Layers:
  - Skin.
    - Subcuticular suture.
  - Subcutaneous tissue.
    - Continuous interlocked.
    - Layers depends on how thick the subcutaneous tissue is.
  - Rectus fascia.
    - Vertical continuous.
  - Rectus muscle.
    - Not sutured.
  - Parietal peritoneum.
    - Continuous suture.
  - Visceral peritoneum.
    - Not sutured.
  - Uterus (lower uterine segment where the visceral peritoneum attaches loosely).

        - Sutured by continuous interlocked 2 layers.
- Complications:
    - Fetal: low APGAR score.
    - Maternal:
        - Immediate (within 24 hours):
            - Uterine artery injury → intraabdominal bleeding → hemorrhagic shock.
                - Retroperitoneal bleeding.
                - Unstable → laparotomy.
            - PPH: leads to hypovolemic shock then DIC.
                - Atonic: reactionary (first 24 hours) or secondary (after 24 hours).
                    - Massage then uterotonics.
                - Traumatic:
                    - Look for lacerations and suture them.
            - Urinary retention.
        - Late (after 24 hours):
            - Secondary PPH.
            - Endometritis.
            - DVT.
            - Wound infections.
            - Spinal headache.
            - UTI.
            - Breast engorgement.



Episiotomy:

- Two types:
  - Median: hurts less and heals better but risk of progression to grade 4.
  - Mediolateral: hurts more but heals poorer but no grade 4 risk.
- Grades:
  - 1: the vagina only.
  - 2: into the perineal body.
  - 3: into the anus but not mucosa.
  - 4: through the mucosa.
    - Could form a rectovaginal fistula.
- Layers:
  - Mucosa.
  - Perineal muscles.
  - Skin.
- Perineal body muscle attachment:
  - Bulbospongiosus.
  - Levator ani.
  - Transverse superficial and deep perineal muscle.
- To prevent excessive tearing → apply perineal pressure.
- C/P post laceration repair:
  - Localized pain with voiding (due to proximity to urethra).
  - Perineal edema.
  - Management: supportive, NSAIDs, and sitz baths.



Anesthesia:

- Opiates:
  - Can be used anytime except in stage 1 latent cause it may lead to a prolonged latent phase.
  - If it was given late it might affect baby → give naloxone.
- Epidural:
  - A "pop" is wrong. Risk of epidural infusion → CVS collapse.
  - Tocometer to know if she's contracting and a coach will be needed.
- Local:
  - Locally anesthetize the cervix to relieve pain in stage 1.
    - Risk of fetal bradycardia. (only time it is not an indication for C-section)
  - Pudendal nerve block for stage 2.
    - Only complication is if you miss.

Povidine iodine vaginal douche:

- Used as a general antimicrobial cleanser for preoperative preparation for vaginal surgery (eg. Hysteroscopy, total vaginal hysterectomy).

Vaginal cuff dehiscence:

- Post-hysterectomy.
- Increased watery vaginal discharge.

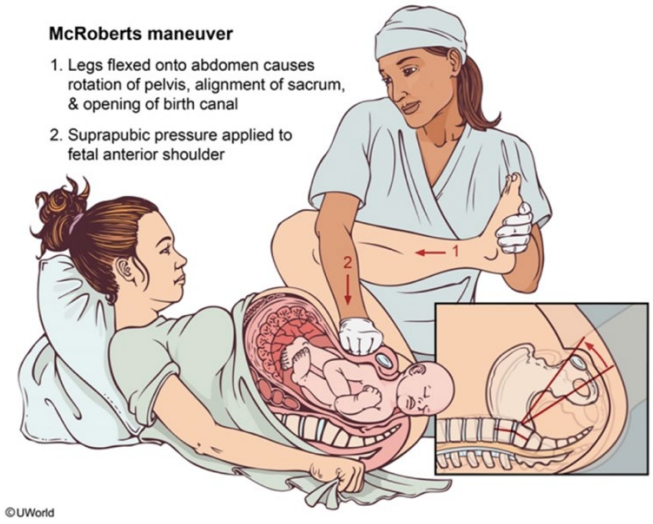
Obstetric Emergency

Shoulder dystocia:

- **Definition: inability to deliver the fetal shoulders with usual obstetric maneuvers.**
- The major risk factor is fetal macrosomia (>4.5 kg).
    - Post-term pregnancy (>42 weeks).
    - Maternal obesity.
    - Gestational DM.
    - Excessive maternal weight gain during pregnancy.
- Warning signs:
    - Prolonged first or second stage of labor.
    - Retraction of fetal head into perineum (turtle sign).

Management of shoulder dystocia (BE CALM)	
B	Breathe; do not push
E	Elevate legs & flex hips, thighs against abdomen **(McRoberts)**
C	Call for help
A	Apply **suprapubic pressure**
L	EnLarge vaginal opening with episiotomy
M	Maneuvers: • Deliver posterior arm • Rotate posterior shoulder **(Woods screw)** – apply pressure to anterior aspect of the posterior shoulder • Adduct posterior fetal shoulder **(Rubin)** – apply pressure to the posterior aspect of the posterior shoulder • Mother on hands & knees –"all fours" **(Gaskin)** • Replace fetal head into pelvis for cesarean delivery **(Zavanelli)**

- Each maneuver should take 30 seconds.
    - Cause with each 30 seconds passing → the fetal pH is decreasing by 0.1 leading to acidosis.
- Maternal complications:
    - Fourth degree perineal lacerations.
    - Postpartum hemorrhage.



Complications of shoulder dystocia	
Fractured clavicle	• Clavicular crepitus/bony irregularity • ↓ Moro reflex due to pain on affected side • Intact biceps & grasp reflexes
Fractured humerus	• Upper arm crepitus/bony irregularity • ↓ Moro reflex due to pain on affected side • Intact biceps & grasp reflexes

Erb-Duchenne palsy	• ↓ Moro & biceps reflexes on affected side
	• "Waiter's tip"
	  ◦ Extended elbow
	  ◦ Pronated forearm
	  ◦ Flexed wrist & fingers
	• Intact grasp reflex

Klumpke palsy	• "Claw hand"
	  ◦ Extended wrist
	  ◦ Hyperextended metacarpophalangeal joints
	  ◦ Flexed interphalangeal joints
	  ◦ Absent grasp reflex
	• Horner syndrome (ptosis, miosis)
	• Intact Moro & biceps reflexes

Perinatal asphyxia	• Variable presentation depending on duration of hypoxia • Altered mental status (eg, irritability, lethargy), respiratory or feeding difficulties, poor tone, seizure

Amniotic fluid embolism:

- Amniotic fluid into the endocervical veins.

Amniotic fluid embolism	
Risk factors	• Advanced maternal age • Gravida ≥5 (live births or stillbirths) • Cesarean or instrumental delivery • Placenta previa or abruption • Preeclampsia
Clinical presentation	• Cardiogenic shock • Hypoxemic respiratory failure • Disseminated intravascular coagulopathy • Coma or seizures
Treatment	• Respiratory & hemodynamic support • ± Transfusion

- High incidence of neurological damage.

Acute Fatty Liver of Pregnancy (AFLP):

Acute fatty liver of pregnancy	
Clinical features	• Nausea, vomiting • Right upper quadrant/epigastric pain • Fulminant liver failure
Laboratory findings	• Profound hypoglycemia • ↑ Aminotransferases (2-3x normal) • ↑ Bilirubin • Thrombocytopenia • Disseminated intravascular coagulopathy
Management	• Immediate delivery

- Labs:
  - **Increased ammonia.**
  - Acute kidney injury due to hepatorenal syndrome.

Postpartum Complications

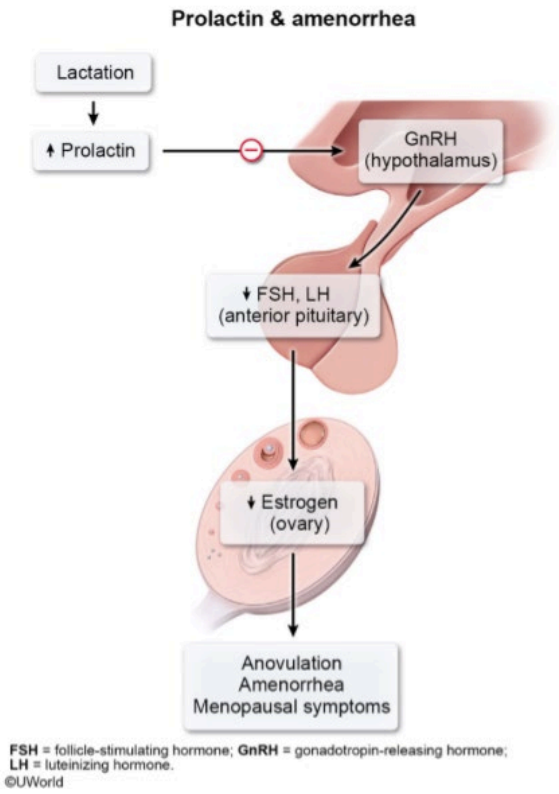
Postpartum period:

Postpartum period	
Normal findings	• Transient rigors/chills • Peripheral edema • Lochia rubra • Uterine contraction & involution • Breast engorgement
Routine care	• Rooming-in/lactation support • Serial examination for uterine atony/bleeding • Perineal care • Voiding trial • Pain management

- Early puerperium; 6 weeks (42 days) after delivery.
- Shivering occurs due to thermal imbalance.
- Uterus contracts and becomes firm and globular and typically 1-2cm above or below the umbilicus.
- During the first few days after delivery → lochia rubra (red or reddish-brown vaginal discharge) from the normal shedding of the uterine decidua and blood.
- After 3-4 days → lochia serosa (thin and pink or brown colored).
- After 2-3 weeks → lochia alba (white or yellow).
- Lactational amenorrhea because prolactin has an inhibitory effect on GnRH. A form of contraception in the first 6 months after pregnancy.
    - Menopause-like vasomotor symptoms and vulvovaginal atrophy (nonhormonal lubricants and moisturizers; if refractory → vaginal estrogen).

Normal postpartum lochia		
	Expected duration	**Description**
Lochia rubra	• Birth to 3-4 days postpartum	• Dark or bright red (blood); odor similar to that of menstrual blood; occasional small clots; quantity decreasing each day
Lochia serosa	• 4th postpartum day to 10th or 14th postpartum day	• Serosanguineous (pink); brownish (old blood); quantity gradually decreasing in amount
Lochia alba	• 11th postpartum day to 6 weeks postpartum	• White/yellow; creamy; light quantity

Lochia may increase in quantity after breastfeeding (suckling releases oxytocin & causes uterus to contract) & 7-14 days postpartum, when scabbing on the placental site sloughs off (heavier bleeding for <2 hr); lochia may also feel increased after lying down & then standing (due to blood pooling in vagina).



Postpartum urinary retention:

- Overdistention of the bladder secondary to impaired detrusor contractility or bladder outlet obstruction.
    - Perineal injury → pudendal nerve damage.
        - Motor: external anal sphincter, levator ani, bulbospongiosus, and ischiocavernosus.
        - Sensory: perineum, clitoris, labia, and anal canal.
    - Neuraxial anesthesia can suppress the micturition reflex and decrease detrusor tone → atony.
- Inability to void for 6 hour or more after vaginal delivery or 6 hours or more after urinary catheter removal following C-section.
- Can have concomitant overflow incontinence.
- Resolves in <1 week.
- A postvoid residual volume of 150 ml of more is consistent with urinary retention.

Postpartum urinary retention	
Risk factors	• Primiparity • Regional anesthesia • Operative vaginal delivery • Perineal injury • Cesarean delivery
Clinical features	• Inability to void or small-volume voids • Incomplete bladder emptying • Dribbling of urine
Management	• Self-limited condition • Intermittent catheterization

Postpartum urinary incontinence:

- Two main mechanisms:
  - Weakening of the pelvic floor muscles due to increased intraabdominal pressure with fetal descent and pushing → urethral hypermobility and inability of the urethra to fully compress closed during periods of increased intraabdominal pressure → leakage of urine with Valsalva.
  - Stretch injury to the pudendal nerve → innervates external urethral sphincter.
- Increases the risk of chronic SUI.
- Self-limited.
- Management:
  - <6 weeks postpartum → observation and reassurance + kegel exercise.
  - Chronic SUI → continence pessary or midurethral sling.

Postpartum fever:

- Fever: 38 or more on 2 or more occasions 6 hours apart, excluding the first 24 hours.

Postpartum Fever

Physical Exam	Diagnosis	Management
Lung "crackles" PP Day 0	Atelectasis	Ambulation, pulmonary exercises
Flank pain, dysuria PP Day 1-2	Pyelonephritis	Single IV antibiotic
Tender uterus PP Day 2-3	Endometritis	IV gentamicin and clindamycin
Wound purulence PP Day 5-6	Wound infection	Wet-to-dry packs
Pelvic mass PP Day 5-6	Pelvic abscess	Percutaneous drainage
"Picket fence" fever PP Day 5-6	Septic thrombophlebitis	Full heparinization

Vaginal hematoma:

Vaginal hematoma	
Risk factors	• Operative vaginal delivery • Infant ≥4000 g (8.8 lb) • Nulliparity • Prolonged 2nd stage of labor
Clinical features	• Vaginal mass • Rectal or vaginal pressure • ± hypovolemic shock
Treatment	• Nonexpanding: observation • Expanding: embolization, surgery

- Stretching of the vaginal canal can injure the uterine artery.

Septic pelvic thrombophlebitis:

Septic pelvic thrombophlebitis	
Risk factors	• Cesarean delivery • Pelvic surgery • Endometritis • Pelvic inflammatory disease • Pregnancy • Malignancy
Pathophysiology	• Hypercoagulability • Pelvic venous dilation • Vascular trauma • Infection
Presentation	• Fever unresponsive to antibiotics • No localizing signs/symptoms • Negative infectious evaluation • Diagnosis of exclusion
Treatment	• Anticoagulation • Broad-spectrum antibiotics

Postpartum DVT:

- C/P:
    - Fever.
    - Leg pain.

    - Warmth.
    - Edema.
    - Erythema.
    - Positive Homan sign.
- Compression US confirms the diagnosis.
- Risk of it peaks 6 weeks postpartum.
- Treatment: LMWH.

Postoperative atelectasis:

- C-section and general anesthesia are associated with reduced lung compliance, diminished ventilation, retained airway secretion, and postoperative pain.
- C/P:
    - Poor cough.
    - Shallow breathing.
- Treatment:
    - Deep breathing exercises.
    - Directed coughing.
    - Incentive spirometry.
    - Suction of secretions.
    - CPAP.

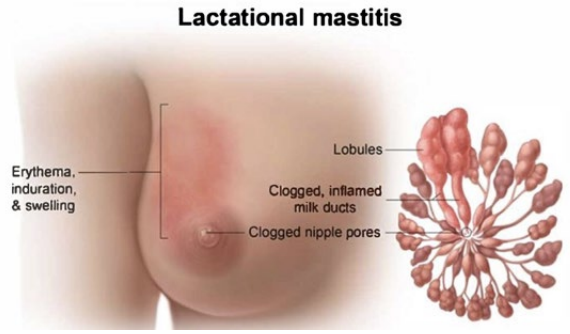
Postpartum aspiration pneumonitis:

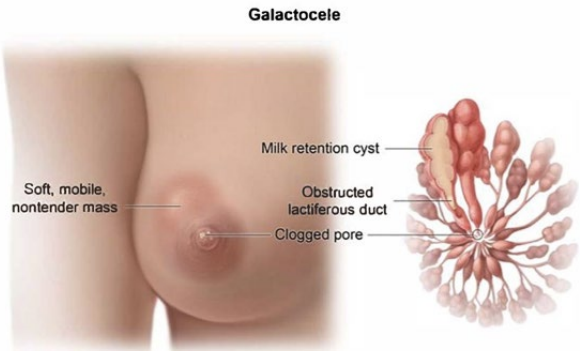
Aspiration (chemical) pneumonitis	
Risk factors	• Gastric reflux (ie, ↓ esophageal sphincter tone) • Delayed gastric emptying • ↑ Intraabdominal pressure • Altered consciousness or sedation (eg, anesthesia) • Endotracheal intubation, nasogastric tube
Pathophysiology	• Aspiration of gastric acid with direct tissue injury • Lung parenchymal inflammation
Clinical presentation	• Within hours of aspiration event • Acute-onset dyspnea, low-grade fever, hypoxemia • Diffuse crackles on lung examination • Chest x-ray infiltrates (dependent lung segments)
Management	• Supportive care (ie, no antibiotics)

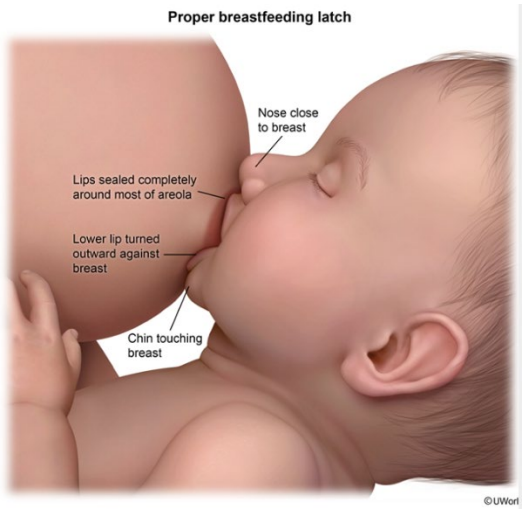
Lactation:

Common problems related to lactation	
Diagnosis	**Clinical features**
Engorgement	Bilateral, symmetric fullness, tenderness & warmth
Nipple injury	Abrasion, bruising, cracking &/or blistering from poor latch
Plugged duct	Focal tenderness & firmness &/or erythema; no fever
Galactocele	Subareolar, mobile, well-circumscribed, nontender mass; no fever
Mastitis	Tenderness/erythema + fever
Abscess	Symptoms of mastitis + fluctuant mass

- Engorgement management: cool compresses, acetaminophen, and NSAIDs.







Sheehan syndrome:

Sheehan syndrome	
Pathogenesis	• Obstetric hemorrhage complicated by hypotension • Postpartum pituitary infarction
Clinical features	• Lactation failure (↓ prolactin) • Amenorrhea, hot flashes, vaginal atrophy (↓ FSH, LH) • Fatigue, bradycardia (↓ TSH) • Anorexia, weight loss, hypotension (↓ ACTH) • Decreased lean body mass (↓ growth hormone)

- Aldosterone levels will be elevated to maintain the blood pressure.
- Management: evaluation of pituitary hormones and replacement.

Postpartum thyroiditis:

- Painless thyroiditis within 1 year of childbirth.
- Increased risk in those with other autoimmune disorders such as DM.
- C/P:
  - Nontender goiter.
  - Bradycardia.
  - Diastolic HTN.
  - Lower extremity edema.
  - Delayed DTRs.
  - Treatable cause of postpartum depression.
- Lab findings:
  - TSH elevated.
  - Low T4.
  - Hypercholesterolemia.
  - Hyponatremia.
  - Low radioactive iodine uptake.
  - Confirmed with positive anti-TPO antibody.
- Eventually return to euthyroid state and does not require treatment.

Pubic symphysis diastasis:

Pubic symphysis diastasis	
Risk factors	• Fetal macrosomia • Multiparity • Precipitous labor • Operative vaginal delivery
Presentation	• Difficulty ambulating • Radiating suprapubic pain • Pubic symphysis tenderness • Intact neurologic examination
Management	• Conservative • Nonsteroidal anti-inflammatory drugs • Physical therapy • Pelvic support

- Recovers within the first 4 weeks postpartum.

Rectovaginal fistula:

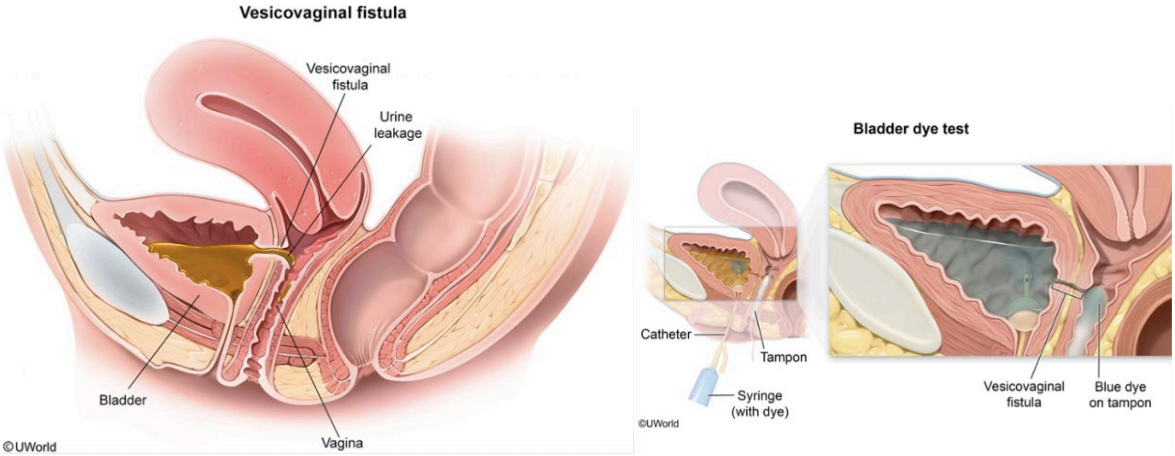
- Occurs due to third- or fourth-degree laceration.
- In developing countries → poor intrapartum care and a prolonged second stage of labor → ischemic necrosis of rectovaginal fistula from fetal head compression.
- C/P: malodorous brown/tan discharge.
- Diagnosis confirmed by visual exam showing dark red, velvety rectal mucosa on the posterior vaginal wall.
    - Anoscopy can help visualize it.
- Treatment: surgical repair.

Rectovaginal fistula	
Risk factors	• Pelvic radiation • Obstetric trauma • Pelvic surgery • Colon cancer • Diverticulitis • Crohn disease
Clinical features	• Uncontrollable passage of gas &/or feces from the vagina
Diagnostic studies	• Physical examination • Fistulography • Magnetic resonance imaging • Endosonography

Vesicovaginal fistula:

- Secondary to obstetric complications.

- Time frame:
    - Immediately following intraoperative bladder surgery.
    - Weeks or months following surgery or childbirth due to necrosis and sloughing.
    - Years after pelvic radiotherapy as a delayed presentation of radiation-induced microvascular injury and progressive tissue ischemia and breakdown.
- C/P:
    - Persistent urinary dribbling.
    - No associated bladder distention.
- Clinical diagnosis:
    - Bladder dye testing may identify small fistulas which are difficult to visualize.
- Treatment:
    - Surgical repair and bladder decompression.



Vesicovaginal fistula	
Risk factors	• Pelvic surgery • Pelvic irradiation • Prolonged labor/childbirth trauma • Genitourinary malignancy
Clinical features	• Painless, continuous urine leakage from the vagina
Diagnostic studies	• Physical examination • Dye test • Cystourethroscopy

Fecal incontinence:

Causes of fecal incontinence	
Trauma	• Operative vaginal delivery, obstetric laceration • Surgery (hemorrhoidectomy, anorectal surgery)
Neurologic	• Diabetic neuropathy • Multiple sclerosis • Spinal cord injury • Dementia
Chronic disease	• Constipation • Hemorrhoids, rectal prolapse • Inflammatory bowel disease • Infiltrative disease (cancer, systemic sclerosis) • Pelvic irradiation

- Fecal incontinence may be delayed and intermittent because surrounding pelvic floor muscles and connective tissue can help compensate for the injury.
- Age-related atrophy of the pelvic floor muscles, fecal incontinence can become increasingly frequent and severe.
- On examination: decreased anal sphincter tone and asymmetric anal wink.
- Diagnosis confirmed by anal manometry or endoanal ultrasound.
- Initial management: dietary modification, bowel training, and antidiarrheal medication.
    - Surgical repair for severe cases.

Postpartum blues/depression/psychosis:

- Sertraline is preferred due to undetectable levels in the infant.

Postpartum blues, depression & psychosis			
	Postpartum blues	**Postpartum depression**	**Postpartum psychosis**
Prevalence	40%-80%	8%-15%	0.1%-0.2%
Onset	2-3 days (resolves within 14 days)	Within 4 weeks	Variable: Days to weeks
Symptoms	Mild depression, tearfulness, irritability	Moderate to severe depression, sleep or appetite disturbance, low energy, psychomotor changes, guilt, concentration difficulty, suicidal ideation	Delusions, hallucinations, thought disorganization, bizarre behavior
Management	Reassurance & monitoring	Antidepressants, psychotherapy	Antipsychotics, antidepressants, mood stabilizers Hospitalization; do not leave mother alone with infant (risk of infanticide)

Intimate partner violence:

- Any type of physical, psychological, or sexual harm committed by a partner or spouse.
- Rate of IPV increase postpartum and cause significant maternal morbidity and/or infant complications.
- Due to increased stressors.
- Routine postpartum screening for IPV is required soon (3-6 weeks) after delivery.
    - Screening using open ended and specific questions to improve disclosure rates.
    - Those who screen positive → should be assessed for immediate safety and given additional resources (domestic violence program referral) for long-term safety planning (housing, childcare, finances).

Intimate partner violence	
Evaluation	• Routine annual examination • Suspicious signs/symptoms (eg, bruising) • Prenatal visits
Consequences	• Homicide • Mental health disorders (eg, PTSD) • Unintended pregnancy • Pregnancy complications (eg, abruptio placentae) • Sexually transmitted infections
Management	• Safety planning (eg, local shelter referral) • Psychosocial counseling

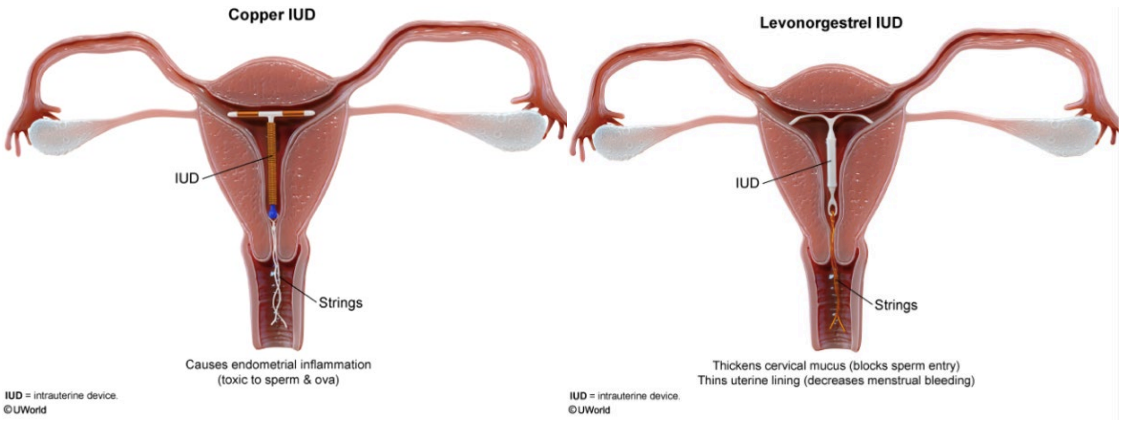
PTSD = posttraumatic stress disorder.

Contraception

High:

Long-acting reversible contraception:

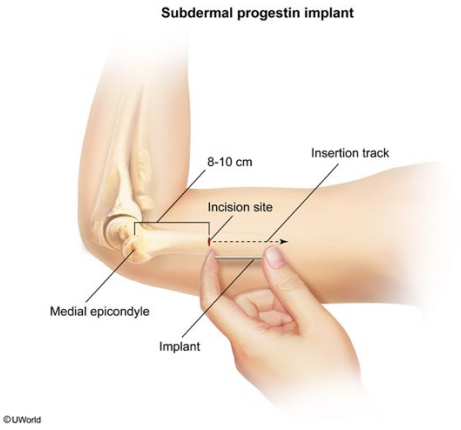
- The most effective.
- Two forms:
    - IUD
        - Indications: whenever OCP is contraindicated.
        - Hormonal: lasts 4 years only. Contains progesterone (levonergestrel).
            - Thickens cervical mucosa and impairs implantation.
            - Avoided in breast cancer.
            - ADRs: amenorrhea.
        - Copper: longest acting.
            - ADRs: Increases bleeding.
            - Benefits: no effect on HTN, high efficacy, and no effect on future fertility.
        - Can be used in the postpartum period if no endometritis took place.



Contraindications to IUD placement	
Copper IUD & progestin IUD	• Pregnancy • Endometrial or cervical cancer • Unexplained vaginal bleeding • Gestational trophoblastic disease • Distorted endometrial cavity • Acute pelvic infection (eg, PID, cervicitis)
Progestin IUD	• Active liver disease • Active breast cancer
Copper IUD	• Wilson disease

IUD = intrauterine device; **PID** = pelvic inflammatory disease.

- Non-IUD: nexplanon and implanon.
  - Injected under the skin.
  - Only good for 3 years.
  - Preferred for prevention of short-interval pregnancy.



Non-reversible contraception:

- Vasectomy in males.
- Bilateral tubal ligation in females:
  - Achieved during a C-section.
  - Can lead to ectopic pregnancy.

Moderate: (listed in descending order of effectiveness and duration)

Injections:

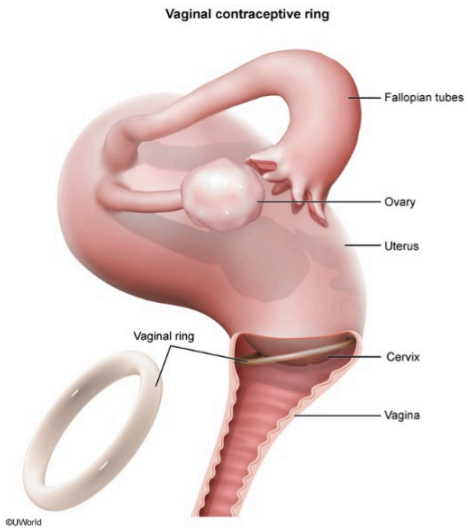
- Depo-provera: medroxyprogesterone acetate.
  - Lasts for 3 months.
  - Intramuscular injection.
  - Suppresses GnRH release from hypothalamus.
  - Causes menstrual irregularities in the first 6 months of use.
  - Amenorrhea after 1 year of use.
  - Used in epilepsy and sickle cell anemia.
  - ADRs:
    - Weight gain.
    - Fatigue.
    - Nausea.
    - Breast tenderness.
    - Osteoporosis.

Patches:

- Ortho-evra: lasts for 1 month.
    - Highest risk of DVT/PE.
        - DVT/PE risk increases when women is exposed to estrogen, smoking and >35 years.

Rings:

- Nuvaring: lasts for 1 month.
    - Vaginally inserted → can fall off.



OCPs:

- Inhibits LH rise that leads to ovulation.
- Daily compliance.
- The right answer for pathological states such as DUB.
- HTN due to increased angiotensinogen from the liver.
- VTE due to decreased protein S production from the liver.
- Negligible risk of teratogenicity.

Estrogen-progestin contraceptives: Benefits & risks	
Benefits	• Pregnancy prevention • Endometrial & ovarian cancer risk reduction • Menstrual regulation (eg, anovulation, dysmenorrhea, anemia) • Hyperandrogenism treatment (eg, hirsutism, acne)
Risks	• Venous thromboembolism • Hypertension • Hepatic adenoma • Stroke, myocardial infarction (both very rare) • Cervical cancer

Combined hormonal contraception contraindications	
Absolute	**Relative**
• Migraines with aura • Severe hypertension • Ischemic heart disease, stroke • Age ≥35 & smoking ≥15 cigarettes/day • <3 weeks postpartum • Thromboembolism • Thrombophilia (eg, factor V Leiden, APLS) • Active breast cancer • Active or severe liver disease	• Mild or medication-controlled hypertension • Age ≥35 & smoking <15 cigarettes/day • Certain medications (eg, lamotrigine, rifampin) • Inherited thrombophilia carrier (& family member with thrombophilia plus thromboembolism)

APLS = antiphospholipid-antibody syndrome.

Side effects & risks of combination oral contraceptives
• Breakthrough bleeding • Breast tenderness, nausea, bloating • Amenorrhea • Hypertension • Venous thromboembolic disease • Decreased risk of ovarian & endometrial cancer • Increased risk of cervical cancer • Liver disorders (eg, hepatic adenoma) • Increased triglycerides (due to estrogen component)

- Does not cause weight gain!
- Hepatic adenoma management:
  - Stop OCP and reimage in 6 months.
- Precoital contraception but can also be used for emergency contraception by taking multiple pills simultaneously to achieve the progestin levels required to delay ovulation.

Minipill (progestin-only contraceptive pills):

- Progesterone only.
- Less DVT risk.
- Daily compliance down to the HOUR.

- Viable option in the postpartum period while breastfeeding.
    - Avoid estrogen.

Low: barrier contraception used for STI protection alongside another form to prevent pregnancy.

Condoms:

- STI protection.
- In males.
- Responsibility of the man.
- At the time of sexual intercourse.

Diaphragms:

- STI protection.
- In females.
- Controlled by females.
- Used ahead of time.

Female condom.

Spermicides, sponges and caps: NO STI protection.

Doesn't work:

Family planning:

- Doesn't work at all to prevent.
- Used to get pregnant.

Withdrawal:

- Worst way.
- Male controlled.

- Pre-ejaculate contains sperm.

Emergency contraception: Qid

Emergency contraception			
Method	**Timing after intercourse**	**Efficacy**	**Contraindications**
Copper-containing intrauterine device	0-120 hr	≥99%	• Acute pelvic infection • Severe uterine cavity distortion • Wilson disease • Complicated organ transplant failure
Ulipristal	0-120 hr	98%-99%	• None
Levonorgestrel	0-72 hr	59%-94%	• None
Oral contraceptives*	0-72 hr	47%-89%	• None
*Combined estrogen/progestin oral contraceptives containing levonorgestrel or norgestrel.			

Adolescent well-child visit:

- To reduce unintended pregnancy:
  - Contraception counseling.
    - Dual contraception: condoms plus another method.
  - Discussion of safe sex practices.

Adolescents with disabilities:

- Dependent on their caregivers for menstrual hygiene.
- Put them on contraception to minimize bleeding and/or frequency.

Gynecology

Cancer Intro

Etiology → precancer → cancer:

- Risk factors: identify, reduce, and prevent.
  - Toxins.
  - Viruses.
  - Estrogen.
  - Ovulation.
- Precancer: resection is curative. Screen for them.
  - Carcinoma in situ.
  - Dysplasia.
- Cancer: diagnosis and staging. Based on staging → surgery (debulking), chemotherapy and radiotherapy. Worse stage → worse prognosis.
  - Adenocarcinoma.
  - Squamous cell carcinoma.

Lifespan of a woman:

- Premenarchal.
  - No ovulation → no estrogen.
  - No intercourse → no viruses.
  - Toxins are important especially the ones mum was exposed to during pregnancy.
- Menarche at 11.
- Reproductive age.
  - Ovulation → estrogen.
  - Intercourse → viruses.
  - Toxins.
- Menopause at 51.
- Postmenopausal.
  - Lifetime exposure to estrogen.

Overview of cancers:

- Ovarian cancer:
  - Germ cell tumors.
  - Epithelial tumors.
  - Stromal tumors.
- Endometrial cancer: most likely adenocarcinoma.
- Cervical cancer: most likely squamous cell carcinoma

    - Ectocervix.
    - Endocervix.
- Vaginal cancer: most likely SCC.
- Vulvar cancer:
    - Paget's disease.

Cancer	Etiology	Precancer	Cancer	Screen	Patient history
Cervical	HPV	CIS	SCC	Pap smear	Postcoital bleeding.
Vaginal	HPV	CIS	SCC	x	Black pruritic lesions.
Vulvar	HPV	CIS	SCC	x	Black pruritic lesions.
Endometrial	Estrogen	Dysplasia and atypia	Adenocarcinoma	x	Postmenopausal bleeding.
Ovarian	Ovulation	Low malignant potential	Epithelial ovarian cancer	x	Renal failure because of ureteral obstruction, small bowel obstruction, ascites.
Choriocarcinoma	Gestational trophoblastic disease	x	Choriocarcinoma.	B-HCG while on OCP	Hyperemesis gravidarum. Hyperthyroid. Size-date discrepancy.

Human papillomavirus	
Disease associations	• Cervical cancer • Vulvar & vaginal cancers • Anal cancer • Penile cancer • Oropharyngeal cancer • Anogenital warts • Recurrent respiratory papillomatosis
Vaccine indications	• All female and male patients* age 11-26 (but may be given to those age 9-45) • **NOT** indicated in pregnant women

*Including those with a history of genital warts, abnormal Pap cytology, or positive human papillomavirus DNA test.

Cervical Cancer

Rates are rapidly decreasing due to HPV vaccination and Pap smear screening.

Risk factors for cervical cancer
• Infection with high-risk HPV strains (eg, 16, 18) • History of sexually transmitted diseases • Early onset of sexual activity • Multiple or high-risk sexual partners • Immunosuppression • Oral contraceptive use • Low socioeconomic status • Tobacco use
HPV= human papillomavirus.

Cervical cancer	
Risk factors	• Immunocompromise (eg, HIV) • Early onset of sexual activity • Multiple or high-risk sexual partners • Previous sexually transmitted infection • Tobacco use
Pathogenesis	• HPV infection (types 16 & 18)
Clinical manifestations	• Asymptomatic • Postcoital or intermenstrual bleeding • Increased vaginal discharge • Inguinal lymphadenopathy • Pelvic or low back pain
Diagnosis	• Cervical biopsy on colposcopy

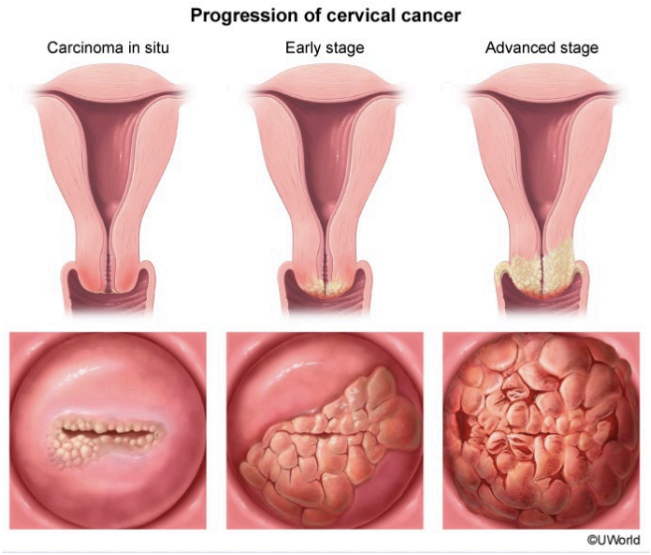
- Cause: HPV 16, 18, and the 30s.
    - HPV 6 and 11 cause warts.
        - Allow for vaginal delivery if mother is affected due to low risk of acquiring the HPV and getting benign laryngeal tumor and recurrent respiratory papillomatosis.

Genital warts (condylomata acuminata)	
Etiology	• HPV 6 & 11
Clinical features	• Multiple pink or skin-colored lesions • Lesions ranging from smooth, flattened papules to exophytic/cauliflower-like growths
Treatment	• Chemical: Podophyllin resin, trichloroacetic acid • Immunologic: Imiquimod • Surgical: Cryotherapy, laser therapy, excision
Prevention	• Vaccination • Barrier contraception

HPV = human papillomavirus.

- Bimodal distribution of cervical cancer.
    - In the 30s.
    - In the 60s.
- Clinical presentation:
    - In the 30s:
        - Asymptomatic bleed.
        - Postcoital bleeding.
    - In the 60s:
        - Postmenopausal bleeding.
- Pathophysiology:
    - Infection with HPV.
    - Inflammation of initial layers of the cervix.
    - Initial layer is dysplastic (CIN 1).
    - More layers affected.
    - Till entire layer is affected with cancer (CIS).
    - Once the cancer leaves the epithelial layer → cancer.

- Types: mostly squamous cell carcinoma.
    - Endocervical cancer.
    - Ectocervical cancer.
- Screen using pap smear for the stages CIN 1, CIN 2, CIN 3, and CIS.
    - Once cancer is developed → biopsy. (can be done during pregnancy)
- How to stage cancer:
    - Stage 1: cervix.
        - 1A: microscopic.
        - 1B: macroscopic.
    - Stage 2A: upper 2/3 of the vagina.
        - 2B: involvement of cardinal ligament.
    - Stage 3A: lower 1/3 of the vagina.
        - 3B: involvement of pelvic side wall.
    - Stage 4:
        - 4A: bowel and bladder.
        - 4B: distant metastasis.



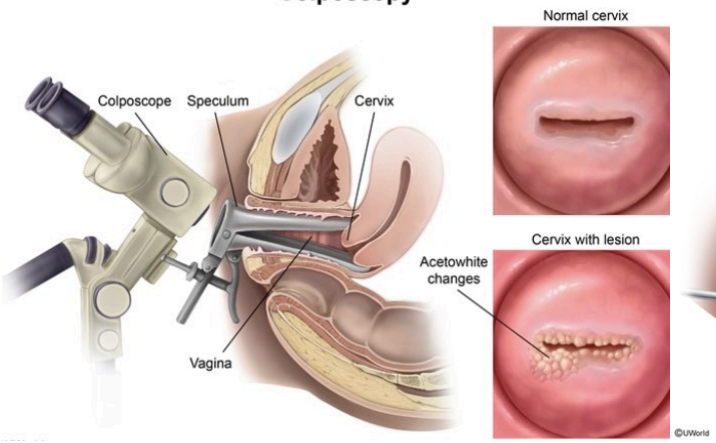
- Asymptomatic screen:
    - Begin at age of 21 regardless of sexual activity.
    - Do it every 3 years.
    - Using a pap smear.
        - Every year for HIV patients.
        - If you are above 30, get Pap smear and HPV testing → every 5 years.
            - If HPV test not available → pap smear.
    - Stop at 65.

When to stop Pap testing
• Age 65 or hysterectomy PLUS • No history of cervical intraepithelial neoplasia 2 or higher AND • 3 consecutive negative Pap tests OR • 2 consecutive negative co-testing results

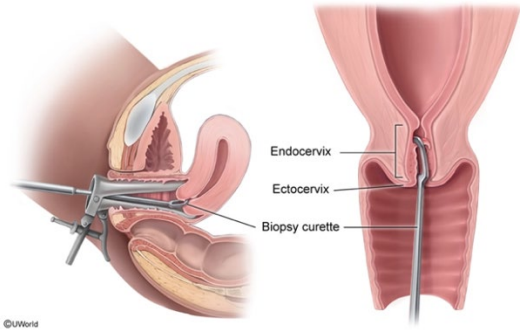
- Results of pap:

- Negative → normal pap smear.
  - Repeat in 3 years.
- Positive → grossly abnormal (HSIL or LSIL).
  - Do a colposcopy.

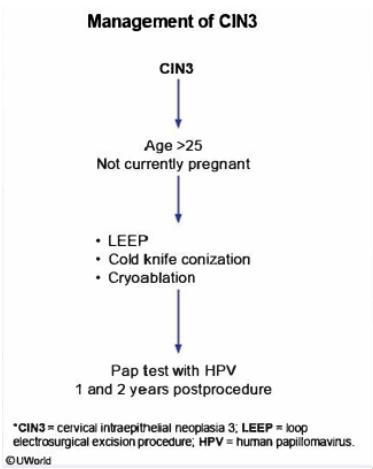
Colposcopy



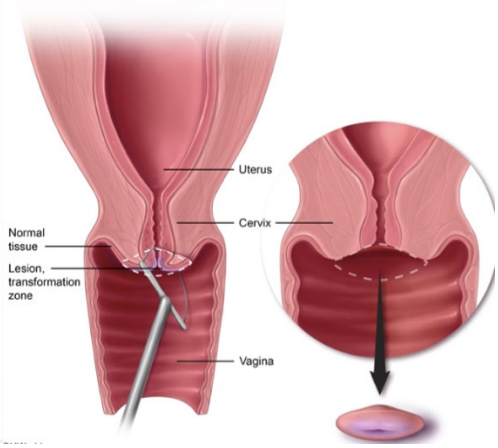
Endocervical curettage



- Abnormal findings:
  - Abnormal vessels.
  - Punctate hemorrhages.
  - Pseudo-white changes with a clear border.
  - Mosaicism.
- If inadequate → endocervical curettage.
- Either ectocervix or endocervix.
  - Ectocervical inspection and biopsy.
    - Positive → local ablation. (LEEP or cryo)
  - Endocervical curettage using a cytobrush.
    - Positive → cone biopsy.
      - Positive margins → continued therapy.
      - Negative margins → pap smear and HPV at 1 and 2 years.
    - Endocervical curettage is contraindicated in pregnancy.



LEEP cervical biopsy



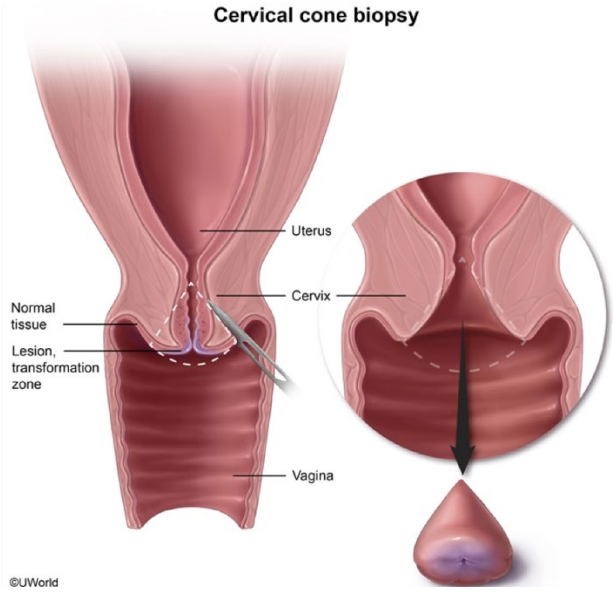
Cervical cancer screening	
Demographics	**Screening guidelines**
HIV	• Onset of sexual intercourse • At time of diagnosis • Annually until ≥3 normal results, then routine testing
Immunosuppressed (SLE, organ transplant)	• Onset of sexual intercourse • Annual Pap test with HPV cotesting
Age <21	• No screening
Age 21-29	• Cytology every 3 years
Age 30-65	• Cytology every 3 years OR • Cytology plus HPV testing every 5 years OR • Primary HPV testing every 5 years
Age ≥65	• No screening if negative prior screens & low risk
Hysterectomy (with cervix removed)	• No screening if negative prior screens & low risk

HPV = human papillomavirus; **SLE** = systemic lupus erythematosus.

    - Atypical squamous cells of unknown significance:
        - HPV DNA.
        - Or increase surveillance for every 6 months.
            - If positive → colposcopy.
    - If LSIL between age 21 to 24.
        - Repeat twice in a 12-month interval.
            - If both negative → return to normal pap smear screening,
            - If progresses → colposcopy.
        - Perform HPV contesting.
    - HSIL → no need for HPV contesting.
    - High grade lesions discovered during pregnancy have a high rate of regression in the postpartum period.
        - Worsening lesions → cervical biopsy; can be done during pregnancy.
- Treatment:
    - Stage 1A or less (CIN)→ local resection (which includes local ablation).
    - Stage 1B or worse → debulking, chemotherapy, and radiation.
- Prophylaxis:
    - HPV vaccine (Gardisil).
        - For girls 11→ 26.
        - For boys 11→ 21.
        - Vaccine series starts at age 11-12 and catch up vaccines should be offered until the age of 26 for those who are unvaccinated or did not complete series.
        - Vaccine can be given from age 9 to 45.

Complication of cervical local ablative therapy:

- Cervical stenosis.
    - ADRs:
        - Secondary dysmenorrhea or amenorrhea.
        - Impaired fertility.
- Cervical incompetence.
    - ADRs:
        - Preterm delivery.



Cervical conization	
Indications	Cervical intraepithelial neoplasia grades 2 & 3*
Complications	• Cervical stenosis • Preterm birth • Preterm premature rupture of membranes • Second trimester pregnancy loss

*Observation preferred for cervical intraepithelial neoplasia 2 in young women.

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Endometrial Cancer

Endometrial hyperplasia/cancer	
Risk factors	Excess estrogen • Obesity • Chronic anovulation/PCOS • Nulliparity • Early menarche or late menopause • Tamoxifen use
Clinical features	• Heavy, prolonged, intermenstrual &/or postmenopausal bleeding
Evaluation	• Endometrial biopsy (gold standard) • Pelvic ultrasound (postmenopausal women)
Treatment	• Hyperplasia: progestin therapy or hysterectomy • Cancer: hysterectomy

PCOS = polycystic ovary syndrome.

- Product of estrogen exposure.
    - Progesterone is protective, inhibiting estrogen effect.
        - OCPs are protective.
        - Smoking is also protective.
    - Excess estrogen:
        - Anovulation. (also, no progesterone)
            - PCOS.
        - Age.
        - Nulliparity.
        - Obesity; peripheral aromatization.
        - Early menarche.
        - Late menopause.
        - Hormone replacement therapy.
        - Tamoxifen of breast cancer.
        - Granulosa-theca tumor (in adolescents).
- Estrogen → hyperplasia → adenocarcinoma.
    - Hyperplasia:
        - Cystic → adenomatous → atypical.
- No screening.
- Diagnosis by biopsy.
- Treatment:
    - Total abdominal hysterectomy. (mass)
    - Plus, bilateral salpingoopherectomy. (source of estrogen)
    - +/- radiation and chemo if it is distant.
        - Chemo: carboplatin + paclitaxel.
- Postmenopausal or perimenopausal bleeding; what to do?
    - In office endometrial sampling.
        - Just as good as dilation and curettage.
    - Results:
        - Negative: vaginal atrophy → estrogen cremes.
        - Precancer (only hyperplasia, usually in reproductive age females) → high dose progesterone.
        - Cancer: TAH + BSO.

- Metastasis: radiotherapy or chemotherapy.

- Pap test:
  - Women age <45 do not have endometrial cells reported on their pap tests because its common especially in the first 10 days of menstrual cycle.
  - Women >45 do have endometrial cells reported on their pap tests because it indicates an abnormality.

Endometrial biopsy indications	
Age ≥45	• Abnormal uterine bleeding • Postmenopausal bleeding
Age <45	Abnormal uterine bleeding PLUS: • Unopposed estrogen (obesity, anovulation) • Failed medical management • Lynch syndrome (hereditary nonpolyposis colorectal cancer)
Age ≥35	• Atypical glandular cells on Pap test

Pap smear results requiring endometrial evaluation	
Result	**Group requiring endometrial sampling**

Benign-appearing endometrial cells	• Premenopausal women with:
	  ○ Abnormal uterine bleeding **OR**
	  ○ Risk for endometrial hyperplasia
	• Postmenopausal women

Atypical glandular cells	• Women age ≥35 **OR** at risk for endometrial hyperplasia
Atypical glandular cells, favor neoplastic	• All women

Hysteroscopy procedure:

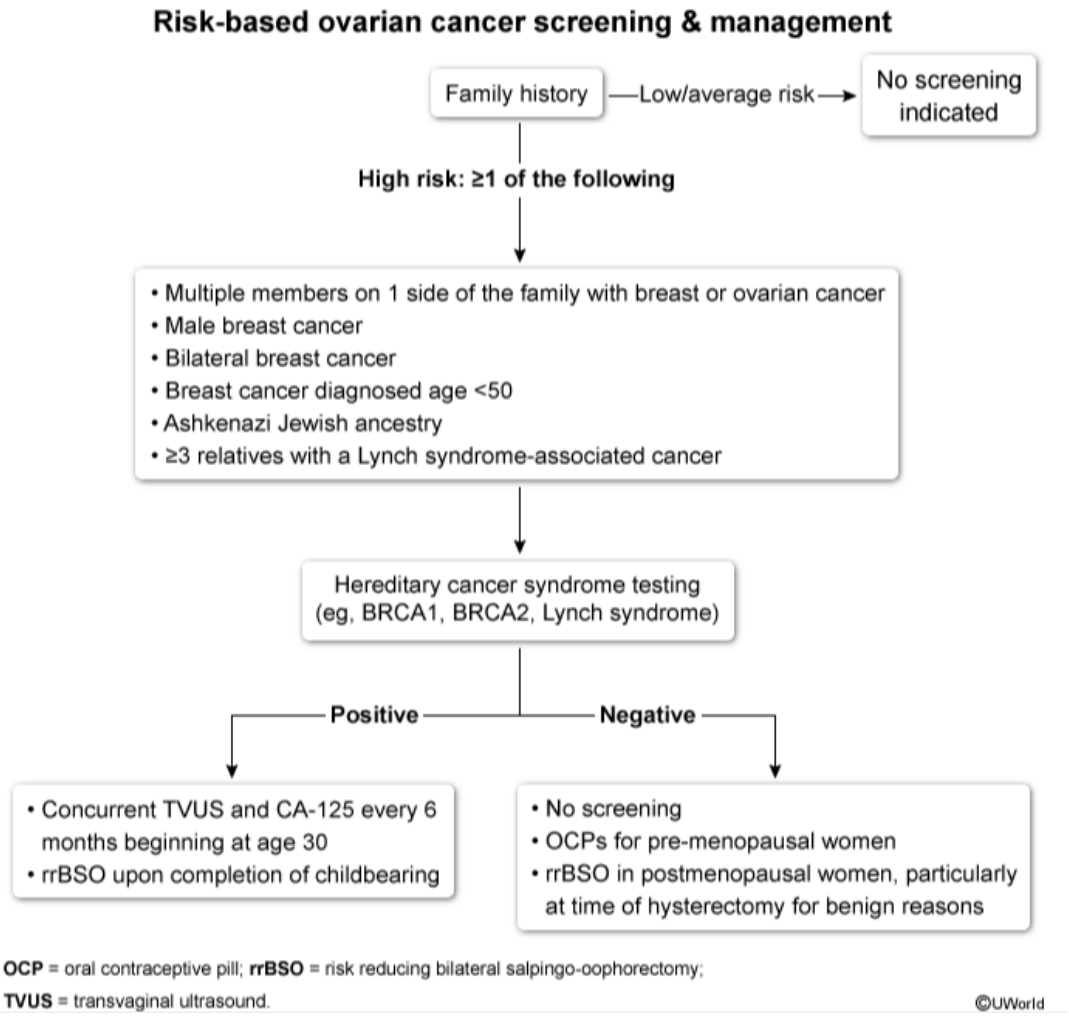
- Anesthesia.
- Lithotomy position.
- Iodine umbilicus to midthigh.
  - From clean to dirty aka outside to inside.
- Empty bladder.
- Bimanual exam.
- Speculum the vaginal posterior wall.
- Clam the anterior lip of the anterior cervix.
- Dilation of cervix until 6 cm.
- Insertion of hysteroscope.
  - Identify ostia and walls of uterus.
- Curette for endometrial sampling.
- Complications are the same as D&C: in addition to pulmonary edema due to hyponatremia or gas emboli.

Endometrial polyp:

- Hyperplastic endometrial growths that extend into the uterine cavity.
- Benign and asymptomatic.
    - C/P:
        - Abnormal uterine bleeding.
        - Regular monthly cycles with light intermenstrual bleeding.
- Treatment: hysteroscopic polypectomy.

Ovarian Cancer

Screening:



Germ cell tumors:

- Pathology: nonmalignant.
- C/P: teenage girls
    - Adnexal masses.
    - Weight gain.
    - Present at stage 1.
- Diagnosis by transvaginal US.
- Types:
    - Dysgerminoma (similar to seminoma):
        - Responds to chemotherapy.
        - Can be tracked by LDH.
    - Endodermal sinus tumors (yolk sac):
        - Tracked by AFP.

- Dermoid cyst (teratoma):
  - No marker.
  - Not malignant unlike in boys.
- Choriocarcinoma:
  - Tracked by B-HCG.

- Treatment:
  - Unilateral salpingoopherectomy.

Mature cystic teratoma	
Pathology	• Benign ovarian germ cell tumor • Endoderm, mesoderm, ectoderm tissue
Clinical features	• Most asymptomatic • Ovarian torsion • Struma ovarii subtype: hyperthyroidism • Unilateral adnexal mass • Ultrasound: complex, cystic, calcifications • Gross appearance: sebaceous fluid, hair, teeth
Management	• Ovarian cystectomy or oophorectomy

Epithelial cell tumors:

- Involves the ovary, fallopian tube, and peritoneum.
- Types:
  - Serous.
  - Mucinous.
  - Endometroid.
    - Above 3 are cystadenocarcinoma.
  - Brenner's tumor.
- Associated with dermatomyositis.
- Pathogenesis:
  - Epithelial trauma (ovulation).
    - The more the ovulation, the more the trauma.
- Extremely malignant.
- Risk increases with
  - Age.
    - Generally postmenopausal.
  - Nulliparity.
    - Since pregnancy prevents ovulation.
  - BRCA1 and 2.
  - HNPCC (lynch syndrome).
- Usually presents at stage 3B or worse.
  - Generally asymptomatic.
  - Seed peritoneally.
  - Advanced stages → renal failure, small bowel obstruction, and ascites not due to liver diseases.
  - Older women with new onset abdominal symptoms and negative colonoscopy → pelvic US.

- **No screening.**
- Diagnosis:
    - Transvaginal US; thick septations, solid components, and peritoneal free fluid (ascites).
    - CT for staging.
    - Ca-125 for tracking.
        - Released by cells from the peritoneum and Mullerian structures.
        - Can be ordered for postmenopausal women for diagnosis.
- Treatment:
    - TAH and BSO.
    - **Exploratory laparotomy** is required for cancer resection and inspection of the entire abdominal cavity for metastasis and staging.
    - Since they're usually stage 3b or more: Chemotherapy by paclitaxel.
- Special consideration:
    - BRCA 1 or 2 → you can screen annually using a TVUS and Ca-125.
    - You can do a prophylactic TAH and BSO at age of 35.

Epithelial ovarian carcinoma	
Clinical presentation	• Asymptomatic: incidental adnexal mass • Subacute: pelvic/abdominal pain, bloating, early satiety • Acute: dyspnea, obstipation/constipation, abdominal distension
Risk factors	• Family history • Genetic mutations (*BRCA1*, *BRCA2*) • Age ≥50 • Hormone replacement therapy • Endometriosis • Infertility • Early menarche/late menopause
Protective factors	• Oral contraceptives • Multiparity • Breastfeeding
Laboratory findings	• ↑ CA-125
Ultrasound findings	• Solid, complex mass • Thick septations • Ascites
Management	• Surgical exploration • ± Chemotherapy

Stromal cell tumors:

- Granulosa-theca tumors:
    - Produce estrogen.
    - C/P:
        - Ovarian torsion.
        - Pelvic pain.
        - Palpable mass.
        - Thickened endometrial stripe (>4mm) in postmenopausal women.
        - Fibrocystic changes in the breast.

Granulosa cell tumor	
Pathogenesis	• Sex cord–stromal tumor • ↑ Estradiol • ↑ Inhibin

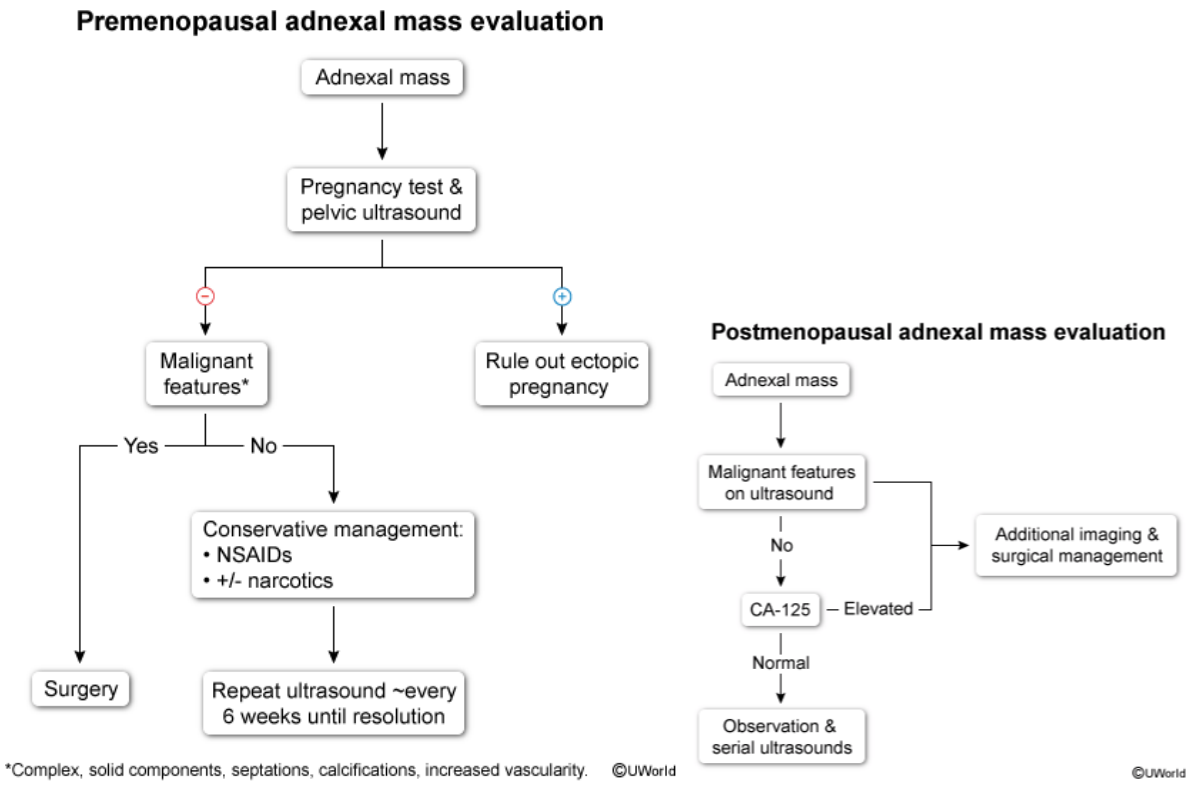
Clinical features	• Complex ovarian mass
	• Juvenile subtype
	  ◦ Precocious puberty
	• Adult subtype
	  ◦ Breast tenderness
	  ◦ Abnormal uterine bleeding
	  ◦ Postmenopausal bleeding

Histopathology	• Call-Exner bodies (cells in rosette pattern)
Management	• Endometrial biopsy (endometrial cancer) • Surgery (tumor staging)

    - Treatment:
        - Unilateral salpingo-oopherectomy for a young women desiring fertility.
        - Hysterectomy and bilateral salpingo-oopherectomy if granulosa tumor with endometrial cancer.
    - Monitored for disease progression or recurrence with serum inhibin levels.
- Sertoli-leydig tumors:
    - Produce testosterone.
- Fibrothecoma:
    - Produces androgens.
- Ovarian fibroma:
    - Meigs syndrome: pleural effusion (often right sided) + ovarian tumor.

How to handle an adnexal mass?

- TVUS.
    - Smooth and small cyst without septations → a simple cyst.
        - Do nothing → just follow up.
    - Large cyst with septations → a complex cyst.
        - Determine type of tumor from age and symptoms.
            - Young girl asymptomatic → germ cell tumors.
                - Unilateral SO.
            - Old and asymptomatic or SBO or ascites → epithelial tumors.
                - TAH and BSO.
                    - With paclitaxel cause of the late stage.

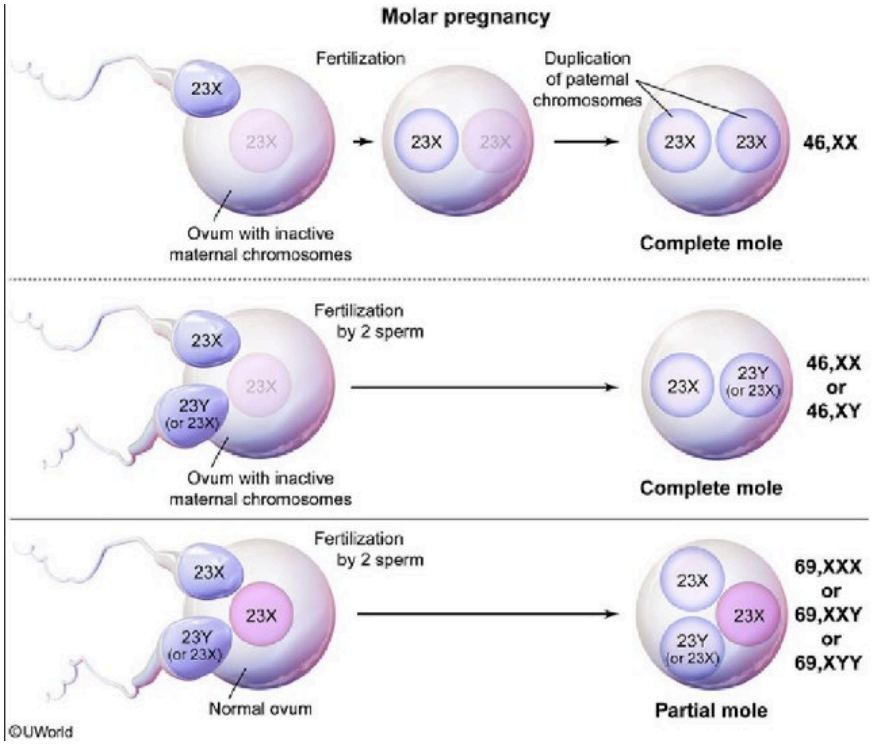


Paraneoplastic syndromes:

- Paraneoplastic encephalomyelitis:
  - Anti-NMDA encephalitis.
  - Associated with ovarian teratoma.
  - Occurs after flu.
  - Multistage syndrome.
  - C/P:
    - Psychiatric: anxiety, psychosis, and insomnia.
    - Autonomic instability: hyperthermia, hypertension, and tachycardia.
    - Cognitive impairment.
    - Rigidity.
    - Hyperreflexia.
    - Dystonia.
    - Focal seizure.
  - Lymphocytic pleocytosis.
  - Clinical diagnosis.
    - Antibodies to the GluN1 subunit of the NDMAR present in the CSF.
  - Management:
    - Resection of tumor.
    - Immunosuppressive treatment is the cornerstone of therapy.
- Paraneoplastic cerebellar degeneration:
  - Anti-Yo antigen of the cerebellar purkinje cells.
  - Associated with ovarian cancer and breast cancer.
  - C/P:

- Dysarthria.

Moles

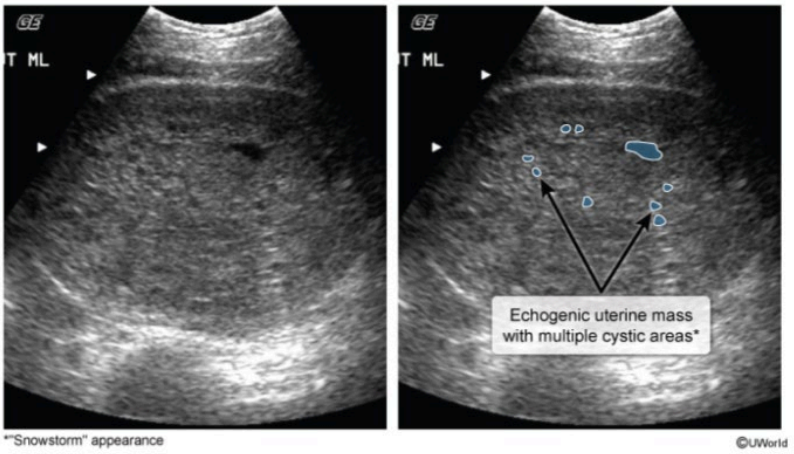


Complete mole:

- Completely chromosomal: 46 XX or XY.
- Completely spermal.
- Completely molar.
- Grows really fast.
- Risk factors: infertility and extremes of age (<15 and >35).
- C/P:
    - Vaginal bleeding.
    - Size-date discrepancy.
    - Very elevated B-HCG (>100,000).
        - Some might experience hyperthyroidism.
        - Hyperemesis gravidarum.
            - Dehydration and electrolyte abnormalities.
    - Grape like mass.
    - Adnexal mass.
- Diagnosis:
    - TVUS→ snow-storm pattern.
    - Best diagnostic and therapeutic tool: suction curettage.
    - Hysterectomy for those who completed childbearing.
    - CXR for metastasis to exclude invasive mole or cancer.
    - Thyroid function test.
- Follow up B-HCG while being on OCP for a year.

- Weekly B-HCG until 3 consecutive assays are negative and then monthly for 6 months.
  - Takes about 8 weeks for B-HCG levels to become undetectable.
- If it rises again or it plateaus → choriocarcinoma (gestational trophoblastic neoplasia).
- Why OCP? Cause pregnancy can also causes increased B-HCG.

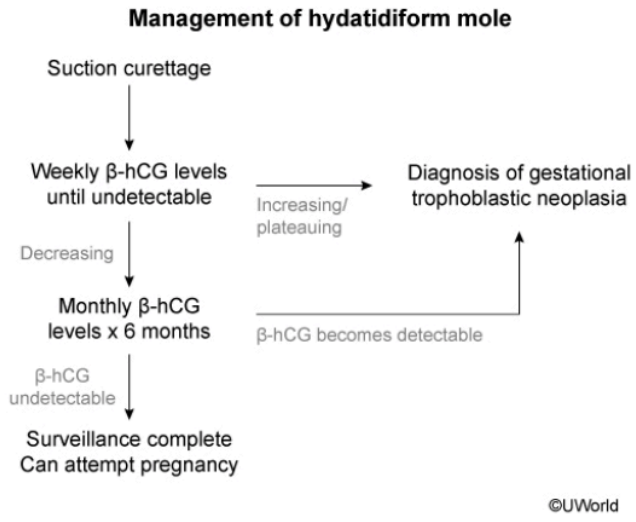
Complete hydatidiform mole



Incomplete moles:

- Diaspermy.
- Egg fertilized by two sperms.
- Incompletely molar → there are fetal parts.
- 69 chromosomes.
- Same presentation as complete mole.
- Same diagnostics as complete mole.
- Same treatment as complete mole.
- Same follow up as complete mole.

Hydatidiform mole	
Clinical presentation	• Abnormal vaginal bleeding ± hydropic tissue • Uterine enlargement > gestational age • Abnormally elevated β-hCG levels • Theca lutein ovarian cysts • Hyperemesis gravidarum • Preeclampsia with severe features • Hyperthyroidism
Risk factors	• Extremes of maternal age • History of hydatidiform mole
Diagnosis	• "Snowstorm" appearance on ultrasound • Quantitative serum β-hCG • Histologic evaluation of uterine contents
Management	• Dilation & suction curettage • Serial serum β-hCG post evacuation • Contraception for 6 months



Choriocarcinoma (invasive gestational trophoblastic neoplasia):

- Malignant.
- Product of gestational contents.
- C/P:
  - Elevated B-HCG.
  - Similar to molar pregnancy.
  - Occurs after a miscarriage, molar pregnancy and normal pregnancy (worst prognosis).
- Diagnosis:
  - TVUS.
  - Best test → biopsy through curettage.
  - Stage → CT scan (lung and brain).

- Treatment:
  - Surgical treatment.
    - TAH (stage 1).
    - Debulking (stage 3).
  - Chemotherapy: MAC
    - Methotrexate.
    - Actinomycin D.
    - Cyclophosphamide.
  - All the patients: methotrexate and actinomycin D.
  - Add cyclophosphamide for refractory and advanced disease.
  - If FIGO score <7; methotrexate plus hysterectomy.
  - If FIGO score >7; multiagent chemotherapy and radiation.

Choriocarcinoma	
Risk factors	• Advanced maternal age • Prior complete hydatidiform mole
Presentation	• Amenorrhea or abnormal uterine bleeding • Pelvic pain/pressure • Symptoms from metastases (lung, vagina) • Uterine mass • Elevated β-hCG level
Treatment	• Chemotherapy

TABLE 30-1. FIGO Prognostic Scoring System (2000)

	Score			
Risk Factor	**0**	**1**	**2**	**4**
Age (yr)	≤ 39	> 39		
Pregnancy	Hydatidiform mole	Abortion	Term	
Interval from pregnancy event to treatment (in months)	< 4	4–6	7–12	> 12
hCG (pre-treatment) (IU/mL)	< 1000	1000–10,000	10,000–100K	> 100K
Largest tumor size uterus (in cm)	3–4	5–6		
Site of metastases	Lung Vagina	Spleen Kidney	GI	Brain Liver
Number of metastasis	0	1–4	4–8	> 8
Prior chemotherapy agent	–	–	Single	Two or more drug agents

Scores are added to give the prognostic score.

Theca lutein cysts:

Theca lutein cysts	
Presentation	• Multilocular • Bilateral • 10-15 cm ovaries

Pathogenesis	• Ovarian hyperstimulation due to:
	  ◦ Gestational trophoblastic disease
	  ◦ Multifetal gestation
	  ◦ Infertility treatment

Clinical course	• Resolve with decreasing β-hCG levels

Hyperemesis gravidarum:

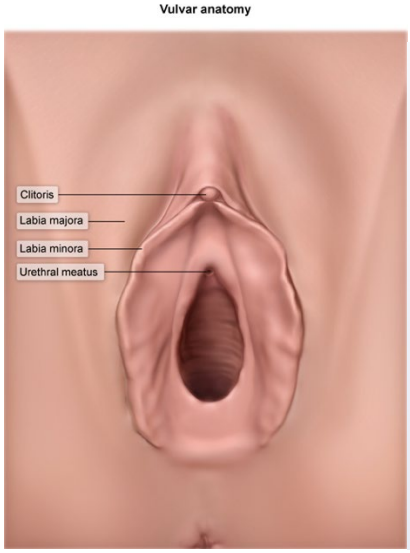
- Risk factors: twin pregnancy, HG in prior pregnancy, mole, history of migraines and motion sickness.
- Severe vomiting in the first or second trimester.
- Leads to weight loss, volume depletion, and ketonuria.
- Contraction metabolic alkalosis.
- Treatment: vitamin b6 + doxylamine.
  - Doesn't resolve → antiemetics.
- Wernicke encephalopathy: associated with increased risk of spontaneous abortion.

Hyperemesis gravidarum	
Risk factors	• Hydatidiform mole • Multifetal gestation • History of hyperemesis gravidarum
Clinical features	• Severe, persistent vomiting • >5% loss of prepregnancy weight • Dehydration • Orthostatic hypotension
Laboratory abnormalities	• Ketonuria • Hypochloremic metabolic alkalosis • Hypokalemia • Hemoconcentration
Treatment	• Admission to hospital • Antiemetics & intravenous fluids

Vaginal/Vulvar Cancer

Vulvar cancer:

- Initially there is pruritis → inspection → no lesions → not cancer.
    - If there is a lesion → biopsy!
- Squamous cell carcinoma:
    - C/P:
        - Black and itchy.
    - Management:
        - Noninvasive → medical therapy or laser ablative therapy.
        - Invasive → Vulvectomy and lymph node dissection +/- chemoradiation..
- Melanoma:
    - C/P:
        - Black and itchy.
    - Vulvectomy and lymph node dissection.
- Paget's disease:
    - C/P:
        - Red and itchy.
    - No underlying cancer.
    - Wide local resection.
- Distal vagina and vulva metastasize to the superficial inguinal LNs.



Vulvar cancer	
Etiology	• Persistent HPV infection • Chronic inflammation
Risk factors	• Tobacco use • Vulvar lichen sclerosus • Immunodeficiency • Prior cervical cancer • Vulvar/cervical intraepithelial neoplasia
Clinical features	• Vulvar pruritus • Vulvar plaque/ulcer • Abnormal bleeding
Diagnosis	• Biopsy

Vaginal cancer:

- Squamous cell carcinoma:
    - Same as cervical cancer.
        - But no pap smear.
- Clear cell adenocarcinoma:
    - C/P:
        - Grape-like mass in the vagina.
    - DES exposure of the mother while girl was in utero.

Vaginal cancer	
Risk factors	• Age >60 • Human papillomavirus infection • Tobacco use • In utero DES exposure (clear cell adenocarcinoma only)
Clinical features	• Vaginal bleeding • Malodorous vaginal discharge • Irregular vaginal lesion
Diagnosis	• Vaginal biopsy
Management	• Surgery ± chemoradiation

DES = diethylstilbestrol.

- Treatment:
  - Noninvasive disease: conservative with topical therapy or wide local excision.
  - Invasive: radical hysterectomy, vaginectomy and pelvic LN dissection. And chemoradiation.

Vaginal cancer		
Type	**Squamous cell**	**Clear cell adenocarcinoma**
Epidemiology	Age > 60	Age <20
Risk factors	• HPV 16 or 18 • History of cervical dysplasia or cancer • Cigarette use	In utero exposure to diethylstilbestrol
Location of cancer	Upper 1/3 of the posterior vaginal wall	Upper 1/3 of anterior vaginal wall
Clinical features	• Malodorous vaginal discharge • Postmenopausal or postcoital vaginal bleeding • Irregular mass, plaque, or ulcer on vagina	
Diagnosis	Biopsy	

Pelvic Anatomy

Ovaries:

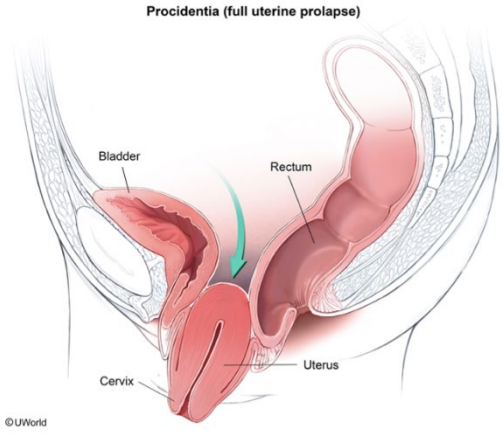
- Supplied directly from the aorta by the ovarian artery.
- Ovarian venous drainage mirrors the adrenal veins.
    - Right side: ovarian vein into IVC directly.
    - Left side: ovarian vein converges onto the renal vein then to the IVC.
- Ovarian ligament contains the vascular supply to the ovaries. Also called suspensory ligament.
    - Ovarian torsion involves the suspensory ligament.

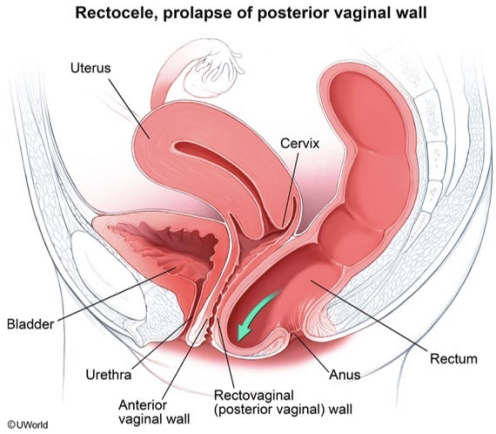
Uterus:

- Common iliac arteries → internal iliac arteries → uterine arteries.
    - Postpartum hemorrhage defined as 500 cc after vaginal birth and a 1000 cc after C-section.
        - Mother has a volume overload, so it is fine to lose this amount.
        - What to do?
            1. Uterine massage.
            2. Medications: oxytocin. Also, methergine and hemobate can be used.
            3. Balloon tamponade (inflated foley catheter).
            4. Surgery: uterine artery ligation. If still bleeding; ligate internal iliacs. Still bleeding → total abdominal hysterectomy.
- Uterosacral ligament: removed in hysterectomy.
    - Connects uterus to sacrum.
    - Looks very similar to ureters.
- Cardinal ligament:
    - Connects uterus to side wall.
    - Contains uterine arteries.
    - Weakens also the uterosacral ligament.→ pelvic floor (levator ani) relaxation.
        - Cause: large and multiple births.
        - C/P: vaginal fullness and chronic back pain.
            1. Cystocele: incontinence.
            2. Rectocele (when rectovaginal fascia is affected): constipation.
                - Splinting: digital maneuvers to help improve bowel movements.
            3. Uterine prolapse: you will see it.
        - Diagnosis by speculum. Clinical diagnosis.
            1. Bladder → cystocele. Anterior on speculum.
            2. Rectum → rectocele. Posterior on speculum.
            3. Uterus → uterine prolapse.
        - Treatment: hysterectomy for uterine prolapse. Colporrhaphy for rectocele and cystocele.
            1. **Asymptomatic → reassurance.**
            2. **Severe POP in an elderly women → colpocleisis.**
        - Degrees of uterine prolapse:
            1. Down into the vagina.

2. At the vaginal opening.
3. Outside the vagina.
4. Full prolapse outside the body=procidentia.

Pelvic organ prolapse	
Definitions	• Anterior prolapse: Bladder (eg, cystocele) • Posterior prolapse: Rectum (eg, rectocele) • Enterocele: Small intestine • Apical prolapse: Uterus, vaginal vault • Procidentia: Complete herniation
Risk factors	• Obesity • Multiparity • Hysterectomy • Menopause
Clinical presentation	• Pelvic pressure • Obstructed voiding • Urinary retention • Urinary urgency/incontinence • Constipation • Fecal urgency/incontinence • Sexual dysfunction
Management	• Weight loss • Pelvic floor muscle training • Pessary • Surgical repair





Clinical features of rectal prolapse	
Risk factors	• Women age >40 with history of vaginal deliveries/multiparity • Prior pelvic surgery • Chronic constipation, diarrhea, or straining • Stroke, dementia • Pelvic floor dysfunction or anatomic defects
Clinical presentation	• Abdominal discomfort (**not** significant pain) • Straining or incomplete bowel evacuation, fecal incontinence with mucus • Digital maneuvers possibly required for defecation • Erythematous mass extending through anus with concentric rings of rectum (can be intermittent)
Management	• Medical ◦ Considered for non–full-thickness prolapse ◦ Adequate fiber & fluid intake, pelvic floor muscle exercises ◦ Possible biofeedback for fecal incontinence • Surgical ◦ Preferred for full-thickness or symptomatic prolapse (eg, fecal incontinence, constipation, sensation of mass)

Adnexal Mass

Ovarian cyst:

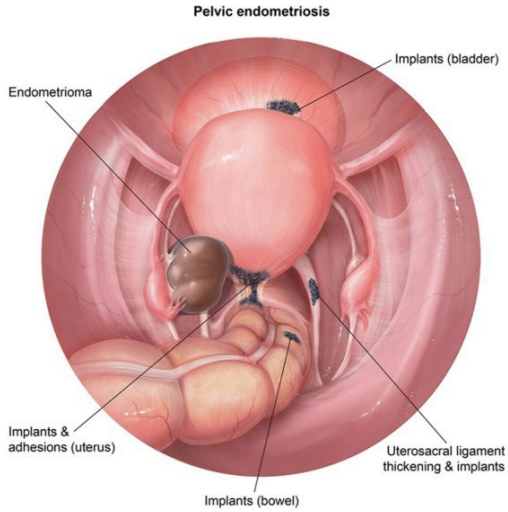
- Probably physiological in the reproductive age.
  - Do a TVUS to differentiate simple and complex cysts.
    - Simple cyst: unilocular, anechoic, homogenous, and small.
    - Complex cyst: multilocular, multiechoic, heterogenous, and large.
      - Differentials: increasing order of acuity. (discussed later)
        - Teratoma.
        - Endometrioma.
        - Ectopic pregnancy.
        - Torsion.
        - Tubo-ovarian abscess.
        - Cancer.
    - Size:
      - <3 cm → ignore.
      - <10 cm → probably simple, resolves by itself, follow up by TVUS.
      - >10 cm → remove (laparoscopy >> laparotomy).
      - If it grows or fails to resolve → remove.
      - In pregnant women: remove if >5cm in the second trimester due to increased risk of rupture, hemorrhage, torsion which all lead to preterm labor.
  - Don't aspirate!!
  - OCPs are useless!!
  - MRI not needed except in certain cases.
- Ovarian cancer in the premenarchal age.
  - Probably a germ cell tumor.
- Ovarian cancer in the postmenopausal age.
  - Probably an epithelial tumor.

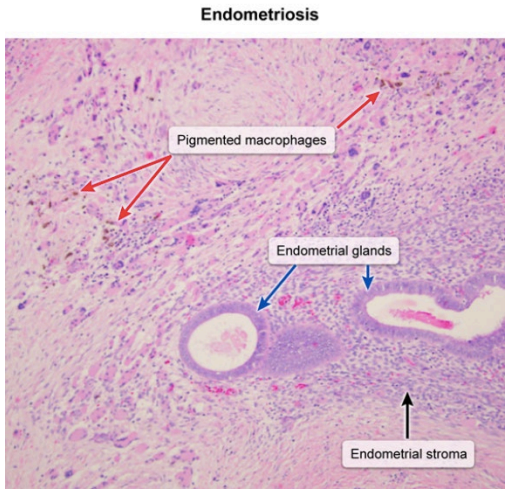
Endometrioma (chocolate cyst) of endometriosis:

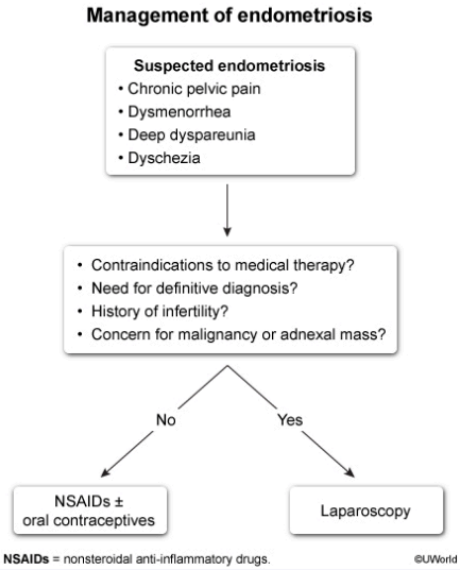
- Pathogenesis: retrograde menses and cellular metaplasia.
- Estrogen responsive.
- Physical exam findings: displacement of cervix due to distortion of pelvic anatomy and intraabdominal fibrosis and adhesions.
- Diagnosis:
  - TVUS.
    - Diffuse homogenous ground-glass appearance.
  - Diagnostic laparoscopy and laser ablation. (best test for endometrioma)
  - Endometriosis: OCP trial.
    - Fails → laparoscopy is indicated.
- Treatment:
  - Pelvic pain. (NSAIDs)
  - OCPs.
  - GnRH analog.

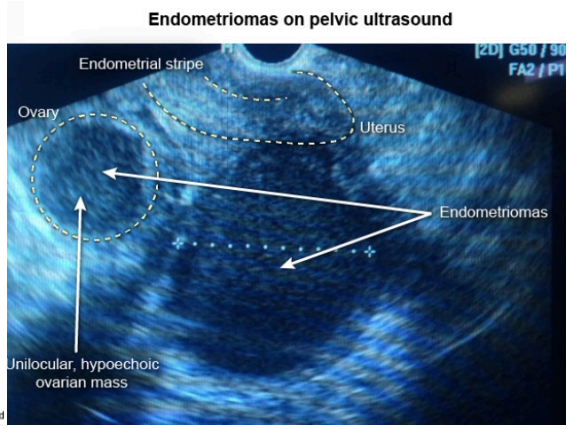
- Diagnostic laparoscopy and laser ablation. (treatment of endometrioma and other visible lesions)
  - Done in those who are not responding to NSAIDs and OCPs.
- Symptomatic endometrioma → surgical resection to improve pain, improve fertility, and decrease torsion.

Endometriosis	
Pathogenesis	• Ectopic implantation of endometrial glands
Clinical features	• Dyspareunia • Dysmenorrhea • Chronic pelvic pain • Infertility • Dyschezia • Cyclic dysuria, hematuria
Physical examination	• Immobile uterus • Cervical motion tenderness • Adnexal mass • Rectovaginal septum, posterior cul-de-sac, uterosacral ligament nodules
Diagnosis	• Direct visualization & surgical biopsy
Treatment	• Medical (oral contraceptives, NSAIDs) • Surgical resection





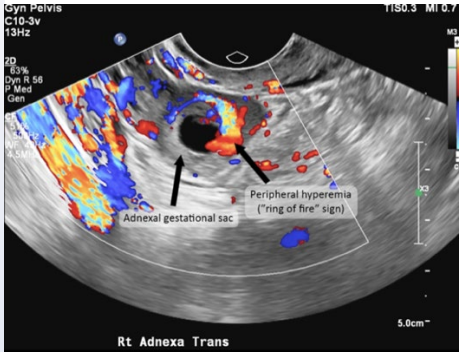




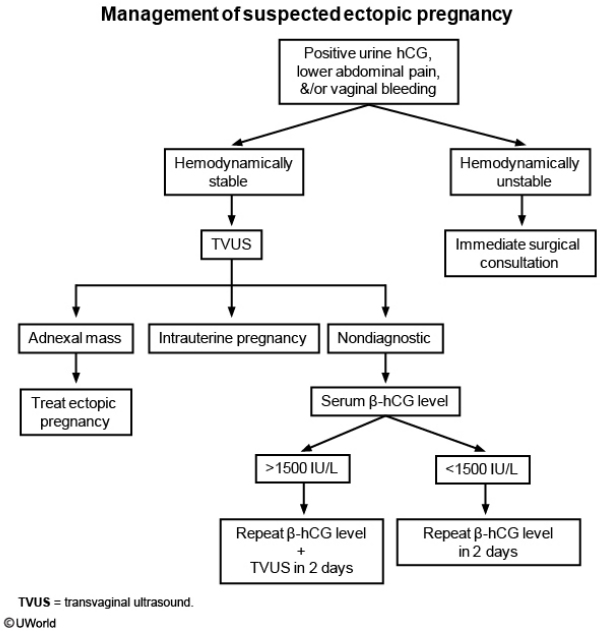
Ectopic pregnancy:

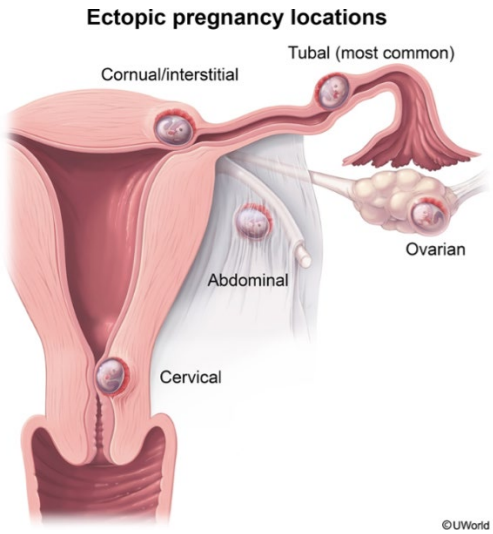
- Early implantation due to stricture or pelvic inflammatory disease.
- Occurs in the ampulla.
    - Other locations: cornu due to uterine anomalies such as bicornuate or unicornuate uterus and IVF.
- C/P:
    - Amenorrhea/spotting.
    - Abdominal pain.
    - Vaginal bleeding.
    - UPT +.
    - Ruptures → hemoperitoneum with blood pooling in the posterior cul de sac → urge to defecate.
- Diagnosis:
    - Urine pregnancy test +
    - Serum B-HCG:
        - B-HCG is greater than 1500 + empty uterus on US.
- Treatment:
    - Salpingostomy (suck out the zygote) → when normal fallopian.
    - Salpingectomy →when fallopian ruptures.
    - Methotrexate +leucovorin for early pregnancy.
        - Indications:
            - Gestational size less than 3 cm.
            - B-HCG <5000.
            - No fetal heart tones.
        - Contraindications:
            - Hematological abnormalities and immunosuppression.
            - Active pulmonary disease.
            - Hepatic or renal disease.
            - Breastfeeding.

Ectopic pregnancy	
Risk factors	• Previous ectopic pregnancy • Previous pelvic/tubal surgery • Pelvic inflammatory disease
Clinical features	• Abdominal pain, amenorrhea, vaginal bleeding • Hypovolemic shock in ruptured ectopic pregnancy • Cervical motion, adnexal &/or abdominal tenderness • ± Palpable adnexal mass
Diagnosis	• Positive hCG • Transvaginal ultrasound revealing adnexal mass, empty uterus
Management	• Stable: methotrexate • Unstable: surgery



- If no visible intrauterine or extrauterine gestation is present on ultrasound and an abnormally high B-HCG level → diagnostic dilation and curettage.
    - It confirms the location of the pregnancy based on the postprocedure B-hCG levels:
        - Negative or decreased → abnormal intrauterine pregnancy.
        - Persistent high B-hCG → ectopic pregnancy.



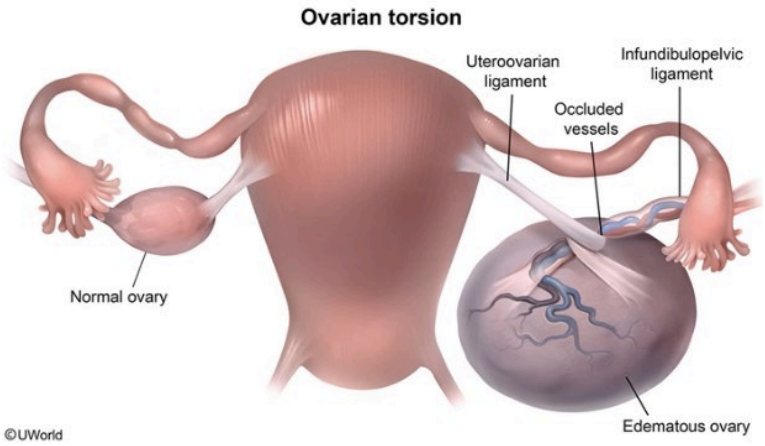


Ovarian torsion:

- Due to rotation of ovary around the infundibulopelvic ligament.
- Intermittent pain if its partial ovarian torsion.
- Diagnosis on physical exam.
    - Confirmed by US with doppler.
    - Normal findings don't exclude it.
- Treatment is surgical; diagnostic laparoscopy.
    - Untwist the ovaries.
        - Pink → leave it.

- Black → remove.

Ovarian torsion	
Risk factors	• Ovarian mass • Women of reproductive age • Infertility treatment with ovulation induction
Clinical presentation	• Sudden-onset unilateral pelvic pain • Nausea & vomiting • ± Palpable adnexal mass
Ultrasound	• Adnexal mass with absent Doppler flow to ovary
Treatment	• Laparoscopy with detorsion • Ovarian cystectomy • Oophorectomy if necrosis or malignancy



Tubo-ovarian abscess.

- PID caused by chlamydia or gonorrhea or vaginal flora.
- C/P:
  - Abdominal or pelvic pain.
  - No other cause of symptoms.
  - One of three:
    - Cervical motion tenderness.
    - Adnexal tenderness.
    - Uterine tenderness.
  - Fever and leukocytosis in TOA.
  - WBCs on wet prep substantially increases chances of PID.
- Diagnosis of abscess: US which is done only if she doesn't approve.
- Treatment in the case of abscess: admit and give IV.
  - Cefoxitin plus doxycycline plus metronidazole.
  - Or clindamycin plus gentamicin.
  - No improvement → surgery to drain.

Ruptured ovarian cyst:

- OCPs suppress formation of ovarian cyst.
- Occurs when fluid fills the space of the recently released follicle → corpus luteal cyst.
- Physical exam:
    - Tenderness of the lower abdomen, and an adnexal mass is palpable.
    - Peritoneal signs & hemodynamically unstable in severe cases.
        - Especially those on anticoagulants.
- Tests:
    - CBC to assess anemia from ovarian bleeding from cyst rupture.
    - Pregnancy test to exclude ectopic pregnancy.
    - US shows pelvic and intrabdominal fluid.
- Management:
    - Uncomplicated (no fever, hypotension, tachycardia,) cyst: conservative with analgesic.
    - Complicated cyst: surgery.

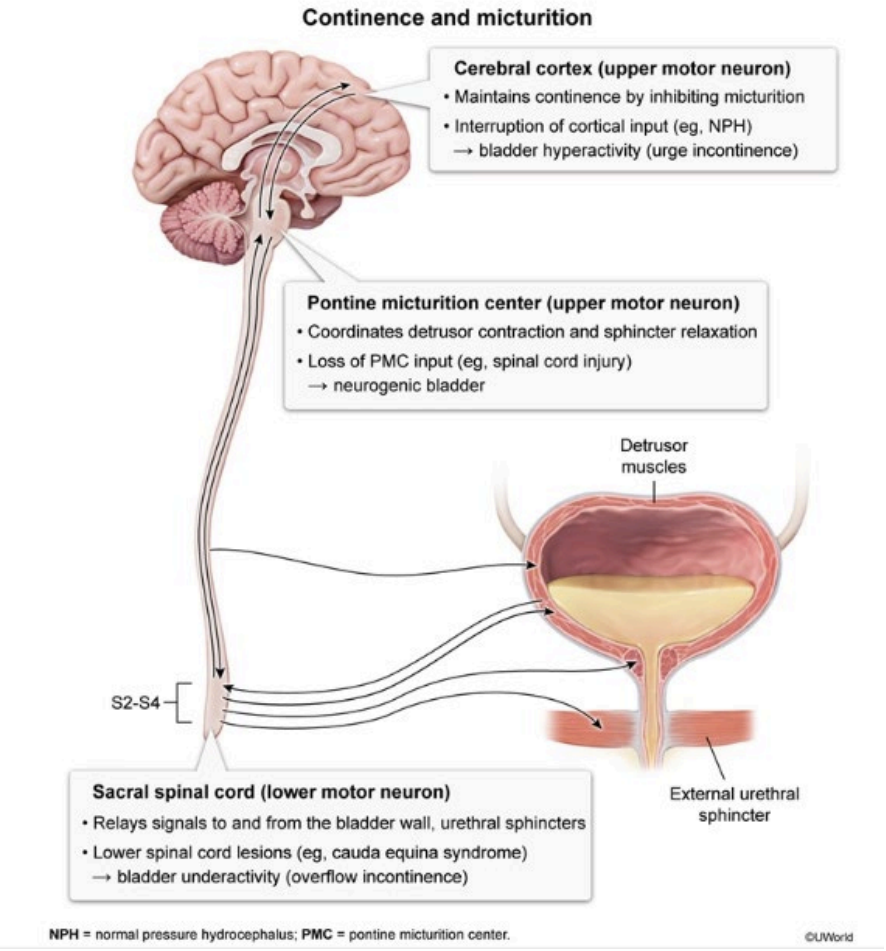
Acute abdominal/pelvic pain in women		
Diagnosis	**Clinical presentation**	**Ultrasound findings**
Mittelschmerz	• Recurrent mild & unilateral mid-cycle pain prior to ovulation • Pain lasts hours to days	Not indicated
Ectopic pregnancy	• Amenorrhea, abdominal/pelvic pain & vaginal bleeding • Positive β-hCG	No intrauterine pregnancy
Ovarian torsion	• Sudden-onset, severe, unilateral lower abdominal pain; nausea & vomiting • Unilateral, tender adnexal mass on examination	Enlarged ovary with decreased or absent blood flow
Ruptured ovarian cyst	• Sudden-onset, severe, unilateral lower abdominal pain immediately following strenuous or sexual activity	Pelvic free fluid
Pelvic inflammatory disease	• Fever/chills, vaginal discharge, lower abdominal pain & cervical motion tenderness	± Tuboovarian abscess

Ovarian hyperstimulation syndrome:

- Rare but life-threatening.
- Exaggerated abnormal response to ovulation induction (clomiphene).
- Caused by overexpression of VEGF in the ovaries → increased vascular permeability and capillary leakage → massive extravascular fluid shifts (third spacing) and VEGF leakage into the peritoneal cavity → ascites and abdominal distention.
- Other features: pleural effusions, intravascular volume depletion (tachycardia, hemoconcentration), leukocytosis.
    - Severe cases → thromboembolism, renal failure, and death.

Ovarian hyperstimulation syndrome	
Pathophysiology	• ↑ hCG enhances ovarian vascular permeability • Acute fluid shift to extravascular space
Clinical features	• Ascites • Respiratory distress • Hemoconcentration • Hypercoagulability • Electrolyte imbalances • Multiorgan failure (eg, renal failure) • Disseminated intravascular coagulation
Evaluation	• Fluid balance monitoring • Serial CBC, electrolytes • Serum hCG • Pelvic ultrasound • Chest x-ray • Echocardiography
Management	• Correct electrolyte imbalances • Paracentesis &/or thoracentesis • Thromboembolism prophylaxis

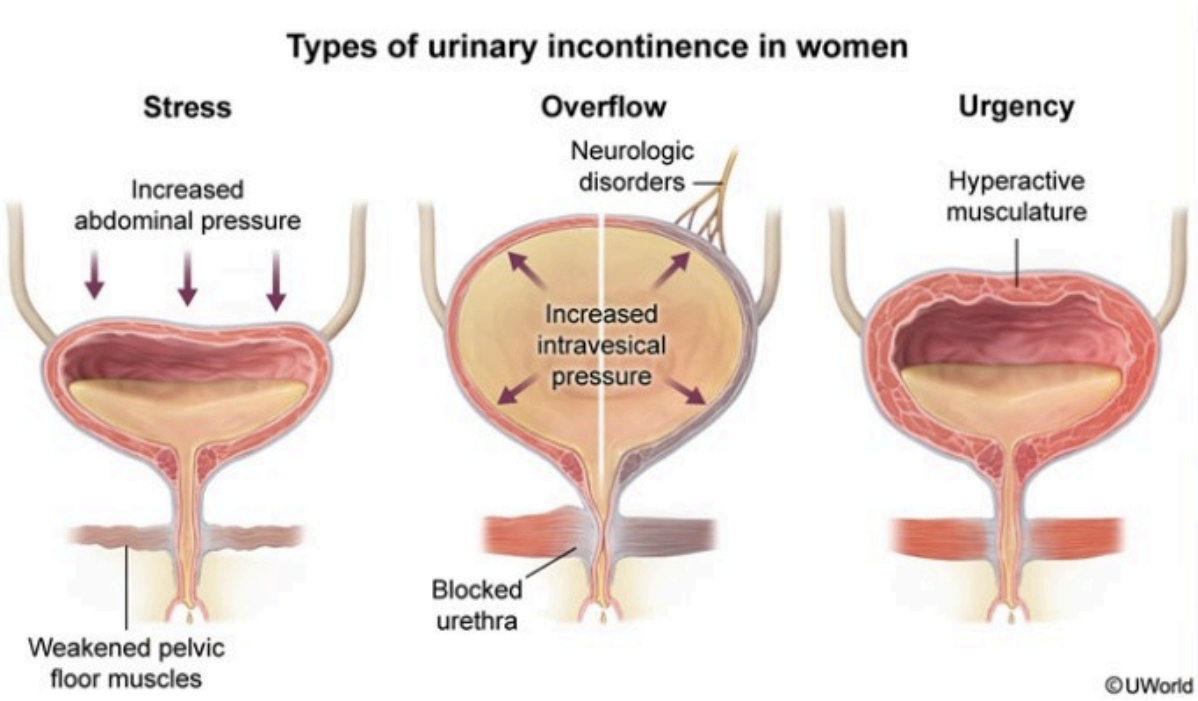
Incontinence



Urinary incontinence		
Type	**Symptoms**	**Treatment**
Stress	Leakage with Valsalva (coughing, sneezing, laughing)	• Lifestyle modifications • Pelvic floor exercises • Pessary • Pelvic floor surgery
Urgency	Sudden, overwhelming, or frequent need to void	• Lifestyle modifications • Bladder training • Antimuscarinic drugs
Mixed	Features of stress & urgency incontinence	• Variable treatment depending on predominant symptoms
Overflow	Constant involuntary dribbling & incomplete emptying	• Identify & correct underlying cause • Cholinergic agonists • Intermittent self-catheterization

Oxybutynin

Bethenecol



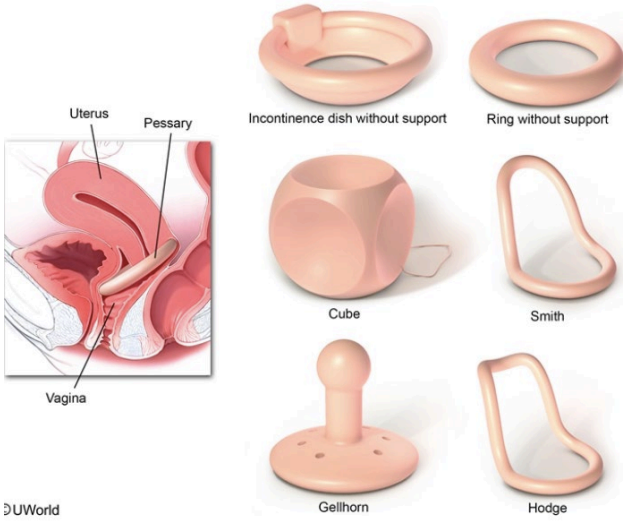
Stress incontinence: only in women.

Stress urinary incontinence	
Physiology	• Urethral hypermobility • Intrinsic sphincteric deficiency
Symptoms	• Leakage with Valsalva maneuver (eg, coughing, sneezing, laughing, intercourse)
Risk factors	• Pregnancy (especially vaginal delivery) • Obesity • Chronic high-impact exercise
Treatment	• Pelvic floor muscle (Kegel) exercises • Lifestyle modifications (weight loss) • Continence pessary • Midurethral sling procedure

- Pathogenesis: big and multiple births causing the stretch of the cardinal ligament. Decreased urethral sphincter tone and urethral hypermobility.
- C/P:
    - Sneeze and pee. (or any cause of increase intraabdominal pressure)
    - No urge.
    - No nocturnal symptoms.
- Diagnosis on physical exam:
    - Cystocele.
    - Q-tip test to check for abnormal urethrovesical angle.
        - Applying a Q tip to urethra and have her increase intraabdominal pressure. If it rotates more than 30 degrees, then that indicates increased mobility.
- Treatment:
    - Kegel exercises.

- Pessaries.
- Injectable bulking agents if caused by decreased internal sphincter tone.
- Duloxetine used for unipolar depression.
- Surgery (MMK and Burch procedures).
  - Urethral sling for SUI due to urethral hypermobility.
  - Complications:
    - Fistulas.
    - Urinary obstruction.
    - Damage to the bladder and bowel.
    - Pain.
    - Bleeding.
    - UTI.

Types of pessaries



Urgency incontinence (overactive bladder):

- Pathogenesis: random spasm of detrusor muscle.
- Etiology:
  - Multiple sclerosis: impaired UMN that exert inhibitory control of spinal neurons (decreased corticospinal tracts) & micturition reflex → lower motor neuron overactivity → spasticity.
  - Prior pelvic surgery (midurethral sling).
- C/P:
  - Urge.
  - Nocturnal.
  - Leak with contraction.
- Diagnosis by cystometry: shows the spasms.
  - Physical exam and urinalysis are normal.
  - Bladder scan: small, contracted bladder.
- Treatment:
  - Timed voiding & kegel exercise.
  - Antispasmodics such as oxybutynin.
  - B-3 receptor agonists such as mirabegron.

Mixed incontinence:

- Stress and urgency symptoms.
- Initial evaluation:
    - Voiding diary: tracks fluid intake, urine output, and leaking episodes in order to classify the predominant type of urinary incontinence and determine optimal treatment.
    - Urodynamic testing for complicated urinary incontinence and those who will undergo surgery.
        - Measures bladder filling and emptying, flow, and pressure (urethral, leak point).
- Management:
    - Bladder training with lifestyle changes; weight loss, smoking cessation, decreased alcohol and caffeine intake.
    - Pelvic floor exercises.
    - Pharmacotherapy or surgery dependent on predominant type:
        - Urge → oral antimuscarinics and timed voiding.
        - Stress → due to weakened pelvic floor muscles → midurethral sling.

Overflow incontinence (hypotonic bladder):

- Pathogenesis: absent detrusor contractions or obstruction of bladder outlet.
    - Severing of the neural system.
        - Neurogenic bladder of MS, trauma or antispasmodic medications.
- No sensation of needing to void.
- C/P:
    - No urge.
    - Nocturnal symptoms.
    - Regularly throughout the day.
- Diagnosis:
    - Physical exam shows distended bladder.
        - Postvoidal residual urine volume >150 ml in women and >50 ml in men.
    - Focal neurological symptoms.
    - Urinalysis is useless.
    - Cystometry is the answer.
- Treatment:
    - Bethanechol.
    - Intermittent vs chronic indwelling catheter.

Irritative bladder:

- Pathogenesis: inflammation, stones, cancer, and UTI.
- C/P:

    - Frequency.
    - Urgency.
    - Dysuria.
    - No nocturnal symptoms.
- Physical exam is normal.
- Diagnosis: urinalysis.
    - WBCs or RBCs.
    - Imaging and capture stone.
    - Imaging for cancer.
- Cystometry is useless.
- Treatment:
    - Antibiotics for UTI.
    - Treat the underlying cause.

Neurogenic bladder:

- Occurs due to diabetic autonomic neuropathy.
- Two types:
    - Spastic neurogenic bladder (UMN): detrusor—sphincter dyssnergia.
        - Treatment: alpha blockers such as prazosin.
    - Flaccid neurogenic bladder (LMN): detrusor areflexia but intact sphincter innervation.
- Decreased ability to sense a full bladder, incomplete emptying, urinary retention, and distended bladder with high post-void residual urine volume (>50ml).
- Patients with higher bladder than urethral pressure develop overflow incontinence and lose urine until pressure equalizes. Can occur during both day and night.

Fistulas:

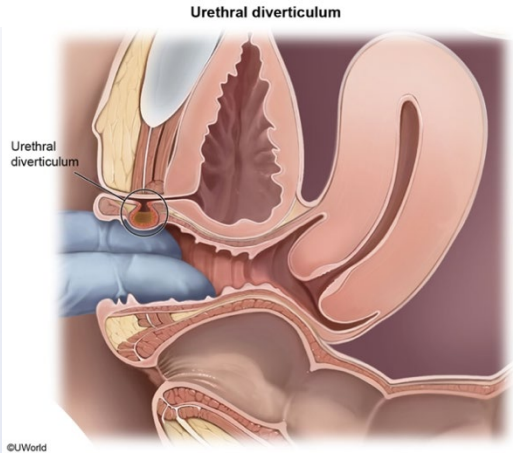
- Fistula: epithelialized tract between two organs.
- Pathogenesis: inflammation or radiation.
    - Surgery, cancer, inflammatory bowel disease.
- C/P:
    - Constant, continuous leak.
    - Normal function of the bladder.
    - If it connects to rectum: stool in urine, air in the urine, and recurrent UTIs.
    - Can also connect to vagina or skin.
- Diagnosis by physical exam.
    - Urinalysis and cystometry is not useful.
    - Tampon test: cover fistula opening with tampon, inject blue dye into the urethra and wait to see where the blue dye goes.
    - Cystourethroscopy.
- Treatment: surgery.

Vesicovaginal fistula	
Risk factors	• Pelvic surgery • Pelvic irradiation • Prolonged labor/childbirth trauma • Genitourinary malignancy
Clinical features	• Painless, continuous urine leakage from the vagina
Diagnostic studies	• Physical examination • Dye test • Cystourethroscopy

Urethral diverticulum:

- Outpouching of the bladder or urethra into the adjacent tissues.
- More common in women than men.
- Occurs from recurrent periurethral gland infections → abscess → breaches the urethral mucosa.
- C/P:
    - Tender anterior vaginal wall mass.
    - Purulent drainage.
    - Post-void dribbling.
    - Dysuria.
    - Dyspareunia.
    - Recurrent cystitis/UTI due to urinary stasis.

Urethral diverticulum	
Definition	• Urethral mucosa herniated into surrounding tissue
Clinical features	• Dysuria • Postvoid dribbling • Dyspareunia • Anterior vaginal wall mass
Diagnostic testing	• Urinalysis • Urine culture • MRI of the pelvis • Transvaginal ultrasound



Gyn Infections

Vulvovaginitis:

- Candida:
  - Risk factors: diabetes, steroids or recent antibiotics use.
  - C/P:
    - Thick white discharge adherent to the vaginal wall.
    - No odor.
  - Wet prep:
    - Hyphae.
    - If negative → vaginal culture.
  - Treatment:
    - Antifungals.
      - OTC: topical.
      - Fluconazole if topical fails.
  - Recurrent vulvovaginal candidiasis (>4 episodes a year) → HbA1c.
- Bacterial vaginosis:
  - Caused by Gardenella vaginalis.
  - C/P:
    - Thin gray-white discharge.
    - Fishy odor.
    - No vaginal inflammation.
  - Wet prep:
    - Clue cells on a saline prep.
    - Whiff test on KOH prep.
    - pH >4.5.
  - Treatment:
    - Oral metronidazole. (avoid alcohol consumption → disulfiram)
      - Topical first then oral.
      - 500 mg twice daily for 7 days.
    - Oral clindamycin.
    - Boric acid vaginal suppositories for recurrent BV.
  - Complications:
    - Increased risk of preterm labor, PROM, and spontaneous abortion.
    - Increased risk of acquisition of HSV 2, HIV, chlamydia, gonorrhea, and Trichomonas.
- Trichomoniasis:
  - C/P:
    - Yellow green frothy discharge.
    - Cervical erythema “strawberry cervix” → postcoital bleeding.
  - Wet prep:
    - Flagellated organisms.
  - Treatment:
    - Metronidazole for both partners at the same time.
      - Starts as PO.

Differential diagnosis of vaginitis

Bacterial vaginosis (*Gardnerella vaginalis*)	Trichomoniasis (*Trichomonas vaginalis*)	Candida vaginitis (*Candida albicans*)
		
• Thin, off-white discharge with fishy odor • No inflammation	• Thin, yellow-green, malodorous, frothy discharge • Vaginal inflammation	• Thick, "cottage cheese" discharge • Vaginal inflammation
		
• pH >4.5 • Clue cells • Positive whiff test (amine odor with KOH)	• pH >4.5 • Motile trichomonads	• Normal pH (3.8 - 4.5) • Pseudohyphae
Metronidazole or clindamycin	Metronidazole; treat sexual partner	Fluconazole

Annual screening for chlamydia and gonorrhea is recommended for sexually active women age <25 and women age 25 and above with risk factors such as multiple sexual partners and inconsistent condom use.

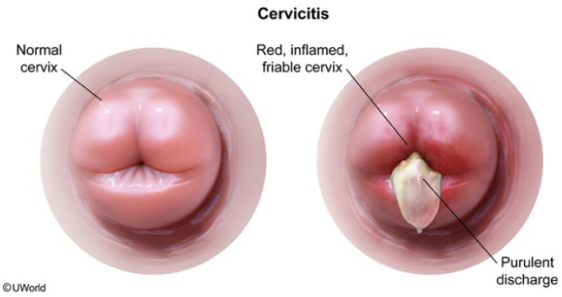
Cervicitis:

- Pathogenesis: inflammation of the cervix by the cause of vulvovaginitis or by gonorrhea and chlamydia.
- Chlamydia and gonorrhea → mucopurulent endocervicitis.
- Trichomonas and HSV → ectocervicitis.
- C/P:

    - Cervical motion tenderness.
    - Mucopurulent discharge.
    - Gonococcal pharyngitis occurs due to inoculation of the pharynx during orogenital contact
        - Pharyngeal edema and nontender cervical LDN.
    - Urethritis: sterile pyuria + dysuria.
- Diagnosis by physical exam.
    - Vaginal or cervical swab.
    - NAATs for gonorrhea and chlamydia.
    - Wet prep.
    - Do not gram stain.
- Treatment:
    - Gonorrhea: Ceftriaxone IM.
    - Chlamydia: doxycycline or azithromycin.
    - Vulvovaginitis etiology: treat the cause.
    - **Test of cure required in pregnant women.**
- Annual screening for chlamydia and gonorrhea is recommended for women who are sexually active and less than the age of 25.
    - Cervical swab for those undergoing a pelvic exam.
    - Vaginal swabs preferred for younger patients.

Chlamydia & gonorrhea in women	
Risk factors	• Age <25 • High-risk sexual behavior
Manifestations	• Asymptomatic (most common) • Cervicitis • Urethritis • Perihepatitis (Fitz-Hugh and Curtis syndrome)
Diagnosis	• Nucleic acid amplification testing
Treatment	• Empiric: azithromycin + ceftriaxone • Confirmed chlamydia: azithromycin • Confirmed gonorrhea: azithromycin + ceftriaxone
Complications	• Pelvic inflammatory disease • Ectopic pregnancy • Infertility • Pharyngitis

Acute cervicitis	
Etiology	• Infectious: *Chlamydia trachomatis*, *Neisseria gonorrhoeae* • Noninfectious: Foreign object, latex, douching
Clinical presentation	• Asymptomatic • Mucopurulent discharge • Postcoital/intermenstrual bleeding • Friable cervix
Evaluation	• Nucleic acid amplification testing • Wet mount microscopy
Management	• Empiric treatment: Azithromycin plus ceftriaxone



Pelvic inflammatory disease:

- Ascending infection. 1/3 gonorrhea. 1/3 chlamydia. 1/3 vaginal flora.
- Risk factors:
    - <25 years.
    - Sexual activity without barrier contraception.
- C/P:
    - Abdominal or pelvic pain.
    - No other cause for the symptoms.
    - 1 of 3:
        - Cervical motion tenderness.
        - Adnexal tenderness.
        - Uterine tenderness.
    - Toxic: fever and leukocytosis.
        - WBCs on wet prep.
        - Mucopurulent discharge.
    - Perihepatitis (fitz-hugh-Curtis disease):
        - C/P:
            - Vomiting.
            - Elevated transaminases.
            - Pleuritic RUQ pain.
    - Gonorrhea can present with pharyngitis as well.
- Clinical diagnosis.
    - US for TOA or free fluid.
        - Complex multiloculated adnexal mass with thick walls and internal debris.

- Can lead to hydrosalpinx of the fallopian tubes.
- Lab findings: leukocytosis, elevated CRP and CA-125.

- Treatment:
  - In patient in severely ill patients: nausea, vomiting or pregnant.
    - Cefoxitin or cefotetan IV and oral doxycycline.
    - Back up: IV clindamycin plus gentamicin.
  - Outpatient:
    - Ceftriaxone IM plus doxycycline plus metronidazole.
- Follow up:
  - Need of surgery in the case of TOA.

Pelvic inflammatory disease	
Symptoms	• Lower abdominal pain • Abnormal bleeding
Physical examination	• Cervical motion tenderness • Fever >38.3 C (>100.9 F) • Mucopurulent cervical discharge
Treatment	• Third-generation cephalosporin ***plus*** • Azithromycin ***or*** doxycycline
Complications	• Tubo-ovarian abscess • Infertility • Ectopic pregnancy • Perihepatitis

Indications for hospitalization for pelvic inflammatory disease
• Pregnancy • Failed outpatient treatment • Inability to tolerate oral medications • Noncompliant with therapy • Severe presentation (eg, high fever, vomiting) • Complications (eg, tubo-ovarian abscess, perihepatitis)

Genital ulcers:

Infectious genital ulcers		
Painful	Herpes simplex virus	• Pustules, vesicles, or small ulcers on erythematous base • Tender lymphadenopathy • Systemic symptoms common
	Haemophilus ducreyi (chancroid)	• Larger, deep ulcers with gray/yellow exudate • Well-demarcated borders & soft, friable base • Severe lymphadenopathy that may suppurate
Painless	*Treponema pallidum* (syphilis)	• Usually single ulcer (chancre) • Indurated borders & hard, nonpurulent base
	Chlamydia trachomatis serovars L1-L3 (lymphogranuloma venereum)	• Initial small, shallow ulcers (often missed) • Then painful & fluctuant adenitis (buboes)

- Herpes simplex virus:
  - C/P:
    - Multiple painful genital ulcers.
    - Associated with systemic symptoms; fever and headache.
    - Acute urinary retention due to reluctance to urinate or lumbosacral neuropathy.
  - Labs:
    - Sterile pyuria; WBCs but no bacteria.

        - Do a viral culture or PCR test.
    - Immunocompetent → spontaneous resolution of symptoms within a week.
    - Immunosuppressed → progress to CNS infections (aseptic meningitis, transverse myelitis)
    - Antivirals (acyclovir) used to reduce symptom duration and frequency of recurrences.
        - If it doesn't work → imiquimod.
- Chancroid:
    - C/P:
        - Multiple purulent lesions 1-2 cm in size with a greyish necrotic base.
        - Painful.
        - Painful inguinal LDN.
    - Treatment:
        - Oral azithromycin or IM ceftriaxone.
- Syphilis:

Syphilis: diagnostic serology	
Nontreponemal (RPR, VDRL)	• Antibody to cardiolipin-cholesterol-lecithin antigen • Quantitative (titers) • Possible negative result in early infection • Decrease in titers confirms treatment
Treponemal (FTA-ABS, TP-EIA)	• Antibody to treponemal antigens • Qualitative (reactive/nonreactive) • Greater sensitivity in early infection • Positive even after treatment

FTA-ABS = fluorescent treponemal antibody absorption; **RPR** = rapid plasma reagin; **TP-EIA** = *Treponema pallidum* enzyme immunoassay.

    - Negative screening serology and strong clinical evidence of primary syphilis → empirical IM benzathine penicillin G treatment.
        - Repeat nontrepenomal tests in 2-4 weeks to establish baseline titers.
            - A 4-fold decrease in 6-12 months would confirm adequate treatment.
- Granuloma inguinale:
    - Klebsiella Granulomatous:
    - Painless large beefy-red genital ulcers with no LDN.
- Lymphogranuloma venereum:
    - Caused by C. trachomatis L1, L2, and L3.
    - C/P:
        - Transient papule that is painless and heals rapidly.
        - Painful suppurative LDN seen 2-6 weeks after the papule heals.
        - Fever, chills, and malaise.

Characteristics of ulcerative sexually transmitted diseases			
Disease	**Causative agent**	**Features of primary lesion**	**Initial lesion painful?**
Chancroid	*Haemophilus ducreyi*	• Multiple & deep ulcers • Base may have gray to yellow exudate • Organisms often clump in long parallel strands ("school of fish")	Yes
Genital herpes	Herpes simplex virus 1 & 2	• Multiple, small, grouped ulcers • Shallow with erythematous base • Multinucleated giant cells & intranuclear inclusions (Cowdry type A)	Yes
Granuloma inguinale (donovanosis)	*Klebsiella granulomatis*	• Extensive & progressive ulcerative lesions without lymphadenopathy • Base may have granulation-like tissue • Deeply staining gram-negative intracytoplasmic cysts (Donovan bodies)	No
Syphilis	*Treponema pallidum*	• Single, indurated, well-circumscribed ulcer • Nonexudative base • Painless inguinal lymphadenopathy • Thin, delicate, corkscrew-shaped organisms on dark-field microscopy	No
Lymphogranuloma venereum	*Chlamydia trachomatis*	• Small & shallow ulcers • Large, painful, coalesced inguinal lymph nodes ("buboes") • Intracytoplasmic chlamydial inclusion bodies in epithelial cells & leukocytes	No

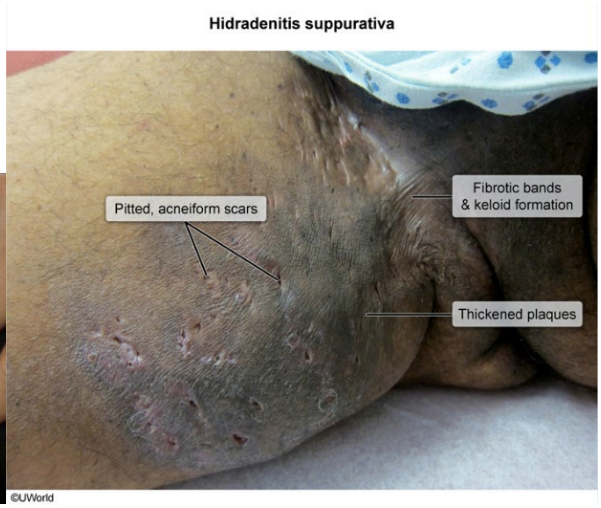
Candida intertrigo:

- Erythematous (“beefy red”) plaques in a symmetric pattern across the skinfold and multiple satellite lesions near the primary infection.
- Caused by candida albicans.
- Risk factors: impaired immunity; steroids or DM.
- Clinical diagnosis.
    - Confirmed by visualization of hyphae or pseudohyphae on microscopic examination.
- Treatment: topical azoles (decrease spread of infection, anti-inflammatory, and antibacterial).

Hiradenitis suppurativa:

- Tender inflammatory nodules in the intertriginous areas.
- Associated with sinus tract formation and multiple open comedones.
- Clinical diagnosis.

- Treatment: aimed at reducing frequency of lesions and preventing disease progression and complications
    - Doxycycline.



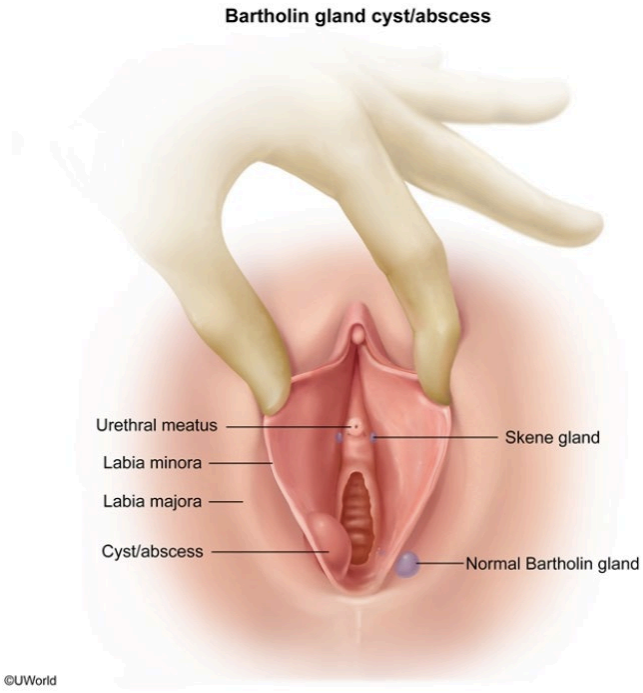
Staphylococcal toxic shock syndrome:

Staphylococcal toxic shock syndrome	
Risks	• Tampon use • Nasal packing • Surgical/postpartum wound infection
Pathogenesis	• *Staphylococcus aureus* • Exotoxin release acting as superantigens
Clinical features	• Fever >38.9 C (102 F) • Hypotension • Diffuse macular rash involving palms & soles • Desquamation 1-3 weeks after disease onset • Vomiting, diarrhea • Altered mentation without focal neurological signs
Treatment	• Supportive therapy (fluid replacement) • Removal of foreign body (eg, tampon) • Antibiotic therapy (eg, clindamycin plus vancomycin)

Clinical features of toxic shock syndrome

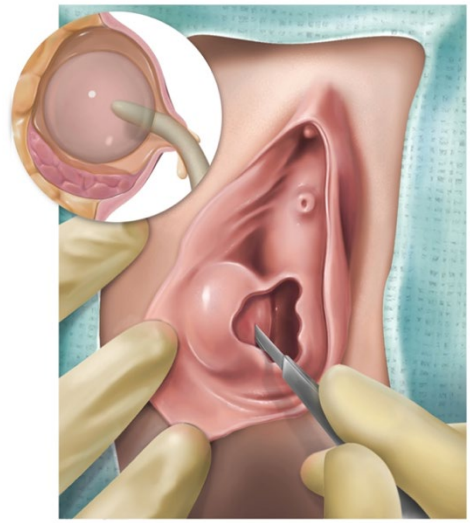
• Fever usually >38.9 C (102 F)
• Hypotension with systolic BP ≤90 mm Hg
• Diffuse macular erythroderma
• Skin desquamation, including palms & soles, 1-2 weeks after illness onset
• Multisystem involvement (3 or more systems)
  ◦ Gastrointestinal (vomiting &/or diarrhea)
  ◦ Muscular (severe myalgias or elevated creatine kinase)
  ◦ Mucous membrane hyperemia
  ◦ Renal (BUN or serum creatinine >1-2x upper)
  ◦ Hematologic (platelets <100,000/µL)
  ◦ Liver (ALT, AST & total bilirubin >2x upper limit of normal)
  ◦ Central nervous system (altered mentation without focal neurological signs)

Bartholin gland cyst:



- C/P:
  - Asymptomatic.
  - Vaginal pain and discomfort with activity.
- Exam:
  - Soft, mobile, nontender, cystic mass palpated behind the posterior labium majus.
- Treatment:
  - Asymptomatic → observation and expectant management.
  - Symptomatic → incision and drainage with possible word catheter placement.
  - Recurrent → marsupialization.
- Complication: Bartholin gland abscess.

Word catheter



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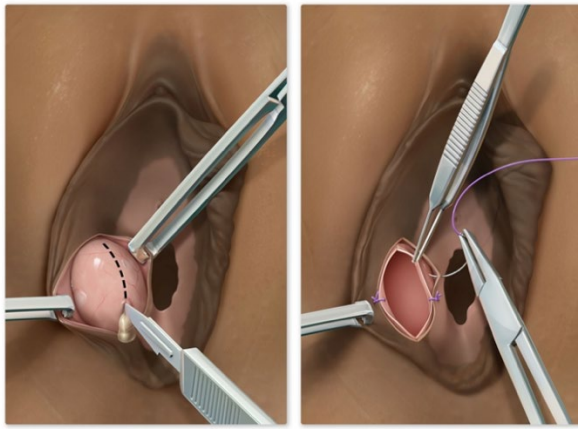
Bartholin gland marsupialization

1. Incise & drain cyst or abscess

2. Evert edges of cyst or abcess & suture to mucosal edge



Vaginal Bleeding

Premenarchal:

- MCC is foreign body.
    - Placed by the girl herself.
- Other differentials:
    - Look for signs of trauma: might be sexual abuse!
    - Precocious puberty.
- What to do?
    - Speculum exam under anesthesia.

Prepubertal vaginal bleeding	
Cause	**Key features**
Withdrawal of estrogen	• Presents in neonatal period • Lasts <1 week • Examination otherwise normal
Trauma	• Usually unintentional from fall • Can be sign of sexual abuse • Genital examination may show laceration/abrasion
Malignancy (eg, rhabdomyosarcoma)	• Rare • Presents age <3 • May visualize protruding vaginal nodules

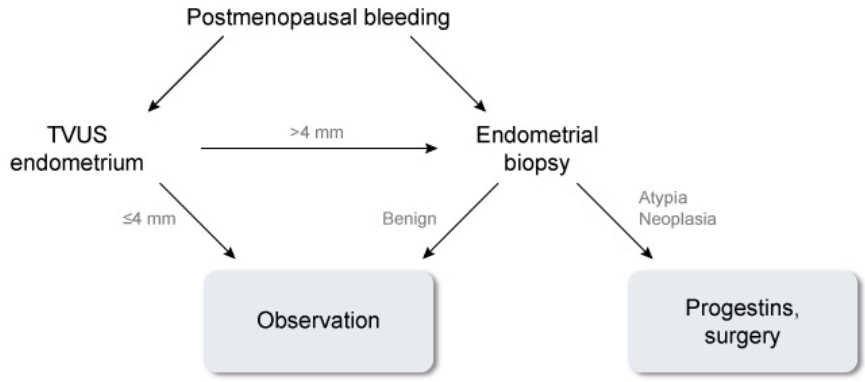
Reproductive:

- MCC is pregnancy.
- Other differentials:
    - Anatomy.
        - PALM → structural.
            - Polyps.
            - Adenomyosis.
            - Leiomyoma.
            - Malignancy.
        - COIEN → nonstructural.
            - Coagulopathy.
            - Ovarian dysfunction (DUB and AUB).
            - Endometrium.
            - Iatrogenic (IUD).
            - Not yet classified.
    - Dysfunctional uterine bleeding (abnormal uterine bleeding).
        - A diagnosis of exclusion.
- What to do?
    - Urine pregnancy test.

Postmenopausal:

- MCC is vaginal atrophy.
    - After sexual intercourse.
- Other differentials:
    - Endometrial cancer.
    - Hormone replacement therapy.
    - Fibroids are not usually a cause since they typically decrease in size and become asymptomatic after menopause.
- What to do?
    - In office endometrial sampling.
    - Pap test for cervical cancer; regardless of when the last pap test was performed.

Approach to postmenopausal bleeding



TVUS = transvaginal ultrasound.
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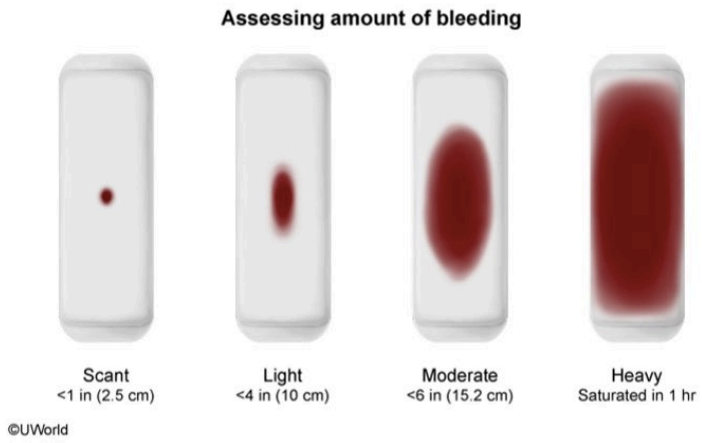
Life-threatening uterine bleeding:

- ABC
    - Two large bore IV cannulas.
    - Boluses.
    - Type and cross for transfusions.
        - Check hemoglobin change over time.
            - Reassess after IV fluids.
        - Hemoglobin less than 7 is an indication.
        - Assess for hemodynamic instability by orthostasis.
            - If there's hypotension → give crystalloids and transfusions.
- **IV estrogen.**
- Surgical intervention if IV estrogen doesn't work.
    - Intracavitary tamponade.
        - Insert a balloon and inflate it.
    - Dilation and curettage is the preferred method.
    - Uterine artery embolization in the case of AV malformations and fibroids.
    - Total abdominal hysterectomy is the last resort.



Medical treatment options for acute abnormal uterine bleeding

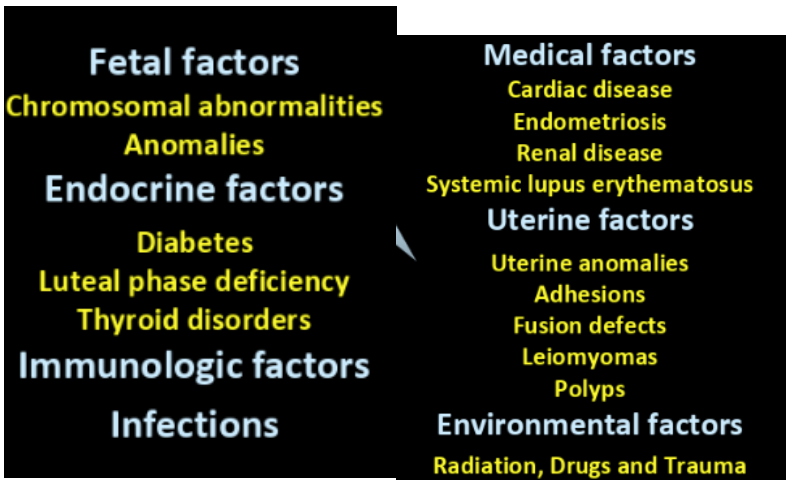
- High-dose intravenous or oral estrogen
- High-dose combined oral contraceptive pills
- High-dose progestin pills
- Tranexamic acid

Bleeding in early pregnancy differentials:

- Abortions.
- Ectopic pregnancy.
- Molar pregnancy.
- Local gyne lesions.
- Physiological implantation of pregnancy.

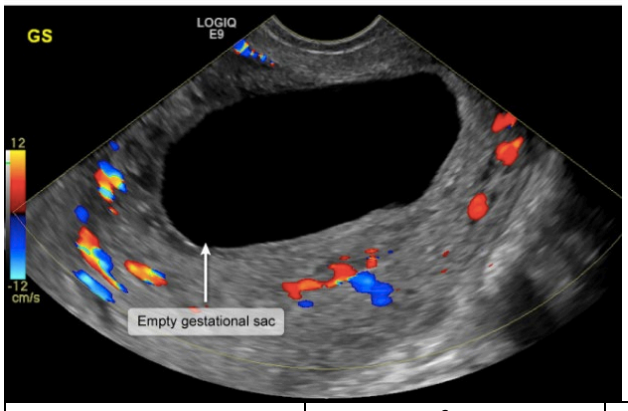
Abortions:

- MCC is chromosomal abnormalities.
- Other causes:

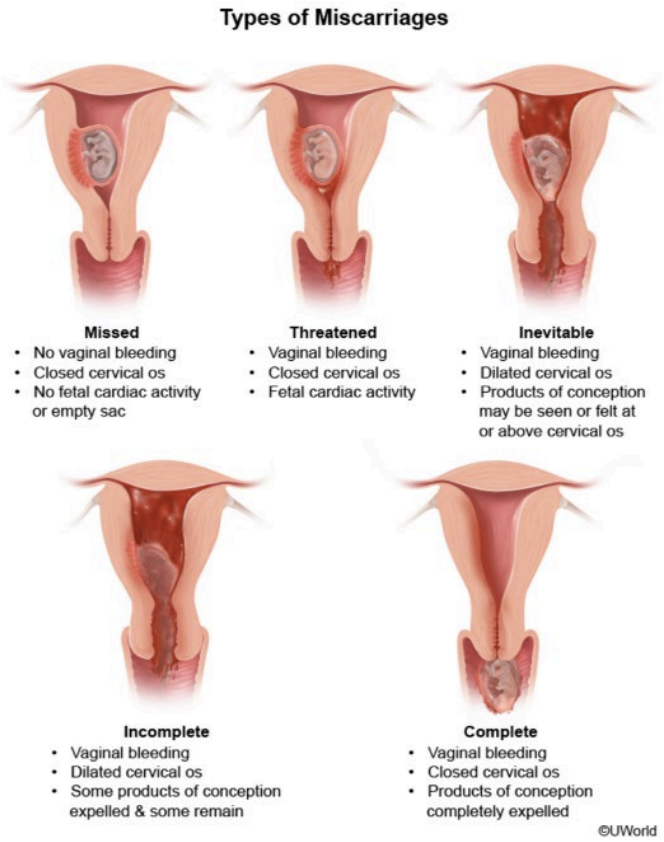


- Another important cause: corpus luteum removal before 10 weeks gestation → loss of progesterone → pregnancy loss.
  - Thus give progesterone supplementation until 10 weeks.
- Intrauterine pregnancy → threatened → inevitable → incomplete → complete.
- Missed? Baby is dead, should be expelled, but body doesn't recognize it.
  - Embryo without cardiac activity or empty gestational sac without a fetal pole.
  - Decreasing B-HCG levels.
  - Complication after 3 weeks → DIC.

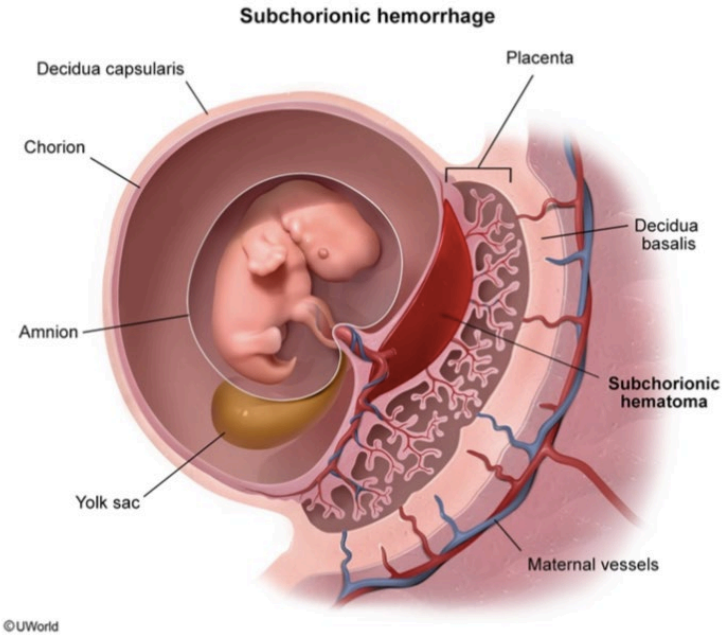
Anembryonic gestation/blighted ovum/pregnancy failure



	Passage of contents	**Cervical Os**	**Ultrasound**
IUP	-	Closed	Live baby
Threatened (bleeding)	-	Closed	Live baby
Inevitable	-	Open	Dead baby
Incomplete	+	Open	Retained parts
Complete	+	Closed	Nothing
Missed	-	Closed	Dead baby



- Threatened abortions associated with subchorionic hematoma (bruise between placenta and uterus).
    - Manage by repeating US in a week.
- Closed abortion; positive B-HCG until 6 weeks post abortion.



- Medical management?
    - Misoprostol in the first trimester (<12 weeks).
    - Oxytocin for the missed abortion.
    - Hemodynamically unstable or infection? Suction curettage.

- All Rh- → give RhoGam-D.

- Recurrent miscarriages: 3 or more consecutive.
  - Initial work up: pelvic US, karyotype, and thrombophilia testing because anatomic, genetic, and thrombotic disorders are the MCC.

Spontaneous abortion	
Definition	• Pregnancy loss <20 weeks
Risk factors	• Advanced maternal age • Previous spontaneous abortion • Substance abuse
Treatment options	• Expectant • Medical induction (misoprostol) • Suction curettage if infection or hemodynamic instability
Additional management	• Rho(D) immune globulin • Pathology examination
Complications	• Hemorrhage • Retained products of conception • Septic abortion • Uterine perforation • Intrauterine adhesions

- Septic abortions:
  - Broad spectrum IV antibiotics e.g. monotherapy with piperacillin-tazobactam or imipenem, triple therapy with clindamycin, gentamicin, and ampicillin.
    - Continued until patient is afebrile for 48 hours.
  - Surgical evacuation of the uterine contents.

Septic abortion	
Risk factors	**Retained products of conception from:** • Elective abortion with non-sterile technique outside of health care setting • Missed, incomplete, or inevitable abortion (rare)
Clinical presentation	• Fever, chills, lower abdominal pain, bloody or purulent vaginal discharge • Boggy & tender uterus with dilated cervix • **Pelvic ultrasound:** Retained products of conception, increased vascularity, echogenic material in the cavity, thick endometrial stripe
Management	• Blood & endometrial cultures • Intravenous fluids & broad-spectrum antibiotics • Surgical evacuation of uterus (suction curettage) • Hysterectomy if no response to antibiotics, development of abscess, or signs of clostridial infection
Complications	• Salpingitis • Peritonitis • Septic shock

- Dilation & curettage steps:
  - Anesthesia.
  - Lithotomy position.
  - Iodine from the umbilicus till mid-thigh.
    - From clean to dirty aka outside to inside.
  - Empty the bladder.
  - Bimanual exam.
  - Speculum of the posterior vaginal wall.
  - Clamp the anterior lip of the anterior cervix.
  - TVUS.
  - Dilation of cervix.
  - Curettage and suction.
  - Grazing sensation and bubbling indicate the end of curettage.
  - TVUS for RPOC.
  - Complications:
    - Early:
      - Bleeding: PPH.
      - Infection: endometritis.
      - Trauma: perforation.
    - Late:
      - Bleeding: secondary PPH due to endometritis.
      - Infection: PID.
      - Trauma: asherman syndrome.

Causes of abortions:

- Antiphospholipid syndrome:

Diagnostic criteria for antiphospholipid-antibody syndrome (1 clinical & 1 laboratory criterion must be met)	
Clinical	**Vascular thrombosis** • Arterial or venous thrombosis **Pregnancy morbidity** • ≥3 consecutive, unexplained fetal losses before 10th week • ≥1 unexplained fetal losses after 10th week • ≥1 premature births of normal neonates before 34th week due to preeclampsia, eclampsia, placental insufficiency
Laboratory	• Lupus anticoagulant • Anticardiolipin antibody • Anti-beta-2 glycoprotein antibody

    - Persistent thrombosis of placental vessels causes pregnancy complications or recurrent pregnancy losses.
    - VDRL +ve.
    - Treatment: enoxaparin and aspirin.
- Cervical insufficiency:
    - Causes second trimester pregnancy loss due to intrinsic cervical instability or from a reduced cervical length (prior cervical conization).
    - C/P: shortened or dilated cervix on transvaginal ultrasound.
    - NO VAGINAL BLEEDING.
    - Prophylactic cerclage in the first trimester (usually at 14 weeks). Suture removed at term to allow vaginal delivery.

Cervical insufficiency during pregnancy	
Risk factors	• Collagen abnormalities • Uterine anomalies • Prior mechanical cervical dilation • Prior obstetric cervical laceration • Prior conization or loop electrosurgical excision procedure
Diagnosis	• History of painless cervical dilation with second trimester loss • Painless cervical dilation in the second trimester of a current pregnancy • History of prior preterm birth and current ultrasound cervical length <25 mm during the second trimester
Management	Serial ultrasound evaluation of cervical length and cerclage placement during the second trimester

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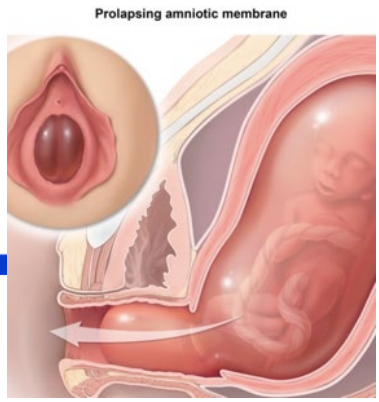
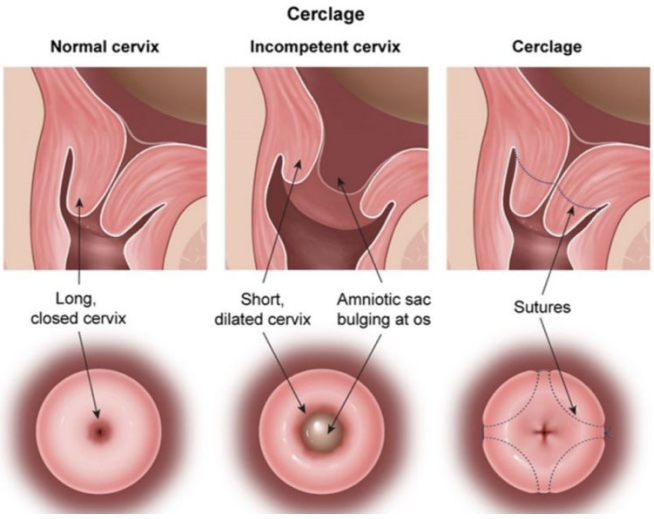




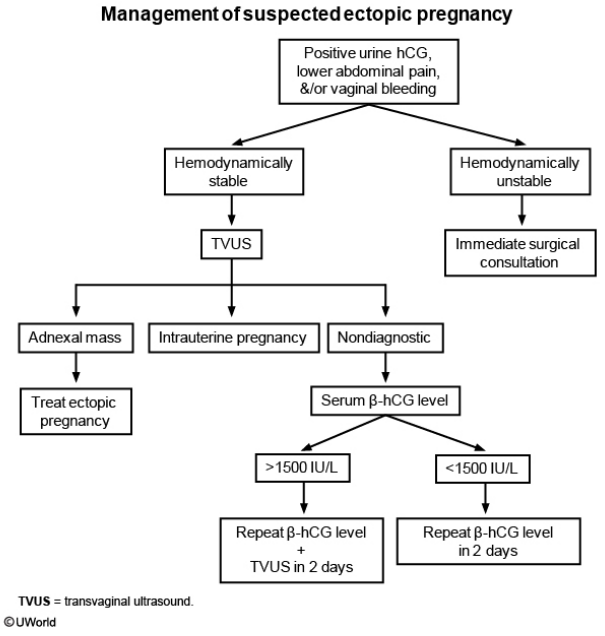
Causes of recurrent pregnancy loss	
Structural	• Uterine: fibroids, adhesions, polyps • Cervical insufficiency
Chromosomal	• Aneuploidy • Translocations/rearrangements • Mosaicism
Immunologic/ Hematologic	• Hypercoagulable disorders (eg, antiphospholipid syndrome) • Alloimmune intolerance
Endocrine	• Thyroid disease • Polycystic ovary syndrome • Diabetes mellitus • Hyperprolactinemia
Other	• Advancing maternal age • Defective endometrial receptivity • Decreased ovarian reserve • Celiac disease

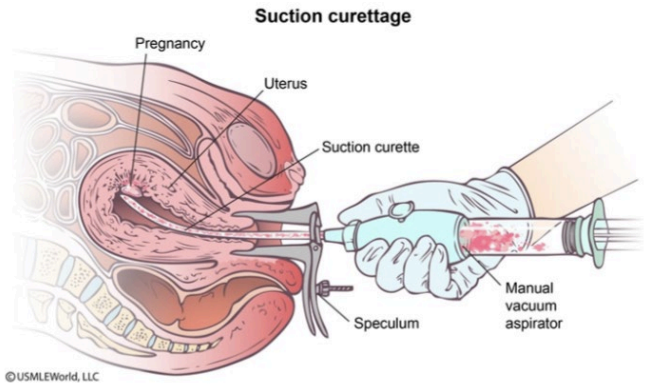
Ectopic pregnancy:

- UPT + plus vaginal bleeding.
- Get TVUS.
    - IUP:
        - Molar pregnancy (snow-storm pattern).
            - Suction curettage.
            - Put her on OCP and monitor B-HCG.
        - Normal pregnancy.
        - Abortion.
    - Ectopic pregnancy:
        - US and B-Quant (B-HCG in the blood).
        - Management:

- Ruptured fallopian tube or hemodynamically unstable → salpingectomy.
    - No need to follow up B-HCG.
- Intact fallopian tube → salpingostomy.
- Methotrexate and leucovorin.
    - Criteria:
        - B-HCG less than 5000.
        - Gestational size less than 3.5
        - No fetal heart sounds.
        - Mother not on folate.
- Rh- mothers should receive Rho-Gam (D).

- Nothing:
    - Use B-Quant.
        - If >=1500 → you should be able to see an IUP if not, then treat as an ectopic.
        - If <1500 → too soon to tell. Have her come back in 48 hours and repeat B-Quant.
            - If B-Quant doubles → IUP.
            - If it doesn't → ectopic pregnancy.





Leiomyomata uteri (fibroids):

- Benign growth of the myometrium.
- Can be serosal or submucosal or intramural or diffuse.
- Asymmetric nodular uterus.
- Estrogen responsive.
    - Gets worse during cycles and regresses after menopause.
- Risk factors:
    - Age.
    - Nulliparity.
    - Menarche <10 years.
- C/P:
    - Asymptomatic.
        - Irregularity on physical exam.
    - Painful; back and pelvic pain.
    - Pelvic pressure.
    - Menorrhagia and dysmenorrhea.
    - Iron deficiency anemia due to bleed.
    - Infertility.
    - Subserosal → visceral obstruction and urinary incontinence.
        - Rarely can cause hydronephrosis and ureteral impingement.
    - Submucosal or intramural → recurrent pregnancy loss (abortions) and malpresentations.
        - Can prolapse into the cervix causing labor-like pain and cervical dilation.
    - Size-date discrepancy.
- Diagnosis: TVUS.
    - Best test → MRI. NOT THE ANSWER.
        - Done only when leiomyosarcoma is a possibility.
- Complications:
    - Degeneration:
        - Hyaline.
        - Calcific.
        - Red; acute pelvic pain!
            - Most common during pregnancy.
            - Since it grows rapidly from the effects of estrogen and progesterone → fibroids outgrow their blood supple → infarction and necrosis.
            - C/P:
                - Uterine contractions (due to PG release).
                - Fundal tenderness.
                - Tender mass.
                - Leukocytosis.
            - Diagnosis: ultrasound.
            - Conservative management: indomethacin for those less than <32 weeks gestation.
- Treatment:
    - Perimenopausal: expectant since it will regress after menopause.
    - Asymptomatic → frequent follow ups.
    - OCPs to regulate the cycle.

- Pain → NSAIDs.
- Surgery:
    - For those who don't want kids → TAH.
    - For those who do → myomectomy.
    - Leuprolide to shrink the fibroids if they're too big and then remove.
    - Uterine artery embolization: closes off the uterine artery but ovarian artery supply remains intact.
        - Adverse effects:
            - Postembolization syndrome: due to fibroids undergoing necrosis.
                - C/P:
                    - Pain, fever, malaise, nausea.
                    - In the first 12 hours.
            - Watery, blood tinged vaginal discharge.
                - Weeks to months after.
                - Expectant management.
                - If excessive → CBC and wet mount microscopy.
                    - Presence of leukocytes is normal.

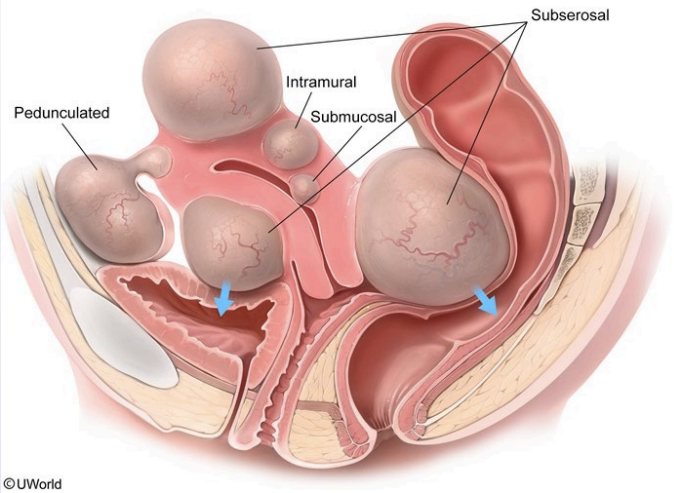
Uterine leiomyomas (fibroids)	

Clinical features	• Heavy, prolonged menses
	• Pressure symptoms
	  ○ Pelvic pain
	  ○ Constipation
	  ○ Urinary frequency
	• Obstetric complications
	  ○ Impaired fertility
	  ○ Pregnancy loss
	  ○ Preterm labor
	• Enlarged, irregular uterus

Workup	• Ultrasound
Treatment	• Asymptomatic: observation • Symptomatic: CHC, surgery

CHC = combined hormonal contraception.

Uterine fibroids



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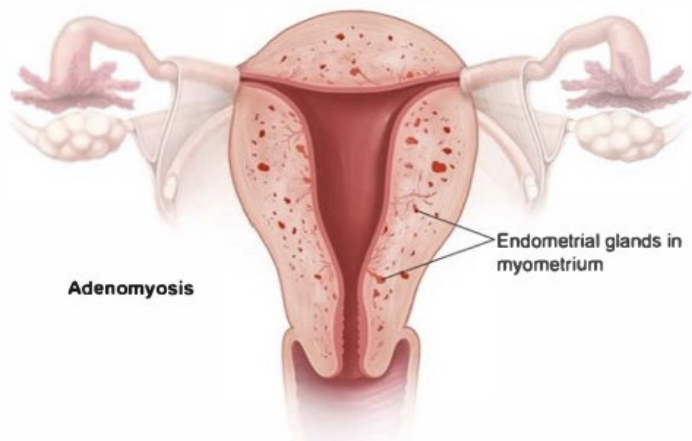
Uterine sarcoma:

Uterine sarcoma	
Risk factors	• Pelvic radiation • Tamoxifen use • Postmenopausal patients
Presentation	• Abnormal/postmenopausal bleeding • Pelvic pain or pressure • Uterine mass
Diagnosis	• Ultrasound ± additional imaging • Endometrial biopsy • Histopathology of surgical specimen
Treatment	• Hysterectomy • ± Adjuvant chemotherapy, radiation therapy

Adenomyosis:

- Proliferation of glandular tissue into the myometrium.
- Occurs in multiparous women aged>40.
- C/P:
    - Dysmenorrhea.
    - Chronic pelvic pain.
    - Symmetric, smooth, tender, and **boggy**.
- Diagnosis:
    - Pelvic US and/or MRI.
    - Definitive diagnosis on histology after hysterectomy.
- Treatment:
    - OCPs.
    - Hysterectomy if conservative fails.

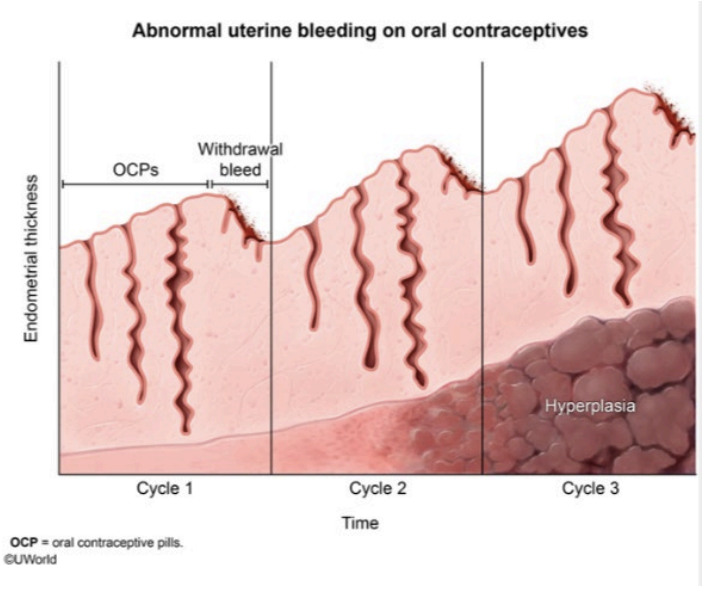
Adenomyosis	
Pathogenesis	• Abnormal endometrial tissue within the uterine myometrium
Risk factors	• Age >40 • Multiparity • Prior uterine surgery (eg, myomectomy)
Clinical features	• Dysmenorrhea • Heavy menstrual bleeding • Chronic pelvic pain • Diffuse uterine enlargement (eg, globular uterus) • ± Uterine tenderness
Diagnosis	• Clinical presentation • MRI & ultrasound: Thickened myometrium • Confirmation via pathology
Treatment	• Hysterectomy



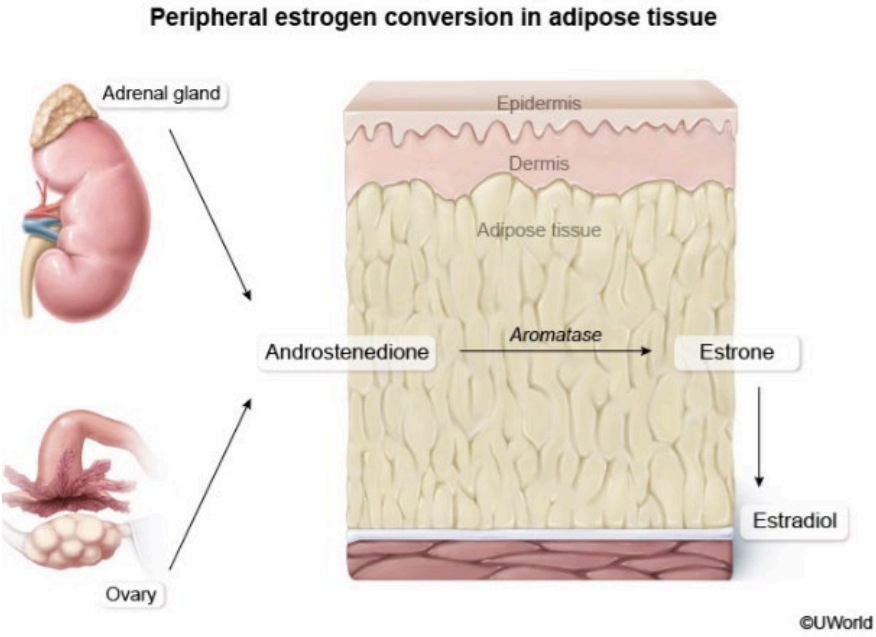
Causes of abnormal menstrual bleeding	
Diagnosis	**Clinical features**
Fibroids	• Heavy menses • Constipation, urinary frequency, pelvic pain/heaviness • Enlarged uterus
Adenomyosis	• Dysmenorrhea, pelvic pain • Heavy menses • Bulky, globular & tender uterus
Endometrial cancer/hyperplasia	• History of obesity, nulliparity, or chronic anovulation • Irregular, intermenstrual, or postmenopausal bleeding • Nontender uterus

Abnormal uterine bleeding:

- Menstrual bleeding that is prolonged (>5 days) and heavy (>1 pad every 2 hours) with an irregular frequency (<21 days or >45 days apart).
- Diagnosis of exclusion.
- Pathology: anovulation.
    - Excess estrogen which builds the endothelium.
- Abnormal uterine bleeding occurs near menarche and menopause.
    - Menarche: due to immature of the HPO axis.
- Management:
    - Active heavy bleeding:
        - First CBC, pregnancy test, and coagulation studies.
        - Hemodynamically stable → IV estrogen or high-dose oral OCP.
            - IV progestins can be given if they have a contraindication to estrogen.
        - Hemodynamically unstable → D&C and/or packed RBCs.
    - Stable patient:
        - 1st line therapy is OCPs.
            - For the progesterone component.
        - NSAIDs reduces bleeding by inhibiting prostaglandins.
        - Surgical intervention: ablation or hysterectomy.
        - **Failed medical management → endometrial biopsy.**



Obesity & anovulation:



- Chronic (> 6 months) abnormal uterine bleeding is secondary to excess adipose tissue associated with obesity.
- Excess adipose tissue affects HPO axis by 2 mechanisms:
    - Mechanisms:
        - Obesity causes insulin resistance and hyperglycemia → decreases the production of sex hormone-binding globulin → elevated free androgen levels.
        - Increased free androgens are aromatized in the adipose tissue to estrone, which leads to persistently elevated estrone levels.

    - High estrone levels affect GnRH pulses at the level of the hypothalamus → high frequency, short interval GnRH pulses → preferentially produce LH →imbalance of LH & FSH release from the anterior pituitary → lack of LH surge → cause anovulation and subsequent abnormal uterine bleeding
- Treatment: weight loss and combined OCPs.

Polycystic ovarian syndrome:

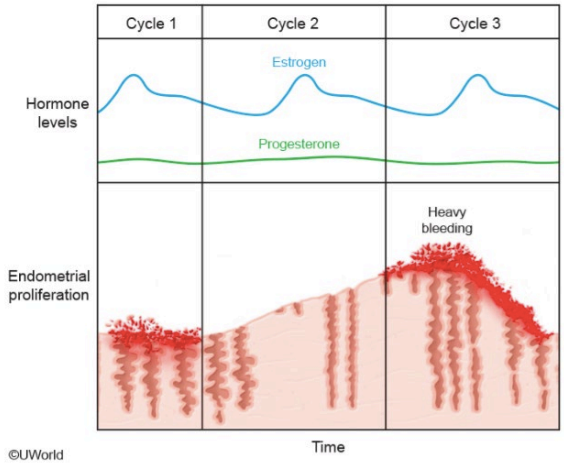
- Pathology: anovulation. Atretic follicles which produces testosterone.
    - Same pathogenesis as "obesity & anovulation".
- C/P:
    - Obese.
    - Hirsutism.
    - Metabolic syndrome.
        - Hypertension.
        - Dyslipidemia.
        - Diabetes.
    - Infertility.
    - Menometrorrhagia.
- Diagnosis:
    - History of anovulation.
    - Biochemical evidence of hyperandrogenism.
        - High testosterone.
        - **Increased LH:FSH ratio.**
    - US for the follicles.
    - Metabolic syndrome:
        - Fasting lipid levels and blood glucose level then OGTT.
    - Decreased sex hormone binding globulin.
- Treatment:
    - WEIGHT LOSS.
    - OCPs ➔ first line!
    - Letrozole is the first line for ovulation induction since its live births rates are better than clomiphene.
    - Clomiphene.
        - Disinhibits GnRH.
        - Used for fertility.
        - After weight loss fails.
    - Metformin: induces ovulation.
    - Spironolactone.

Polycystic ovary syndrome	
Clinical features	• **Androgen excess** (eg, acne, male pattern baldness, hirsutism) • Oligoovulation or anovulation (eg, **menstrual irregularities**) • Obesity • **Polycystic ovaries** on ultrasound
Pathophysiology	• ↑ Testosterone levels • ↑ Estrogen levels • LH/FSH imbalance
Comorbidities	• Metabolic syndrome (eg, diabetes, hypertension) • Obstructive sleep apnea • Nonalcoholic steatohepatitis • Endometrial hyperplasia/cancer
Treatment options	• Weight loss (first-line) • Oral contraceptives for menstrual regulation • Letrozole for ovulation induction

Hyperandrogenism	
Clinical features	• Hirsutism • Nodulocystic acne • Androgenic alopecia • ↑ Serum testosterone
Differential diagnosis	• Polycystic ovary syndrome • Androgen-secreting tumor • Cushing syndrome • Nonclassical CAH

CAH = congenital adrenal hyperplasia.

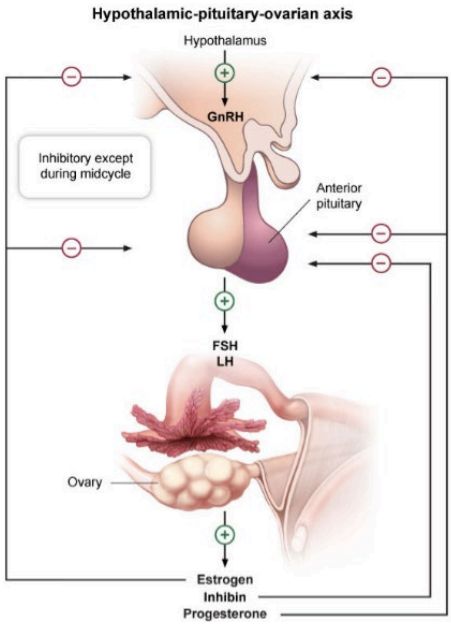
Effect of anovulatory cycles on the endometrium

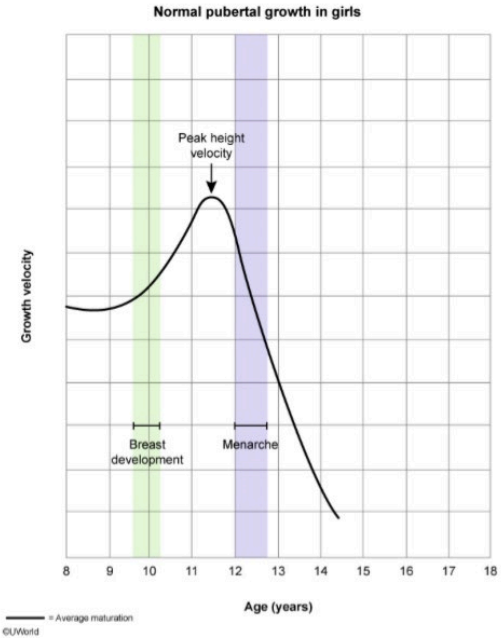


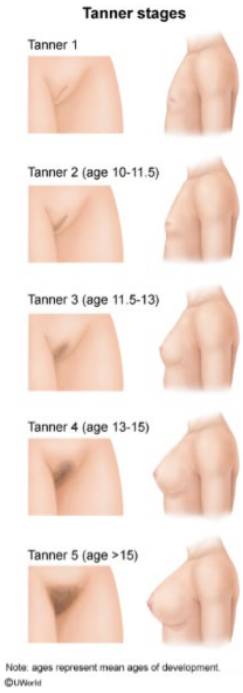
Puberty

Normal development:

- Breast (8) → axillary hair (9) → growth spurt (10) → menarche (12.5).
    - Tits, pits, mits, and lips.
    - Menarche expected around tanner stage 4.
- Hypothalamus releases GnRH → pituitary produces FSH and LH → ovary produces estrogen and progesterone → proliferation and glandular development of endometrium. Adrenals influence the endometrium via the DHEA and testosterone.
    - Things that can go wrong:
        - Constitutional at the level of the hypothalamus.
        - Tumor of the anterior pituitary.
        - Stromal cell tumors of the ovary.
        - CAH and tumors of the adrenals.

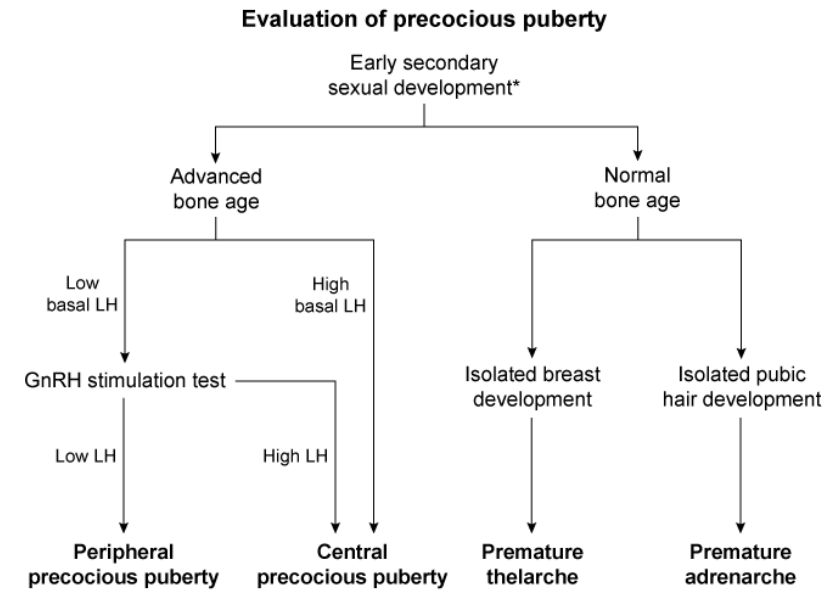






Precocious puberty: secondary sexual characteristics in a girl less than 8 years old:

- Determine bone age by looking at wrist x-ray.
    - Positive if 2 years greater than chronological age.
- GnRH (leuprolide) stimulation test:
    - Increased LH → central precocious puberty.
        - Do an MRI.
            - Differentials: hypothalamic hamartomas, hydrocephalus, pineal tumors, and intracranial infections (TB meningitis).
            - If positive for a tumor → resect.
            - If no tumor → constitutional.
                - Continuous GnRH → which turns off the axis.
    - No change in LH → peripheral precocious puberty:
        - US abdomen.
        - TVUS of ovaries.
        - DHEAs and testosterone levels.
        - 17-hydroxyprogesterone in the urine.
            - Differentials:
                - CAH → treat with steroids.
                - Tumor → resect.
                - Cyst → reassurance or resect.



Delayed puberty:

- No secondary sexual characteristics by age of 13 or no bleeding by age of 15.
- Do a bone age and check FSH and LH levels.
    - If FSH and LH are elevated → hypergonadotropic hypogonadism.
        - Do a karyotype.
    - If FSH and LH are low → hypogonadotropic hypogonadism.
        - Prolactin level for prolactinoma.
        - TSH and free t4 for thyroid disease.
        - UPT.
        - CBC, LFT, and ESR.
        - MRI for pituitary lesions.
        - If everything is negative → constitutional delay. Right answer is to wait. Do not do growth hormones. Forego all the testing if there's family history.

Menstrual disorders:

- Primary dysmenorrhea:

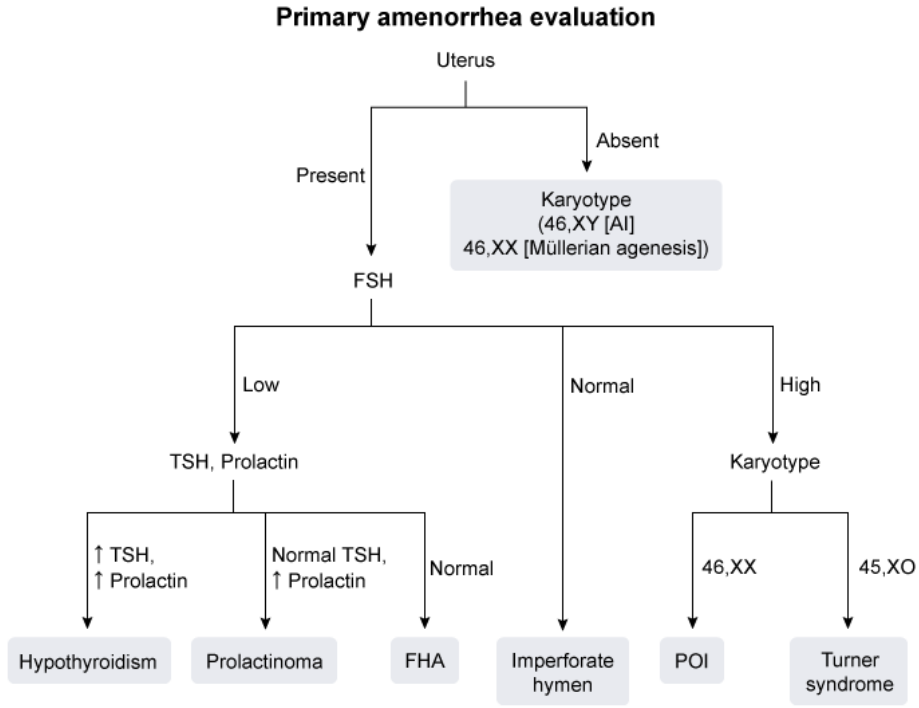
Primary dysmenorrhea	
Etiology	• Excessive prostaglandin production
Risk factors	• Age <30 • BMI <20 kg/m^2 • Tobacco use • Menarche at age <12 • Heavy/long menstrual periods • Sexual abuse
Clinical features	• Pain first 2-3 days of menses • Nausea, vomiting, diarrhea • Normal pelvic examination
Management	• Nonsteroidal anti-inflammatory drugs • Combination oral contraceptives

- OCPS is an option in the sexually active.

- Secondary dysmenorrhea:
  - Following clinical features:
    - Onset after the age of 25.
    - Unilateral pelvic pain.
    - No systemic symptoms during menses.
    - Abnormal uterine bleeding.

Dysmenorrhea			
Type	**Examples**	**Examination**	**Pain pathophysiology**
Primary	N/A	Normal	Release of prostaglandins from endometrium causes uterine contractions
Secondary	Endometriosis	Uterosacral nodularity, adnexal tenderness	Bleeding from ectopic endometrium
	Adenomyosis	Uterine tenderness & enlargement	
	Pelvic infection	Cervical motion tenderness, purulent cervical discharge	Bacterial infection & inflammatory response
	Uterine leiomyomata	Uterine contour irregularity	May be associated with heavy bleeding

Primary Amenorrhea



AI = androgen insensitivity; **FHA** = functional hypothalamic amenorrhea; **POI** = primary ovarian insufficiency.
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Craniopharyngioma & Kallmann syndrome:

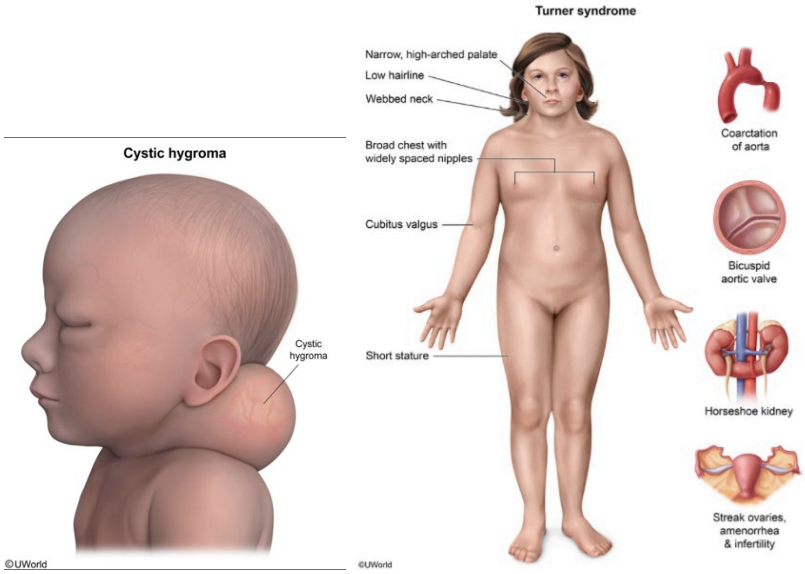
- Pathophysiology:
  - Craniopharyngioma: anterior pituitary fails to produce FSH and LH.
  - Kallmann: Lack of GnRH from the hypothalamus.
- C/P:
  - Anatomy is present.
  - No secondary sexual characteristics.
  - Anosmia in the case of Kallmann.
- Diagnosis:
  - Low FSH and LH.
  - MRI.
- Treatment: Give her what she doesn't have. Resect craniopharyngioma

Turner syndrome:

- 45 XO or 46 XX (mosaicism)
- Atretic ovaries (streak) → no estrogen or progesterone.
  - Thus, no secondary sexual characteristics.
- Mullerian duct develops normally.
- External genitalia will be normal.
- C/P:

- Webbed neck.
- Cystic hygroma.
  - Fluctuant mass that transilluminates.
- Broad spaced nipples.
- Shield like chest.
- Coarctation of the aorta and bicuspid aortic valve.
- No secondary sexual characteristics.

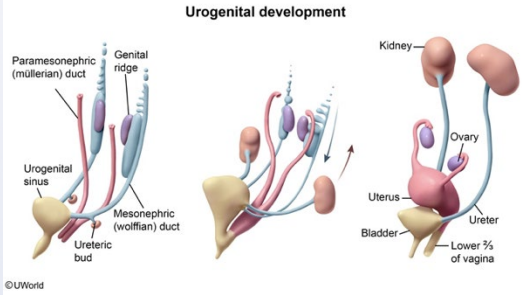
- Diagnosis:
  - Karyotyping.
  - High FSH and LH.
  - Ultrasound shows atretic ovaries.
- Treatment:
  - Give her what she doesn't have → estrogen and progesterone.
  - Growth hormone even though her levels are normal; to aid in growth.
  - Follow up Echo to look for cardiac abnormalities.



Mullerian agenesis:

- No Mullerian duct development.
- 46 XX.
- Ovaries and external genitalia are normal.
- Secondary sexual characteristics develop.
- Diagnosis:
  - Karyotype is XX.
  - Normal LH, FSH, and testosterone levels.
  - Look for renal anomalies.
    - Duplicated ureters.
- Treatment:
  - Elevate vagina surgically.

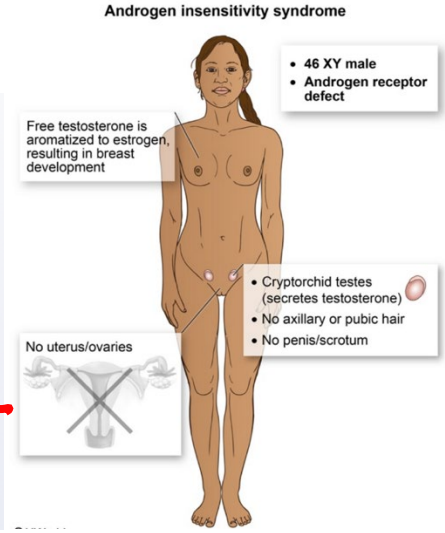
Müllerian agenesis	
Pathogenesis	• Müllerian duct system defect • Abnormal development of uterus, cervix & upper third of vagina
Clinical features	• Primary amenorrhea • Normal female external genitalia • Blind vaginal pouch • Absent or rudimentary uterus • Bilateral functioning ovaries (normal FSH)
Management	• Evaluate for renal tract abnormalities (eg, renal ultrasound) • Vaginal dilation (surgical or nonsurgical)



Androgen insensitivity:

- 46 XY.
- X-linked recessive mutation.
- Resistance to testosterone.
- No Mullerian duct development due to anti-mullerian hormone secretion.
- No testosterone for male external genitalia so it remains female.
- All the testosterone is converted to estrogen thus secondary sexual characteristics will develop.
- Diagnosis:
    - Karyotype is 46 XY.
    - High testosterone.
    - Normal FSH and LH.
    - Ultrasound shows testes.
- Treatment:
    - Surgically elevate vagina.
    - After puberty → bilateral orchiectomy.
        - To allow testes to continue producing testosterone.

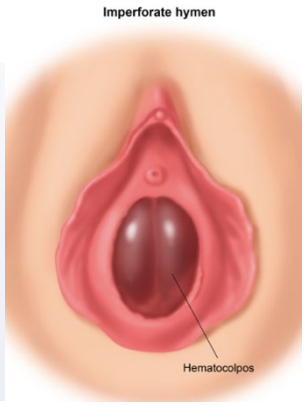
Androgen insensitivity syndrome	
Pathophysiology	• X-linked mutation in androgen receptor
Clinical features	• Genotypically male (46,XY karyotype) • Phenotypically female • Breast development • Absent or minimal axillary & pubic hair • Female external genitalia • Absent uterus, cervix, & upper one-third of vagina • Cryptorchid testes
Management	• Gender identity/assignment counseling • Gonadectomy (malignancy prevention)



Imperforate hymen:

- Hymen fails to fenestrate during embryonic development.
- C/P:
    - Cyclic lower abdominal pain.
    - Absence of vaginal bleeding.
    - Lower back pain.
    - Defecatory pain especially if hematocolpos extends backwards.
- Blood collects above hymenal membrane → hematocolpos.

Imperforate hymen	
Pathogenesis	• Incomplete degeneration of hymen
Clinical features	• Cyclic lower abdominal pain • Bulk symptoms (defecatory & urinary dysfunction) • Primary amenorrhea • Suprapubic mass (uterus) • Blue-tinged vaginal mass
Management	• Hymenal incision & drainage



Secondary Amenorrhea

Definition: three consecutive cycles without any menses with previously regular menses or 6 cycles if previously irregular.

Differentials:

1. Pregnancy: do a UPT.
2. Hypothyroidism: check TSH.
3. Disorders of prolactin: prolactinemia or prolactinoma → do a prolactin level.
4. Medications.
5. HPO axis.

Hypothyroidism, disorders of prolactin, and medications:

- Hypothyroidism: No T4 → high TRH → stimulates anterior pituitary → high prolactin → no GnRH.
- Prolactinemia: high prolactin → low GnRH.
    - Dopamine inhibits prolactin.
        - Antipsychotics inhibit dopamine.
    - Treatment of prolactinoma → cabergoline.

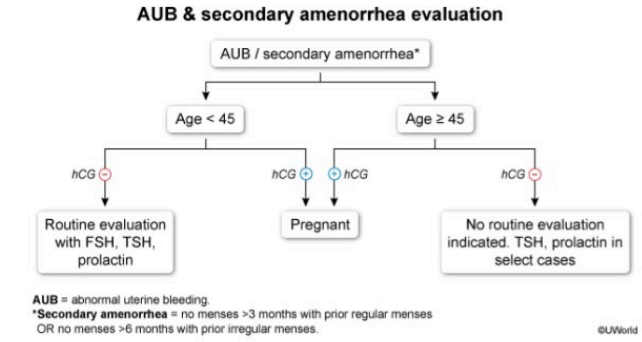
HPO axis:

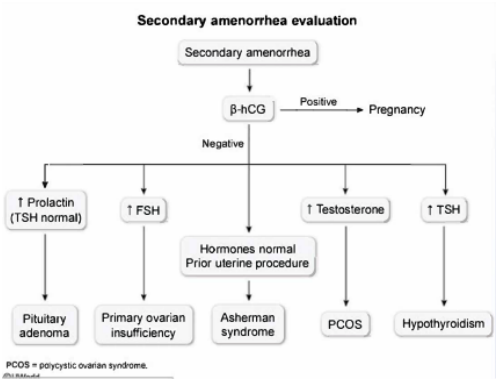
- Stress and anxiety affect hypothalamus.
    - Anorexia and extreme exercise and weight loss.
- Adenoma affecting anterior pituitary.
    - Or sheehan syndrome or apoplexy.
- Savage syndrome and premature ovarian failure.
- Asherman syndrome or ablation of the endometrium.
- Workup of axis:
    - Endometrium:
        - Progesterone challenge: to check if the uterus bleeds or not.
            - If it bleeds → anovulation → PCOS.
        - Estrogen and progesterone challenge.
            - No bleed → asherman or ablation.
    - Ovary:
        - Check FSH and LH levels.
            - High FSH and LH if ovaries aren't working.
                - Follow it up with US.
                    - Follicles present → savage syndrome.
                        - Give high dose hormone replacement therapy. (treated just like menopause)
            - Low FSH and LH if anterior pituitary isn't working.
    - Anterior pituitary: MRI.

- Tumor or necrosis.
- Hypothalamus: diagnosis of exclusion.

What to do?

1. Urine pregnancy test.
    a. Positive: begin obstetrical care.
2. TSH and prolactin levels.
    a. Hypothyroidism → give levothyroxine.
    b. High prolactin levels → MRI → to see the adenoma → dopamine agonists.
        i. Surgery is the wrong answer.
        ii. MRI is negative → medication induced.
3. Review the medications.
4. EVALUATE THE AXIS. (found above)

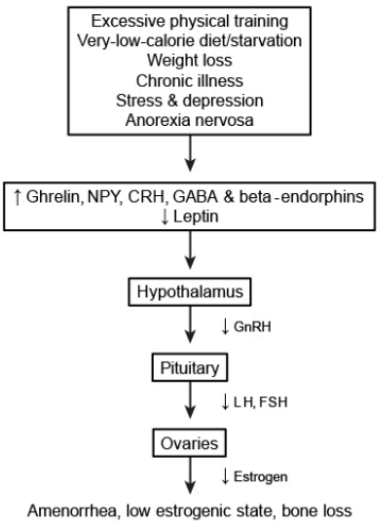




Diagnostic findings of amenorrhea				
	FSH	**LH**	**Prolactin**	**TSH**
Ovarian failure	↑	↑	Normal	Normal
Functional hypothalamic amenorrhea	↓	↓	Normal	Normal
Asherman syndrome	Normal	Normal	Normal	Normal
Prolactinoma	↓	↓	↑	Normal
Hypothyroidism	↓	↓	↑	↑

Hypothalamic amenorrhea:

Pathophysiology of functional hypothalamic amenorrhea



Exercise-induced hypothalamic amenorrhea	
Clinical presentation	• Strenuous exercise • Relative caloric deficiency • Stress fractures • Amenorrhea • Infertility
Hormone levels	• ↓ GnRH • ↓ LH/FSH • ↓ Estrogen
Long-term consequences	• ↓ Bone mineral density • ↑ Total cholesterol • ↑ Triglycerides
Treatment	• Increased caloric intake • Estrogen • Calcium & vitamin D

- In women who are above 18.5 BMI and desire pregnancy → pulsatile GnRH therapy.

Primary ovarian insufficiency:

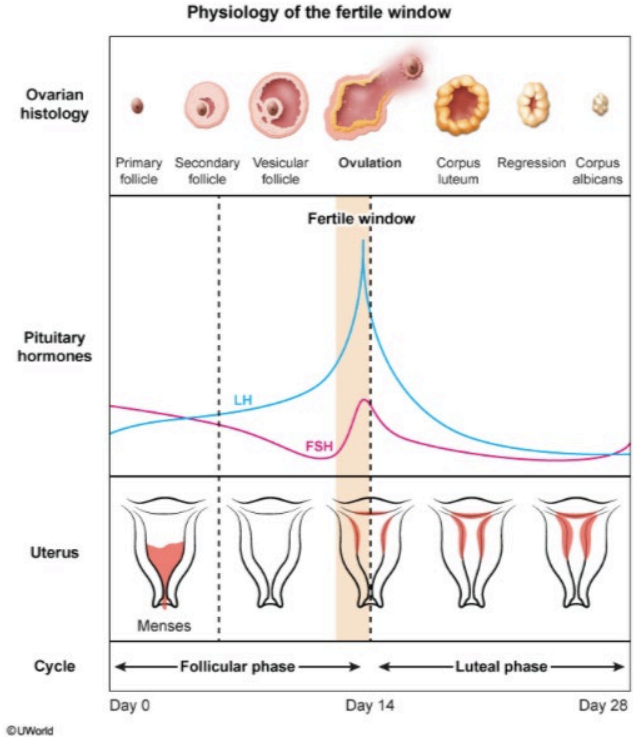
- Cessation of ovarian function at age <40.
- Hypergonadotropic hypogonadism.
- Can happen with fragile x syndrome premutation carriers (50-200 CGG repeats).
    - Neurobehavioral clinical features; GAD and autism.
    - Family history of fragile x syndrome.
    - Premutation causes an FMR1 mRNA overexpression → accelerated follicle depletion.
    - Women with POI and no other obvious cause should be tested for it.
- C/P:
    - Amenorrhea.
    - Oligomenorrhea.
    - Symptoms of decreased estrogen; hot flashes or fatigue.
- Diagnosis:
    - Increased FSH to LH ratio.
    - Further evaluation: autoimmune, karyotype, and BMD testing.
- Treatment:
    - IVF or embryo donation.
    - Estrogen containing therapy.

Primary ovarian insufficiency	
Clinical features	• Amenorrhea at age <40 • Hypoestrogenic symptoms (eg, hot flashes) • ↑ FSH • ↓ Estrogen
Major causes	• Turner syndrome (45,XO) • Fragile X syndrome (*FMR1* premutation) • Autoimmune oophoritis • Anticancer drugs • Pelvic radiation • Galactosemia
Management	• Estrogen therapy (with progestin if intact uterus)

FMR1 = fragile X mental retardation 1.

	GnRH	FSH	Estrogen
Hypothalamic hypogonadism	↓	↓	↓
Primary ovarian insufficiency	↑	↑	↓
Polycystic ovary syndrome	↑	Normal	↑
Normal ovulation	Normal	Normal	Normal
Exogenous estrogen use	↓	↓	↑

Infertility



Couples not being able to conceive after having sexual intercourse for a year if less than 35 years of age and 6 months if more than 35 years of age.

- Counselling.
- Male workup.
- Female workup.

Workup for the male (begin with it):

- Male erections.
    - Erectile dysfunction:
        - Differentiate between psychogenic or organic by nighttime tumescence.
        - Organic treated by PDE inhibitors (e.g. sildenafil).
- Flagellated (motility).
- Count.
    - Treat either by artificial insemination:
        - Intrauterine insemination is when you take concentrated sperm in a turkey booster.
        - Invitro fertilization: harvest egg and sperm and reimplant zygote back into mum.
        - Intracytoplasmic spermal injection: inject sperm into the egg and then take zygote and implant in mum.

Workup for the female:

- Mucus workup: (NO LONGER RECOMMENDED)
    - At the beginning and the end of the cycle the mucus is hard.
    - At day 14 it turns soft to allow sperm to pass.
    - Do a smush test:
        - Less than 6 cm stretch is positive for hard mucus.
        - -ve sperm.
        - -ve fern sign (a reaction to estrogen).
    - Hostile mucus → estrogen.
        - If not→ artificial insemination (intrauterine injection).

Common first tests include:
1. Day 3 FSH and Estradiol (evaluation of HPA axis)
2. Anti-Mullerian Hormone (egg quantity measure)
3. TSH (r/o endocrinopathy)
4. Prolactin (r/o endocrinopathy)
5. Hysterosalpingogram (determine tubal patency and basic evaluation of uterine cavity)

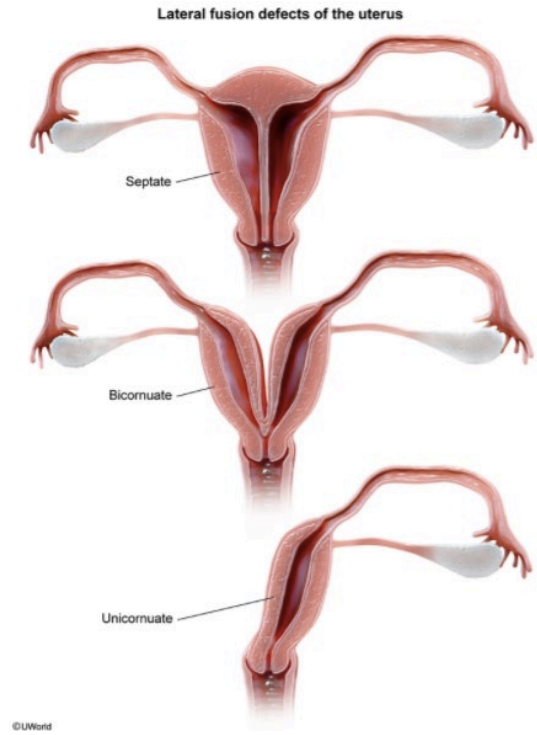
- Assess ovulation:
    - Medications: clomiphene or pergenol.
        - Clomiphene disinhibits GnRh.
        - Pergenol mimics FSH and LH.
    - Basal temperature is used.
        - Spike in temperature at ovulation. (1 degree Celsius)
    - The best way→ endometrial biopsy. (NO LONGER RECOMMENDED)
    - Progesterone level at day 22.
    - Urine LH + serum LH.
    - Simple history of PCOS sometimes is sufficient.
- Assess the anatomy:
    - Hysterosalpingogram.
        - Look for anatomical defects.
            - Bicornuate uterus or strictures etc…
    - If anatomy +ve → surgery or tuboplasty or artificial insemination.
    - If anatomy -ve → endometriosis.
        - Laser ablation for endometrioma.
        - OCPs for the condition.
- Unexplained infertility:
    - Surrogate pregnancy.
    - Artificial insemination.
    - Adoption. (answer on the test)

Intrauterine adhesions (ASHERMAN):

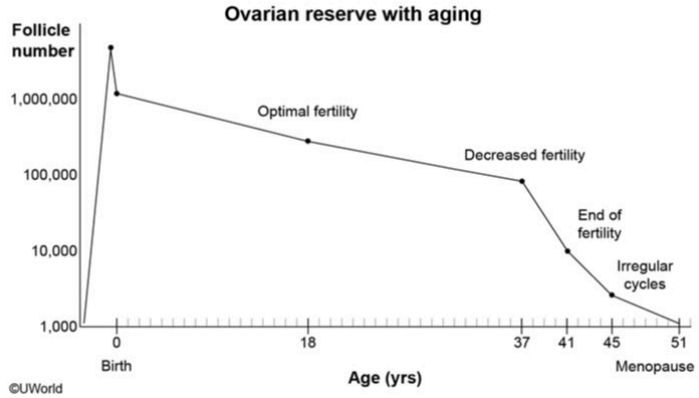
Intrauterine adhesions	
Risk factors	• Infection (eg, septic abortion, endometritis) • Intrauterine surgery (eg, curettage, myomectomy)
Clinical features	• Abnormal uterine bleeding • Amenorrhea • Infertility • Cyclic pelvic pain • Recurrent pregnancy loss
Evaluation	• Hysteroscopy

- Negative progesterone challenge test.
- Normal FSH and TSH levels.
- Cyclic pelvic pain due to small pockets of obstructed, proliferated endometrium.

Uterine septal defects:



Ovarian reserve with aging:



- Due to the rapid decline in ovarian reserve after the age of 35. Infertility is defined as lack of conception after 6 months in that age group.
- Regular menstrual periods but fecundability decreases.
- Ovarian reserve and function decline →estradiol and inhibin production decreases and the normal negative feedback mechanism is suppressed.

Vaginismus:

Genitopelvic pain/penetration disorder	
Risk factors	• Sexual trauma • Lack of sexual knowledge • History of abuse
Clinical features	• Pain with vaginal penetration • Distress/anxiety over symptoms • No other medical cause
Treatment	• Desensitization therapy • Kegel exercises

Vulvodynia:

- Pain on superficial touch of vestibule.
- There is an area of tenderness to touch on external examination.

Pudendal neuralgia:

- Superficial pain located at the vulva, perineum, and rectum.

Virilization

Caused by excess androgens→ hirsutism or virilization.

Hirsutism:

- Fat and hairy.
- Modest elevation in androgens.

Virilization:

- Hirsutism + clitoromegaly + deepened voice (irreversible) + androgenic muscles.
- Severe elevation in the androgens.
    - Testosterone >150 or DHEA >700.

Androgens:

- Testosterone:
    - From the ovaries → do a TVUS.
- DHEA:
    - From the adrenals → do a CT/MRI.

Pathology based:

- Cancers associated with severe elevation in androgens and they're unilateral.
- Noncancers associated with modest elevation in androgens and they're bilateral.

	PCOS	**Sertoli-Leydig tumor**	**Adrenal tumors**	**Congenital Adrenal Hyperplasia**	**Familial hirsutism**
Exam	Hirsutism	Virilization	Virilization	Hirsutism	Hirsutism
Testosterone	Elevated	Very elevated	Normal	Normal	Normal
DHEA-S	Normal	Normal	Very elevated	Elevated	Normal
Imaging	Bilateral ovaries	Unilateral ovary	Unilateral adrenal	Bilateral adrenal	Normal

PCOS:

- Diagnosis:
    - High LH to FSH ratio.

    - Atretic follicles on US.
- Treatment:
    - Weight loss/exercise.
    - Metformin.
    - OCPs.
    - Clomiphene.
    - Spironolactone.

Sertoli-Leydig tumor:

- Diagnosis by US.
- Treatment is resection.

Sertoli-Leydig cell tumor	
Pathogenesis	• Sex cord–stromal tumor • ↑ Testosterone

Clinical features	• Rapid-onset virilization
	  ◦ Voice deepening
	  ◦ Male-pattern balding
	  ◦ Increased muscle mass
	  ◦ Clitoromegaly
	• Oligomenorrhea
	• Unilateral, solid adnexal mass

Management	• Surgery (tumor staging)

Adrenal tumors:

- Diagnosis by CT/MRI.
    - Do adrenal vein sampling to confirm laterality.

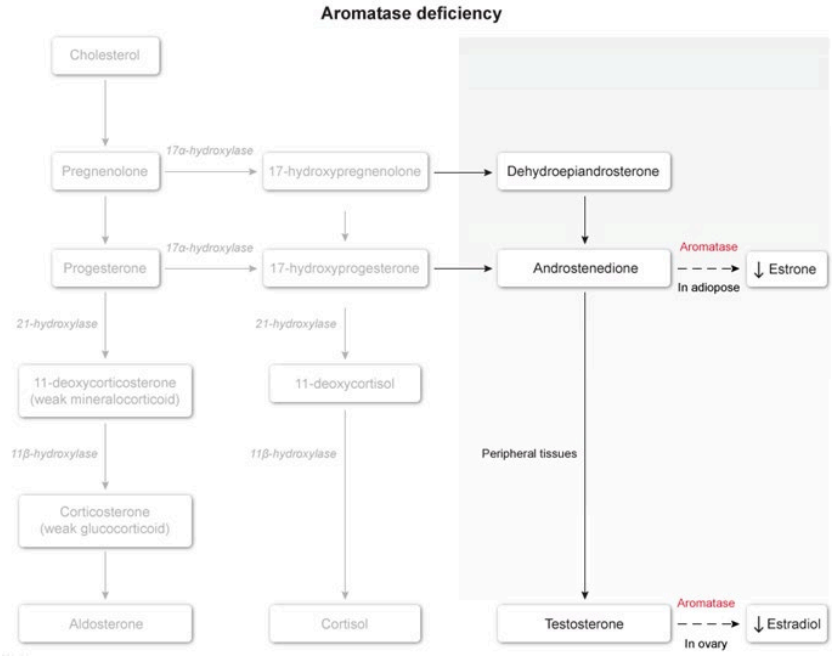
Congenital adrenal hyperplasia:

- Severe → virilization & precocious puberty.
- Diagnosis:
    - CT/MRI.
    - 17-hydroxyprogesterone in the urine.
- Treatment: give cortisol w/wo fludrocortisone. (depending on severity)

Nonclassic congenital adrenal hyperplasia	
Pathophysiology	• Autosomal recessive • ↓ 21-hydroxylase activity • Normal gluco- & mineralocorticoids • ↑ Androgens
Clinical features	• Early pubic/axillary hair growth • Severe acne • Hirsutism & oligomenorrhea in girls • ↑ Growth velocity & bone age • ↑ 17-hydroxyprogesterone level
Treatment	• Hydrocortisone

Aromatase deficiency:

- 46 XX or XY.
- High serum testosterone and decreased serum estrogen.
- C/P:
    - Normal internal genitalia.
    - External virilization.
    - Delayed puberty.
    - Osteoporosis.
    - Polycystic ovaries due to increased gonadotrophins.
    - Manifests in utero as maternal masculinization.
        - Disappears after delivery.
    - Ambiguous genitalia at birth.
- Labs: undetectable serum estrogen levels.
- Treatment:
    - Estrogen and progesterone replacement therapy.
    - Calcium and Vitamin D supplementation.
    - Surgical correction of ambiguous genitalia.



5-alpha-reductase deficiency:

- 46 XY.
- Normal testosterone production but inability to convert it to dihydrotestosterone.
- C/P:
    - Female external genitalia.
    - Internal urogenital organs are male.
    - In puberty, the increased testosterone causes virilization.
- Diagnosis:
    - Low DHT.
    - Normal or increased testosterone.
    - Genetic testing for definitive diagnosis.
- Treatment:
    - Female gender identity:
        - Gonadectomy.
        - Estrogen substitution therapy upon completion of longitudinal growth.
    - Male gender identity:
        - Testosterone.
        - Phalloplasty.
        - Orchidopexy.

5-alpha-reductase deficiency	
Pathogenesis	• 46,XY genotype • Impaired testosterone to DHT conversion • Impaired virilization during embryogenesis • Normal male testosterone & estrogen levels

Clinical features	• Male internal genitalia (eg, testes, vas deferens)
	• Female external genitalia (eg, blind-ending vagina)
	• Phenotypically female at birth
	• Virilization at puberty (↑ testosterone)
	  ◦ Clitoromegaly
	  ◦ Increased muscle mass
	  ◦ Male-pattern hair development
	  ◦ Nodulocystic acne

DHT = dihydrotestosterone.

Causes of hyperandrogenism in women	
Diagnosis	**Clinical features**
PCOS	Oligo-ovulation, clinical or biochemical hyperandrogenemia, polycystic ovaries on imaging, no evidence of another diagnosis
Nonclassic CAH	Oligo-ovulation, hyperandrogenemia, ↑ 17-hydroxyprogesterone levels
Ovarian/adrenal tumors	Older age, rapidly progressive symptoms, ↑ androgen levels (>3 times upper limit of normal)
Hyperprolactinemia	Amenorrhea, galactorrhea, ↑ prolactin levels
Cushing syndrome	Cushingoid features, nonsuppressible dexamethasone suppression test, ↑ 24-hour urinary free cortisol
Acromegaly	Excessive growth, ↑ GH & IGF-1 levels
CAH = congenital adrenal hyperplasia; **GH** = growth hormone; **IGF-1** = insulin-like growth factor 1; **PCOS** = polycystic ovary syndrome.	

Causes of hirsutism in women	
Etiology	**Clinical features**
Polycystic ovary syndrome	• Oligomenorrhea, hyperandrogenism, obesity • Associated with type 2 diabetes, dyslipidemia, hypertension
Idiopathic hirsutism	• Normal menstruation • Normal serum androgens
Nonclassic 21-hydroxylase deficiency	• Similar to polycystic ovary syndrome • Elevated serum 17-hydroxyprogesterone
Androgen-secreting ovarian tumors, ovarian hyperthecosis	• More common in postmenopausal women • Rapidly progressive hirsutism with virilization • Very high serum androgens
Cushing syndrome	• Obesity (usually of the face, neck, trunk, abdomen) • Increased libido, virilization, irregular menses

also caused by hyperprolactinemia and acromegaly.

Menopause

Cessation of menstrual cycle for 12 consecutive cycles.

Pathology: ovarian failure → loss of estrogen → loss of fertility.

Menopause	
Clinical features	• Vasomotor symptoms • Oligomenorrhea/amenorrhea • Sleep disturbances • Decreased libido • Depression • Cognitive decline • Vaginal atrophy
Diagnosis	• Clinical manifestations • ↑ FSH
Treatment	• Topical vaginal estrogen • Systemic hormone replacement therapy

C/P:

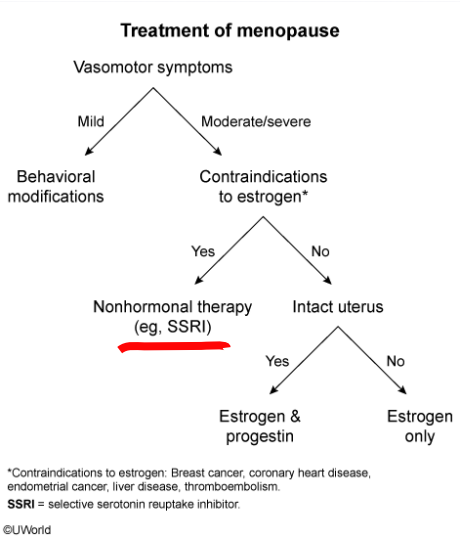
- Hot flashes.
- Vaginal atrophy; thinning of the vulvar skin, narrowing of the vaginal introitus, and loss of natural lubrication.
    - Minimal tissue manipulation → vestibular fissures and vaginal petechiae.
    - Similar presentation to a patient with sjogern.
- Frequent UTIs.
    - Decreased glycogen content → decreased lactobacilli → high pH (pH >5)→ recurrent UTI.
    - Decreased elasticity, collagen, and blood flow in the bladder trigone and urethra (estrogen-sensitive) results in urogenital atrophy → urgency incontinence.
    - Stress incontinence due to weakened pelvic floor and urogenital mucosal atrophy.
- Libido decreased.
    - Due to decreased testosterone.
- Irritability and mood swings.

Genitourinary syndrome of menopause	
Symptoms	• Vulvovaginal dryness, irritation, pruritus • Dyspareunia • Vaginal bleeding • Urinary incontinence, recurrent urinary tract infection • Pelvic pressure
Physical examination	• Narrowed introitus • Pale mucosa, ↓ elasticity, ↓ rugae • Petechiae, fissures • Loss of labial volume
Treatment	• Vaginal moisturizer & lubricant • Topical vaginal estrogen

Diagnosis: a clinical diagnosis.

- Rule out pregnancy because they have similar symptoms.
- Lab tests: elevated FSH and LH. Low estrogen.
- CHECK THYROID FUNCTION TEST IN MIDDLE AGED WOMEN.
- Ultrasound shows no follicles.

Treatment:



- Phytoestrogen can be used for hot flashes → doesn't work for the test.
- Hormone replacement therapy.
  - Only current indication for HRT is vasomotor symptoms in women <60 years who have undergone menopause in the past 10 years.
    - No longer recommended to decrease risk of osteoporosis or CAD.
  - Estrogen only for those who had a hysterectomy.
  - Leads to breast cancer, endometrial cancer, VTE, and gallbladder disease.
- First line for hot flashes is weight loss especially If mild symptoms.
  - If severe → HRT is first line according to uworld.
- If estrogen is contraindicated → SSRIs/SNRIs.
  - Especially venlafaxine.
- Estrogen cremes for vaginal atrophy.
- Screen LDL for CVS disease.
  - Put her on statins if high.
- DEXA scan for osteoporosis at 65 for all patients. 60 for smokers.
  - Bisphosphonates.
  - Prophylaxis: vitamin D and calcium.
    - If she is deficient → vitamin D 50,000 IU.
    - EXERCISE!

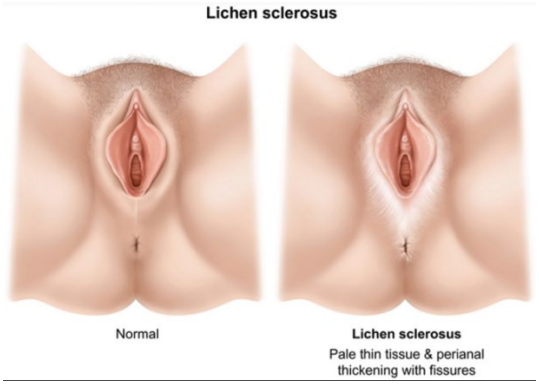
Vulvar lichen sclerosus:

- Vulva thins and causes hypopigmented areas and increasing skin sensitivity.
- Commonly associated with autoimmune disease such as alopecia areata.
- C/P:

- Vulvar itching and burning.
- Initially thin skin.
- Thickened, white vulvar plaques due to the chronic itching.
- Dysuria and nocturia.
- **Doesn't affect vagina vs atrophic vaginitis.**

- Complications:
  - Loss of labia minora.
  - Clitoral head retraction → dyspareunia.
  - Labial adhesions.

Vulvar lichen sclerosus	
Epidemiology	• Prepubertal girls & perimenopausal or postmenopausal women
Clinical features	• Thin, white, wrinkled skin over the labia majora/minora; atrophic changes that may extend over the perineum & around the anus • Excoriations, erosions, fissures from severe pruritus • Dysuria, dyspareunia, painful defecation
Workup	• Punch biopsy of adult-onset lesions to exclude malignancy
Treatment	• Superpotent corticosteroid ointment



Lichen simplex chronicus:

- Secondary to scratching.
- **Thickened**, leathery skin.
- **Treatment: clobetasol.**

Lichen planus:

Vulvar lichen planus	

Clinical features	• Women age 50-60
	• Vulvar pain or pruritus
	• Dyspareunia
	• Erosive variant (most common):
	  ◦ Erosive, glazed lesions with white border
	  ◦ Vaginal involvement ± stenosis
	  ◦ Associated oral ulcers
	• Papulosquamous variant:
	  ◦ Small pruritic papules with purple hue

Diagnosis	Vulvar biopsy
Treatment	High-potency topical corticosteroids

- Bright, glazed, red-purple plaques and papules with an overlying white, lacy pattern (ie Wickham striae).

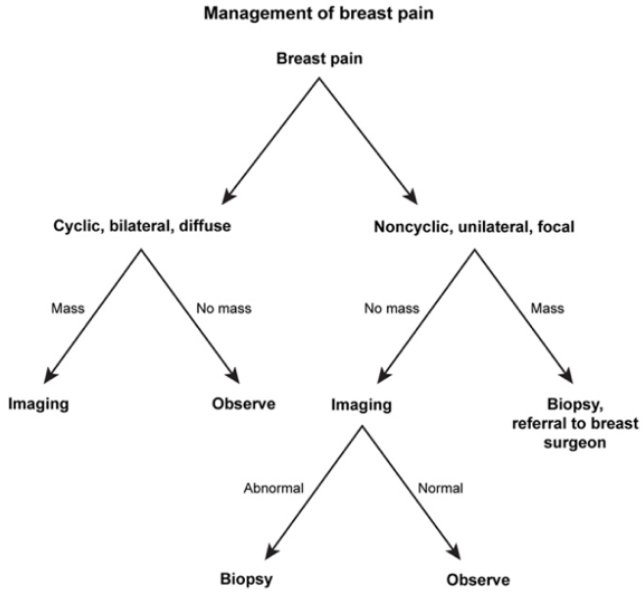
Vitiligo:

- Acquired depigmentation disorder due to melanocyte destruction.
- Flat hypopigmented macules.
- Asymptomatic.
- Immune-mediated.
- Clinical diagnosis.
- Treatment: steroids and phototherapy.

Breast Pathologies

Mastalgia:

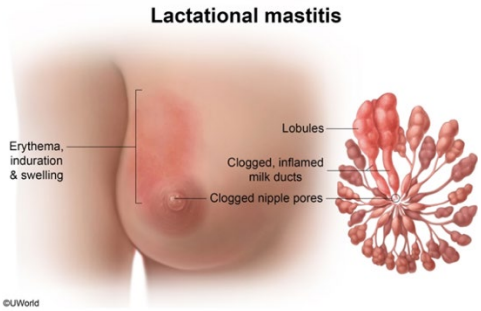
- Bilateral breast pain with no mass.
- Ice packs and supportive bra is required.



Physiological galactorrhea:

- Bilateral, gray, nonbloody nipple discharge.
- Bilateral and guaiac negative.
- Hyperprolactinemia is the MCC.
- Other causes: hypothyroidism, pregnancy, & nipple stimulation.

Lactational mastitis:



Lactational mastitis	
Pathogenesis	• Skin flora (eg, *Staphylococcus aureus*) enters ducts through nipple & multiplies in stagnant milk

Risk factors	• History of mastitis
	• Engorgement & inadequate milk drainage due to:
	  ◦ Sudden increase in sleep duration
	  ◦ Replacing nursing with formula or pumped breast milk
	  ◦ Weaning
	  ◦ Pressure on the duct (tight bra or clothing, prone sleeping)
	  ◦ Cracked or clogged nipple pore
	  ◦ Poor latch

Clinical presentation	• Fever • Firm, red, tender, swollen quadrant of unilateral breast • ± Myalgia, chills, malaise
Treatment	• Analgesia • Frequent breastfeeding or pumping • Antibiotics

- Antibiotics:
  - MSSA → dicloxacillin or cephalexin.
  - MRSA → clindamycin, TMP-SMX, or vancomycin.

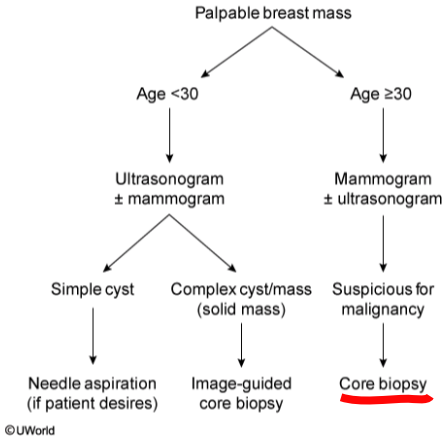
Breast abscess:

Breast abscess	
Risk factors	• Maternal age >30 • First pregnancy • Tobacco use
Clinical features	• Fever • Focal inflammation • Fluctuant, tender mass
Diagnosis	• Breast ultrasound
Management	• Antibiotics • Drainage

- Arises from untreated mastitis.
- MCC is staph aureus.
- Clinical diagnosis.
  - US to differentiate mastitis from abscess in the case of a tender breast nodularity but no palpable discrete, fluctuant mass.
- Antibiotics against MSSA:
  - Dicloxacillin or cephalexin.

- Continue breastfeeding.

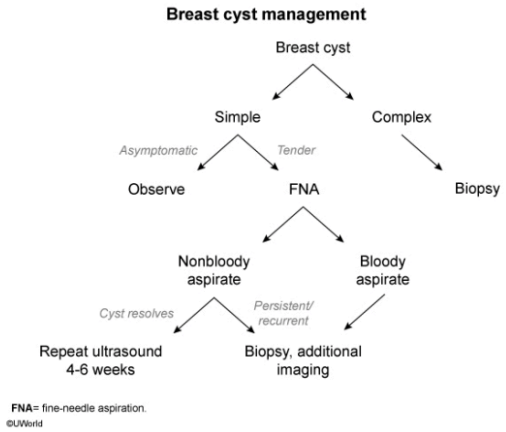
Breast mass:



- Triple diagnostic: physical exam + imaging + biopsy.
- Imaging:
  - Mammography for women aged 30 or more.
    - Targeted US is used with mammography to further characterize the mass.
  - US for women less than the age of 30.
- Biopsy: ultrasound guided.
  - Core biopsy for solid, acellular masses.
  - Excisional biopsy for large or suspicious ones.
  - FNA for suspected cystic or small masses.

Benign breast disease:

Benign breast disease	
Diagnosis	**Clinical features**
Breast cyst	• Solitary, well-circumscribed & mobile mass • ± Tenderness
Fibrocystic changes	• Multiple, diffuse nodulocystic masses • Cyclic premenstrual tenderness
Fibroadenoma	• Solitary, firm, well-circumscribed & mobile mass • Cyclic premenstrual tenderness
Fat necrosis	• After trauma/surgery • Firm, irregular mass • ± Ecchymosis, skin/nipple retraction



- Simple breast cyst:
  - US shows posterior acoustic enhancement (indicative of fluid) and no echogenic debris or solid components.
  - C/P:
    - No symptoms.

        - Severe, localized pain.
    - Aspiration shows clear fluid and causes disappearance of the mass; confirming the diagnosis.
    - Follow up: breast exam in 2-4 months.
- Fibrocystic changes:
    - Most common benign condition of the breast and commonly causes a palpable breast mass.
    - C/P:
        - Mastalgia.
        - Cyclic pain with menses.
        - Clear/white nipple discharge.
    - Mammogram: focal regions of thick parenchyma and/or cysts.
    - Prognosis:
        - Proliferative: increased risk of cancer.
    - Treatment: NSAIDs and/or OCPs.
- Fibroadenoma:

Fibroadenoma	
Pathogenesis	• Benign, estrogen-sensitive fibroepithelial tumor
Epidemiology	• Adolescent girls & women age <30
Clinical features	• Unilateral, firm, mobile, well-circumscribed mass • Upper outer quadrant • Cyclic changes with menses (eg, premenstrual breast tenderness, size change)
Management	• Observation & repeat examination in adolescents • Ultrasound in adults or patients with persistent mass

    - If the mass decreases in size/and or tenderness after the menstrual period, the patient can be reassured.
    - History of breast trauma or surgery.
    - Popcorn calcifications on mammography.
    - Biopsy shows benign hyperplastic stroma encapsulating ductal tissue.
- Fat necrosis:
    - Calcifications on mammogram.
    - Biopsy shows fat globules and foamy histiocytes which is diagnostic.

Breast cancer:

Breast cancer risk factors	
Modifiable	• Hormone replacement therapy • Nulliparity • Increased age at first live birth • Alcohol consumption
Non-modifiable	• Genetic mutation or breast cancer in first-degree relatives • White race • Increasing age • Early menarche or later menopause

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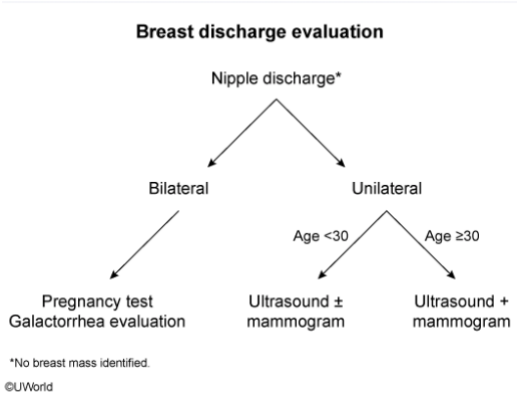
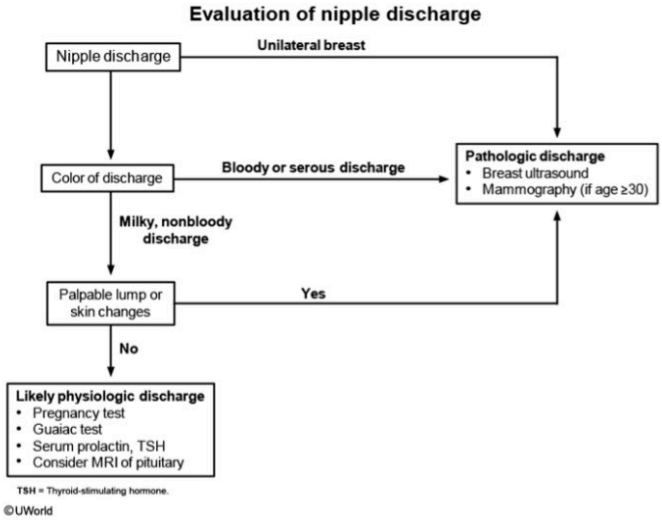
- Risk factors:
  - Risk of being diagnosed with breast cancer is 1 in 8.
  - Alcohol has a dose-dependent effect.
  - Genetic testing offered to individuals who get diagnosed at age <50 or ovarian cancer at any age.
  - BRCA2 carriers → estrogen receptor positive breast cancer.

Breast cancer warning signs	
Clinical finding	**Pathophysiology**
Nipple retraction	Invasion of lactiferous ducts
Nipple scaling or ulceration	Epidermal infiltration by neoplastic cells
Nipple discharge	Intraductal tumor growth ± necrosis
Skin retraction	Invasion of suspensory (Cooper) ligaments
Peau d'orange	Obstruction of dermal lymphatics
Fixed breast mass	Invasion into adjacent breast tissue
Axillary lymphadenopathy	Lymphatic spread to regional lymph nodes

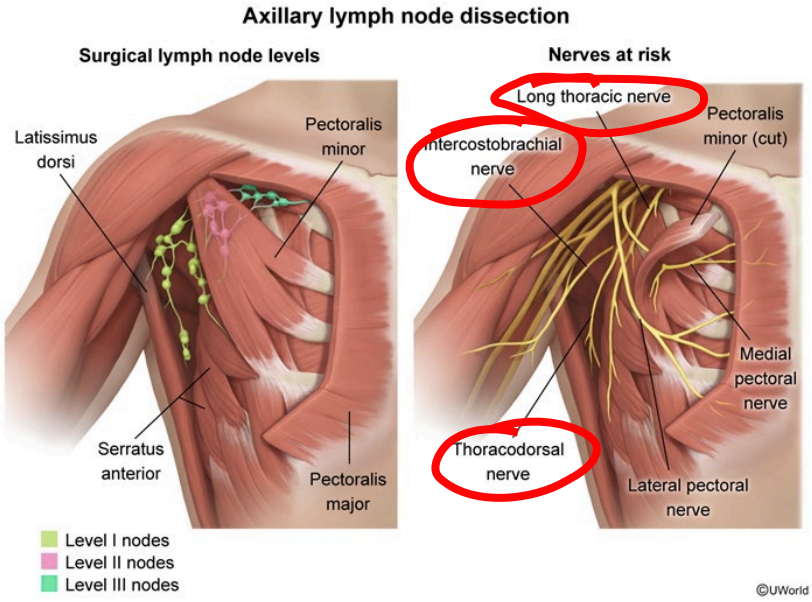
- Nipple discharge:
  - Physiological: bilateral, multiductal, milky or nonbloody (guaiac negative) and is expressed by manipulation of breast.
  - Pathological: unilateral, uniductal, bloody or serous, and spontaneous.





- Routine mammogram at age 50 or more due to increased risk with age.
- Diagnosis:
  - Women <30 years of age → Ultrasound.
  - Women >30 years of age → mammography.
  - MRI: performed in patients with known cancer to evaluate for recurrence and to screen for breast cancer in high-risk patients (BRCA carrier and first-degree relative of known BRCA carrier).
- Treatment:
  - Stage 0 (DCIS): breast conservative therapy + SLNB.
    - Simple mastectomy when DCIS is too large for BCT.
    - Radiation following BCT.

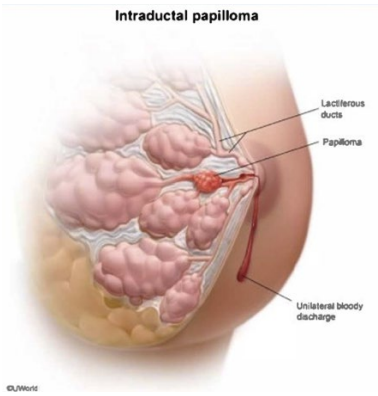
        - Adjuvant hormone therapy if DCIS is hormone receptor positive.
    - Stage 1: tumor <2 cm with or without micrometastasis.
        - BCT or mastectomy plus SLNB (first draining lymph node biopsy) or ALND (if SNLB is positive).
        - Radiation following BCT.
        - Adjuvant hormone therapy if DCIS is hormone receptor positive.
        - Adjuvant chemotherapy for tumors larger than 1 cm in diameter or breast cancer that is HER2+ or hormone receptor negative.
        - Adjuvant targeted therapy for HER2+ breast cancer.
    - Stage 2: tumor >5 cm without level 1 or 2 regional LN involvement or tumor >2 cm and <5 cm with or without level 1 or 2 regional LN involvement. No distant metastasis.
        - BCT or mastectomy plus SLNB or ALND.
        - Radiation following BCT.
        - Chemotherapy or hormone therapy adjuvant or neoadjuvant or both.
    - Stage 3: any tumor size with level 3 LN involvement or chest wall invasion. No distant metastasis.
        - Neoadjuvant chemotherapy.
        - Followed by radiation.
        - Hormone positive will receive adjuvant hormone therapy.
        - Mastectomy for locally advanced cancer with ALND.
    - Stage 4: distant metastasis.
        - Chemotherapy, hormone therapy, targeted therapy, and possibly immunotherapy plus radiation.
        - Palliative surgery for local symptoms.
    - Breast conserving therapy (BCT):
        - Alternative to mastectomy for many patients with early stage, unifocal breast cancer.
        - Typically begins with partial mastectomy (aka, lumpectomy) to excise all invasive and/or in situ cancer (DCIS), along with axillary sentinel LN biopsy.
            - Examined under microscopy:
                - Partial mastectomy: positive margins (DCIS at the lateral margin) require re-excision of the involved margins.
                - Sentinel LN biopsy: positive → ALND (typically performed for 3 or more positive nodes).
- Prognostic factors: in order of decreasing significance.
    - TNM.
    - ER+ and PR+; good prognosis.
    - Overexpression of Her-2/neu; worse prognosis.
    - Histology; poorly differentiated associated with a worse prognosis.



Tumors:

- Phyllodes tumor:
  - Large (>3 cm), rapidly growing breast mass which is painless.
  - Biopsy required to differentiate it from fibroadenoma.
    - Leaf-like appearance and papillary projections under the microscope.
- Intraductal papilloma:

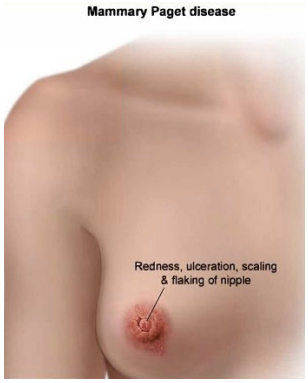
Intraductal papilloma	
Clinical features	• Unilateral bloody nipple discharge • No associated mass or lymphadenopathy
Management	• Mammography & ultrasound • Biopsy, +/- excision



Diff brown intraductal papilloma and malignancy. Both have bloody nipple discharge but with malignancy there will either be calcifications on mammography or lymph node invovlment and with intraductal papilloma it is unilateral

- Paget disease of the breast:
  - C/P:
    - Eczematous nipple change that involves the areola.
    - Ulcerating rash localized to the nipple and spreads to areola.
    - Vesicles.

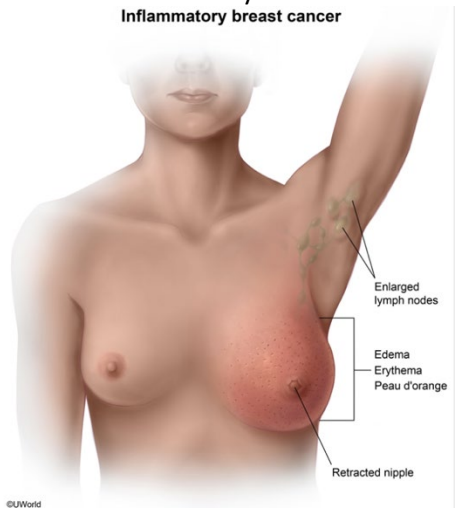
        - Scales.
        - Bloody discharge.
        - Nipple retraction.
        - Pain.
        - Itching.
        - Burning.
        - No resolution with corticosteroids.
    - Indicates underlying DCIS or invasive ductal carcinoma (adenocarcinoma).
    - Diagnosis:
        - Punch biopsy or surface biopsy of nipple tissue.
        - Imaging to look for DCIS/IDC.
    - Treatment:
        - Breast-conservative surgery with subsequent adjuvant whole-breast radiation.



- Invasive ductal carcinoma:
    - Most common form of breast cancer.
    - C/P:
        - Painless breast mass.
        - Retraction.
        - Dimpling.
        - Edema.
        - Nipple retraction.
        - Bloody nipple discharge.
        - Metastasis to the bone.
    - Diagnosis:
        - Mammogram or US.
        - Core needle biopsy.
        - MRI for bone metastasis.
    - Treatment:
        - Breast conserving therapy and sentinel node biopsy is diagnostic and therapeutic.
            - Plus, postoperative radiation.
            - Positive SNLB → axillary lymph node dissection.
        - Her2 + ➔ trastuzumab.
            - Monoclonal antibody.
            - Do echo.
            - High risk of cardiotoxicity when used with other cardiotoxic medications such as doxorubicin.
            - Prevent cardiotoxic effect by dexrazoxane.

Chemotherapy-induced cardiotoxicity	
Type I	• Associated with **anthracyclines** • Myocyte necrosis & destruction (**fibrosis**) • Progression to overt clinical heart failure • Less likely to be reversible
Type II	• Associated with **trastuzumab** • Myocardial **stunning**/hibernation without myocyte destruction • **Asymptomatic** left ventricular systolic dysfunction • More likely to be reversible

        - ER+ and/or PR+ ➔ tamoxifen and raloxifene.
            - For postmenopausal women →aromatase inhibitors (exemestane, anastrozole, letrozole).
                - ADRs: atrophic vaginitis, decreased bone density.
- Invasive lobular carcinoma:
    - C/P:
        - Painless breast nodule.
        - Retraction.
        - Dimpling.
        - Edema.
        - Nipple retraction.
        - Bloody nipple discharge.
- Inflammatory breast cancer:



    - C/P:
        - Peau d'orange.
        - Edematous, erythematous, and painful.
        - Itching, palpable breast mass, and nipple changes.
        - Axillary LDN.
    - Early lymphatic involvement → rapid tumor growth and metastasis.
    - Diagnosis: mammogram and ultrasound.
        - Breast biopsy and full-thickness skin punch biopsy.
    - Core needle biopsy and skin punch biopsy used to differentiate it from mastitis or abscess.
    - Treatment:
        - Chemotherapy plus radiation plus modified radical mastectomy.

Selective estrogen receptor modulators:

Selective estrogen receptor modulators	
Drugs	• Tamoxifen • Raloxifene
Mechanism of action	• Competitive inhibitor of estrogen binding • Mixed agonist/antagonist action
Indications	• Prevention of breast cancer in high-risk patients • Tamoxifen: adjuvant treatment of breast cancer • Raloxifene: postmenopausal osteoporosis
Adverse effects	• Hot flashes • Venous thromboembolism • Endometrial hyperplasia & carcinoma (tamoxifen only) • Uterine sarcoma (tamoxifen only)

- Tamoxifen causes endometrial polyps in premenopausal women.
- Hot flashes due to antiestrogenic activity in the CNS leading to thermoregulatory dysfunction of the anterior pituitary.
- VTE → DVT, PE, and retinal vein thrombosis.
- Contraindication to use:
    - Current or prior VTE.

Lymphangiosarcoma:

- Rare secondary malignancy that originates in vascular endothelial cells and occurs secondary to chronic lymphedema.
- Strongest risk factor: localized radiation therapy.
- Classically in women who have undergone axillary lymphadenectomy after mastectomy.
- C/P:
    - Multiple, purple-colored macules or papules and tender subcutaneous nodules.
    - Early hematological spread is common.
        - Dyspnea due to lung metastasis.
- Diagnosis: biopsy.
- Treatment:
    - When possible, surgical resection is curative.

Male breast cancer:

Male breast cancer	
Risk factors	• Family history; *BRCA 1/2* • Abnormal estrogen/androgen ratio: Klinefelter syndrome, obesity, cirrhosis, marijuana use
Presentation	• Subareolar mass • Skin & nipple dimpling, induration, ulceration • Often detected at advanced stage
Diagnosis	• Mammography • Biopsy: invasive ductal carcinoma (hormone receptor–positive) most common