Quick Notes

OB GYN Guide

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# Table of Contents

1. **CARDIOLOGY** ................................................................. 4
   1.1 Cardiomyopathy .......................................................... 4
   1.2 Pregnancy-Induced Hypertension .................................. 6
   1.3 Deep Venous Thrombosis ........................................... 6

2. **PULMONOLOGY** .......................................................... 8
   2.1 Pulmonary Embolism ................................................... 8

3. **ENDOCRINOLOGY** ...................................................... 10
   3.1 Gestational Diabetes ................................................... 10
   3.2 Polycystic Ovarian Syndrome ...................................... 10
   3.3 Thyroiditis ............................................................... 11

4. **GASTROENTEROLOGY** ................................................. 13
   4.1 Hyperemesis Gravidarum ............................................. 13

5. **GENITOURINARY** ....................................................... 14
   5.1 Dysfunctional Uterine Bleeding .................................... 14
   5.2 Endometriosis & Adenomyosis ................................. 14
   5.3 Cervicitis ................................................................. 16
   5.4 Cervical Dysplasia ...................................................... 16
   5.5 Incompetent Cervix (Cervical Insufficiency) ................ 19
   5.6 Vaginitis ................................................................. 20
   5.7 Dysmenorrhea ............................................................ 21
   5.8 Breast Cancer ............................................................ 22
   5.9 Fibroadenoma ............................................................ 24
   5.10 Vulvar Neoplasia ........................................................ 24
   5.11 Leiomyomas (Uterine Fibroids) ................................. 25
   5.12 Ovarian Neoplasia ..................................................... 26
   5.13 Endometrial Neoplasia .............................................. 27
   5.14 Menopause ............................................................... 28
   5.15 Amenorrhea ............................................................. 29
   5.16 Premenstrual Syndrome ........................................... 30
   5.17 Fibrocystic Breasts .................................................... 30
   5.18 Pelvic Inflammatory Disease .................................... 31
   5.19 Mastitis ................................................................. 31
   5.20 Contraceptive Methods ............................................. 32
   5.21 Infertility ................................................................. 38
   5.22 Normal Labor & Delivery .......................................... 39
   5.23 Abruptio Placenta (Placental Abruption) ..................... 40
   5.24 Placenta Previa .......................................................... 41
   5.25 Ectopic Pregnancy .................................................... 42
   5.26 Molar Pregnancy (Hydatiform Mole) and Gestational Trophoblastic Disease (PROM) ................................................................. 43
   5.27 Preterm Labor .......................................................... 43
   5.28 Rh Incompatibility ..................................................... 44
   5.29 Induced Abortion ...................................................... 45
5.30 Prenatal Care .................................................................................................................. .46  
5.31 Spontaneous Abortion .................................................................................................... .49  
5.32 Shoulder Dystocia ........................................................................................................ .50  
5.33 Fetal Distress.................................................................................................................. .51  
5.34 Labor Dystocia ................................................................................................................ .51  
5.35 Postpartum Hemorrhage ............................................................................................... .51  
5.36 Intrauterine Growth Restriction .................................................................................... .52  
5.37 Preeclampsia (Toxemia) & Eclampsia ......................................................................... .53  
6  MUSCULOSKELETAL ........................................................................................................... .55  
    6.1 Osteoporosis ................................................................................................................ .55  
7  PSYCHIATRY ..................................................................................................................... .57  
    7.1 Intimate Partner Violence (Domestic Violence) .............................................................. .57  
    7.2 Postpartum Depression ................................................................................................ .57  
8  DERMATOLOGY ................................................................................................................ .59  
    8.1 Melasma ....................................................................................................................... .59  
9  HEMATOLOGY ................................................................................................................... .60  
    9.1 Normocytic Anemia...................................................................................................... .60  
10 INFECTIOUS DISEASE .................................................................................................... .62  
    10.1 Chlamydia ................................................................................................................... .62  
    10.2 Gonorrhea ................................................................................................................... .62  
    10.3 Toxoplasmosis ............................................................................................................ .63  
    10.4 Syphilis ........................................................................................................................ .63  
    10.5 Human Papilloma Virus .............................................................................................. .64  
    10.6 Herpes Simplex ........................................................................................................... .65  
11 Obstetrics Exam Notes ...................................................................................................... .66  
    11.1 Infertility ..................................................................................................................... .66  
    11.2 Pregnancy Genetics Counseling .................................................................................. .67  
    11.3 Normal Pregnancy ...................................................................................................... .71  
    11.4 First Prenatal Visit & Ongoing Care ........................................................................... .73  
    11.5 Early and Mid-Trimester Complications ...................................................................... .81  
    11.6 Later Complications of Pregnancy ............................................................................. .86  
    11.7 Preterm Labor & PROM ............................................................................................. .88  
    11.8 Hemorrhage ............................................................................................................... .91  
    11.9 Labor & Delivery, Complications, and Postterm Pregnancy ......................................... .94  
    11.10 Infections in Pregnancy ............................................................................................. .99  
    11.11 Postpartum Care ........................................................................................................ 101  
    11.12 Postpartum Mood Disorders ..................................................................................... 103
1 CARDIOLOGY

1.1 Cardiomyopathy

- A group of diseases of the myocardium associated with mechanical or electrical dysfunction that usually exhibit ventricular hypertrophy or dilation
- Current major society definitions of cardiomyopathies exclude heart disease secondary to CV disorders such as HTN, CAD, or valvular disease
- Etiologies may be genetic, inflammatory, metabolic, toxic, or idiopathic

1.1.1 Dilated Cardiomyopathy: dilation and impaired contraction of one or both ventricles

- Common etiologies: viral, genetic, alcoholism
- Systolic dysfunction

Signs & Symptoms

- CHF
- Arrhythmias
- Sudden death
- Exercise intolerance
- Fatigue or weakness
- Dyspnea

Management

- Treat CHF symptoms
- ICDs
- Eval for transplant

1.1.2 Hypertrophic Cardiomyopathy: disorganized hypertrophy of left ventricle and occasionally right ventricle

- Caused by genetic mutations
- Diastolic dysfunction
- Usually asymptomatic until childhood or adolescence
- Athletes with underlying HOCM at greater risk for lethal arrhythmia during exertion
- May have abnormal SAM movement of mitral valve

Signs & Symptoms

- Varied presentation, may be asymptomatic
- CHF
- DOE: the most common sx
- Orthopnea and PND
- Exertional chest pain
- Atypical chest pain
- Syncope and presyncope
- Palpitations
- Postural hypotension
- Fatigue
- Edema
- Arrhythmias
- Harsh crescendo systolic murmur ± mitral regurg
- S4
- Displaced apical impulse or thrill
- Sudden death
- Stroke

**Workup**
- Differential: athlete's heart (physiologic LVH), HTN, aortic stenosis
- Valsalva will increase HCM murmur and decrease aortic stenosis murmur
- EKG: prominent Q waves, P wave abnormalities, LAD
- Echo
- Holter monitor
- Exercise stress test
- Screen relatives

**Management**
- β-blockers to reduce O2 demand
- CCB to reduce contractility and improve diastolic relaxation
- Pacer or AICD
- Surgical myectomy, mitral valve surgery, or ethanol ablation to destroy thickened septum

**Prognosis**
- Annual mortality of 1%
- May progress to dilated cardiomyopathy

1.1.3 **Restrictive Cardiomyopathy:** diastolic dysfunction → normal contractility but rigid and stiff ventricular walls
- Etiologies: scleroderma, amyloidosis, genetic, HOCM, DM, chemo, HIV
- Uncommon in US

**Signs & Symptoms**
- R CHF as pulmonary pressures must increase to deliver blood

**Workup**
- Differential: constrictive pericarditis

1.1.4 **Arrhythmogenic Right Ventricular Cardiomyopathy/Dysplasia:** RV wall replaced with fibrous tissue
- Genetic cause

**Signs & Symptoms**
- Ventricular arrhythmias

1.1.5 **Unclassified Cardiomyopathies**
- Includes stress-induced cardiomyopathy and left ventricular noncompaction
1.2 Pregnancy-Induced Hypertension

**Signs & Symptoms**
- Defined as BP > 140/90 after 20th week of pregnancy WITHOUT proteinuria in a previously normotensive woman
- No symptoms of preeclampsia, such as HA, vision changes, RUQ pain

**Workup**
- Differentiate from preeclampsia: urine dip for protein may not be 100% reliable, so need to do 24 hour urine or spot urine: creatinine
- Assess fetal wellbeing with biophysical profile or NST with amniotic fluid estimation

**Management**
- Weekly prenatal visits
- Delivery at 37-39 weeks for frequent mildly elevated BPs, or earlier for severe HTN
- Antihypertensives if severe to reduce risk of maternal stroke

**Prognosis**
- Generally favorable, not associated with morbidity and mortality of preeclampsia, however women with gestational HTN are at increased risk of developing preeclampsia
- Associated with development of HTN later in life

1.3 Deep Venous Thrombosis

**Signs & Symptoms**
- Palpable cord
- Calf pain
- Ipsilateral edema, warmth, tenderness, erythema

### Table 5. Wells et al Clinical Model For Predicting Pretest Probability For DVT²⁴

<table>
<thead>
<tr>
<th>Clinical Characteristic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (patient receiving treatment for cancer within previous 6 months or currently receiving palliative treatment)</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis, or recent plaster immobilization of the lower extremities</td>
<td>1</td>
</tr>
<tr>
<td>Recent bedridden for greater than 3 days or major surgery within the previous 12 weeks requiring general or regional anesthesia</td>
<td>1</td>
</tr>
<tr>
<td>Localized tenderness along the distribution of the deep venous system</td>
<td>1</td>
</tr>
<tr>
<td>Entire leg swollen</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling at least 3 cm larger than that on the asymptomatic leg (measured 10 cm below tibial tuberosity)</td>
<td>1</td>
</tr>
<tr>
<td>Pitting edema confined to the symptomatic leg</td>
<td>1</td>
</tr>
<tr>
<td>Collateral superficial veins (normocoece)</td>
<td>1</td>
</tr>
<tr>
<td>Previously documented deep-vein thrombosis</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis at least as likely as deep-vein thrombosis</td>
<td>-2</td>
</tr>
</tbody>
</table>

A total score of two or higher indicates that the probability of deep-vein thrombosis is likely; a total score of less than two indicates that the probability of deep-vein thrombosis is unlikely. In patients with symptoms in both legs, use the more symptomatic leg.

**Workup**
- Homan’s is only + 50% of the time
- Determine probability with Well’s criteria → < 2 indicates unlikely, > 6 highly likely
- Further investigation using D-dimer
- US for at least moderate Well’s score
Management

- Immediate anticoagulation with heparin, LMWH, or fondaparinux
- Lytics or thrombectomy for select cases
- 3 months of anticoagulation for initial distal DVT or consider IVC filter if not a good candidate
2 PULMONOLOGY

2.1 Pulmonary Embolism

Etiologies
- Most arise from LE DVT
- Stasis: surgery, heart failure, chronic venous stasis, immobility
- Blood vessel injury: fractures, surgery
- Hypercoagulability: postpartum, malignancy, OCPs, protein C/S/antithrombin III deficiency, lupus anticoagulant, factor V Leiden, prothrombin gene mutations, hyperhomocysteinemia

Classification
- Massive = sustained hypotension, pulselessness, persistent bradycardia, or need for inotropic support
- Submassive = pt is normotensive with myocardial necrosis
- Minor/nonmassive = normotensive with no myocardial necrosis

Signs & symptoms
- Onset does not have to be sudden!
- Dyspnea, pleuritic or anginal chest pain, cough, wheezing
- Leg swelling or pain
- Hemoptysis
- Palpitations, syncope
- Tachycardia and tachypnea, loud P2 from pulmonary HTN
- Diaphoresis
- Fever
- Homan’s sign
- Orthopnea
- ↓ Breath sounds
- JVD
- “Massive PE” ⬇ hypotension

Differential
- Pneumonia
- Infection
- Obstructive lung disease
- CHF
- Msk disease
- Acute MI
- Anxiety

Workup
- D-dimer is only useful if PE is very unlikely! Otherwise risk is too great that there will be a false negative
- PE highly unlikely in ED if pt meets these criteria: age < 50, HR < 100, SpO2 ≥ 95%, no hemoptysis, no estrogens, no prior h/o DVT or PE, no unilateral leg swelling, no surgery or hospitalization in past 4 weeks
- ABG if respiratory distress present: will usually show respiratory alkalosis, overall not very useful in diagnosing PE
- Troponin
- EKG sometimes shows S1Q3T3
- Troponins: May be + in moderate to large PEs from acute R heart overload
- May have concomitant DVT detected by US
- CXR may show edema, cardiomegaly, prominent pulmonary vein, left sided pleural effusion, or atelectasis
- VQ scan, spiral CT pulmonary angiography (test of choice), or pulmonary angiography (gold standard but hi morbidity, requires femoral cath)
- Pregnant? VQ scan vs CTA and radiation dose is debated

**Management**
- Supplemental O2 if hypoxic
- Give empiric heparin while waiting for imaging results (depending on level of suspicion as well as timeframe to get test results back)
- IVC filter for repeat clots or poor anticoagulant candidates
- Consider lytics for massive PE
- Consider surgical embolectomy for failed or contraindicated anticoagulation or lytic therapy
- Can be managed outpatient for select stable patients with no comorbidities
- Continue outpatient anticoagulation for at least 3 months

**Prognosis**
- 30% are fatal without treatment
- Less than 10% mortality if treated by anticoagulation
3 ENDOCRINOLOGY

3.1 Gestational Diabetes

- Carb intolerance induced by human placental lactogen
- Occurs in 3-5% of all pregnancies
- Classification via White’s classification (A1 = nutritional controlled; A2 = insulin requiring)

Screening

- Oral glucose tolerance test administered at 28 weeks, when HPL begins to have most effect
- Positive results followed up with 3 hour glucose tolerance test

Management

- Diet + exercise, insulin if needed (preferred over orals)
- BG monitoring 4x daily, with goal FBG < 95 and 1 hour postprandial BG < 130
- Early NSTs with amniotic fluid index for fetal monitoring of insulin-requiring mothers d/t higher rates of placental insufficiency, with biweekly NSTs after 32 weeks for type A2
- Single 3rd trimester US to screen for macrosomia
- Deliver by 40 weeks or earlier if fetus is nearing 8.8 lb
- Rescreen mother at 6 weeks postpartum for glucose intolerance

Prognosis

- Increased risk of having DM postpartum, as well as preeclampsia, bacterial infection, macrosomia, neonatal complications, polyhydramnios, preterm labor, and ketoacidosis
- Child will be predisposed to developing DM later in life

3.2 Polycystic Ovarian Syndrome

- Highly genetic predisposition

Signs & Symptoms

- Oligomenorrhea
- Hyperandrogenism → acne, hirsutism, male-pattern hair loss, DUB due to endometrial hyperplasia
- Obesity
- Glucose intolerance
- Dyslipidemia
- OSA
- NASH

Workup

- Diagnose with 2/3 Rotterdam criteria: oligomenorrhea, hyperandrogenism, polycystic ovaries on US
- Also can check total testosterone
- Rule out other causes of irregular menses: bHCG, prolactin, TSH, FSH

Management

- Weight loss and exercise
- Follow fasting lipids and glucose regularly
- Assess for depression, eating disorders, and sleep apnea regularly (hi prevalence in this population)
- Fertility evaluation if desired
- Hirsutism and other androgenic symptoms → OCPs, adding spironolactone later if needed (has antiandrogenic effects)
- Endometrial protection against hyperplasia → OCPs or intermittent progestins to induce bleeding
- Glucose intolerance → metformin especially helpful if infertility also present
- Infertility → weight loss, consider clomiphene

3.3 **Thyroiditis**

3.3.1 **Subacute Thyroiditis**

- AKA de Quervain’s thyroiditis

**Causes**
- Radioiodine therapy
- Viral or infectious cause
- Trauma

**Signs & Symptoms**
- Painful thyroid, neck pain, or goiter

**Workup**
- TSH, free T3 & T4, ESR
- Radiiodine imaging (uptake will be low)

**Management**
- Pain control with NSAIDs or prednisone if refractory
- Monitor thyroid panel every 2-8 weeks to confirm resolution of thyroid imbalance and normalization of function
- β-blockers for palpitations

3.3.2 **Painless Thyroiditis**

**Causes**
- Usually autoimmune: Hashimoto’s (aka chronic lymphocytic thyroiditis) or a variant, can be postpartum
- From exposure to drugs like Li
- Precipitating factors: infection, stress, sex steroids, pregnancy, iodine intake, and radiation exposure

**Signs & Symptoms**
- Painless thyroiditis; typically involves 2-6 weeks of hyperthyroidism followed by transient hypothyroidism, then euthyroid
- Postpartum presentation can occur up to 1 year after giving birth and has a longer course than typical painless thyroiditis
- Hashimoto’s typically causes a goiter

**Workup**
- TSH, free T3 & T4
- Differentiate from Grave’s disease with technetium scan or radioiodine uptake scan

**Management**
- Monitor thyroid panel every 2-8 weeks to confirm resolution of thyroid imbalance and normalization of function
- β-blockers for palpitations
- Hyperthyroid phase is generally mildly symptomatic and does not require treatment
- Treatment of symptomatic hypothyroid phase with thyroxine
Prognosis
- May have recurrent episodes
- 20% develop permanent hypothyroidism

3.3.3 Acute (Suppurative) Thyroiditis
- Rare!

Cause
- Suppurative bacteria

Signs & Symptoms
- Painful, red, tender thyroid

Management
- Antibiotics
- Surgical drainage if needed

3.3.4 Riedel’s (Fibrous) Thyroiditis

Signs & Symptoms
- Painful, stony, hard thyroid
- Dysphagia
- Dyspnea
- Hoarseness

Management
- Short-term steroids
- Long-term tamoxifen therapy
4 GASTROENTEROLOGY

4.1 Hyperemesis Gravidarum

Differential
- Infection: UTI, hepatitis, meningitis, gastroenteritis, appendicitis, cholecystitis, pancreatitis
- Other GI: PUD, fatty liver, SBO
- Metabolic: thyrotoxicosis, Addison's disease, DKA, hyperparathyroidism
- Drugs: antibiotics, iron supplements

Signs & Symptoms
- Severe vomiting in pregnancy with dehydration and weight loss

Workup
- UA
- Labs: CBC, CMP, thyroid panel
- Diet changes: avoid spicy, fatty, or odorous foods, taking multivitamin with folate
- Lifestyle changes: frequent naps, shortening work day
- CAM: acupressure, ginger
- Initial pharmacologic therapy with pyridoxine + doxylamine
- Add antihistamine or 5HT3 agonist if needed: Benadryl, meclizine, Dramamine, Zofran
- Add dopamine agonist if needed: Compazine, Reglan
- Glucocorticoids only for refractory cases after the 1st trimester
- Hospitalization with IVF + thiamine for dehydration
- Enteral or parenteral nutrition may be required

Prognosis
- Symptoms typically resolve by midpregnancy
- Infants of others who gain less than 15 lb during pregnancy tend to be of lower birth weight, small for gestational age, and preterm
- No significant difference in neonatal mortality rate between infants born to mothers with hyperemesis gravidarum compared to other mothers
5 GENITOURINARY

5.1 Dysfunctional Uterine Bleeding

- Bleeding outside normal parameters of menses (24-35 days, < 80 mL per cycle) found in the absence of demonstrable structural or organic pathology that is unrelated to another underlying illness
- Classified as ovulatory or anovulatory
- Some providers consider DUB to be a subset of abnormal uterine bleeding

Causes

- Usually a hormonal disturbance: menopause, premature ovarian failure, PCOS, prolactinoma, anovulation, immature HP axis (adolescents), perimenopause
- Anovulation causes DUB b/c there is no corpus luteum formation □ no progesterone to oppose estrogen-induced hyperplasia of the endometrium

Differential

- Abnormal uterine bleeding (known pathology): miscarriage, gestational trophoblastic disease, IUD, meds, trauma, coagulopathy, adrenal disorder, stress, pituitary adenoma, smoking, infections, fibroids, malignancy, atrophic vaginitis

Workup

- A diagnosis of exclusion
- Pregnancy test
- Malignancy workup if postmenopausal
- Coagulopathy workup: PT/aPTT, CBC,
- Assess ovulatory status: biphasic body temp, progesterone levels, urine LH
- Pelvic exam with pap
- May need endometrial biopsy or hysteroscopy
- Consider US evaluation for fibroids, polyps, or adenomyosis
- Consider testosterone and DHEAS levels in women with signs of virilization

Management

- Treat underlying cause if due to abnormal uterine bleeding
- Adolescent mild DUB can be treated with iron supplements and observation
- Adolescent mod-severe DUB can be treated with OCPs or progestin only regimen
- Patients with contraindication to estrogen therapy can consider symptomatic management with NSAIDs, progestin-only regimen, or Mirena IUD
- Endometrial ablation an option for women not wishing to conceive (although will still need contraception)
- Hysterectomy is the definitive treatment

5.2 Endometriosis & Adenomyosis

Endometriosis

- Location of endometrial tissue any place outside of the uterus
- May be caused by retrograde menstruation, where sloughed off endometrial tissue escapes through the fallopian tubes to implant outside of uterus
- Could also be caused by Mullerian cell remnants, direct surgical transplantation, altered immune response, genetics, or increased estrogen stimulation
- Usually occurs in the pelvis, but can occur in the ovary, cul de sac, uterine ligaments, fallopian tubes, bladder, rectum, bowel cervix, vagina, omentum, umbilicus, vulva, ureter, spinal cord, nasopharynx, breast, lung, and kidney
Adenomyosis
- Endometriosis within the uterine muscle

Signs & Symptoms
- Endometriosis typically occurs in young, tall, thin, nulliparous Caucasian women
- Adenomyosis typically occurs in women ages 40-50
- Associated with early menarche and late menopause
- May be asymptomatic
- Dysmenorrhea
- Dyspareunia
- Pelvic pain
- Sacral backache
- Pelvic mass
- Tenesmus and diarrhea with painful BMs
- Urinary frequency
- Infertility
- Lateral displacement of cervix or stenosed os

Workup
- US or MRI
- Laparoscopy for definitive diagnosis (implants will have variable coloration and appearance)

Management
- Endometriosis improves with suppression of ovulation and medical therapy is first line: OCPs, NSAIDs for cyclical pain, GnRH agonists for severe pain (create a hypoestrogenic state)
- Surgical excision for failed medical management
- Adenomyosis is treated with hysterectomy

Prognosis
- Associated with epithelial ovarian cancer but NOT endometrial cancer
- Recurrence is common
- Herniation of pelvic organs to or beyond the vaginal walls
- Can be a cystocele, rectocele, enterocele, uterus, vaginal vault, fibroid
- Classified via the Pelvic Organ Prolapse Quantitation system

Risk Factors
- Multiparity
- Advancing age
- Obesity
- Hysterectomy
- Chronic constipation
- Heavy lifting

Signs & Symptoms
- Feeling a bulge or something falling out of vagina
- Urinary, defecatory, or sexual dysfunction

Workup
- Pelvic and rectovaginal exam to determine location and source of prolapse
- Neuromuscular exam: bulbocavernosus and anocutaneous reflexes, sharp/dull touch, strength
Management

- No treatment needed if asymptomatic
- Symptomatic prolapse may be treated conservatively (pessaries or Kegels) or surgically

5.3 Cervicitis

Etiologies

- Infectious: chlamydia, gonorrhea, HSV, HPV, trichomoniasis, Mycoplasma genitalium, CMV, BV
- Noninfectious: cervical cap, pessary or diaphragm use, chemical or latex allergy, cervical trauma

Signs & symptoms

- Postcoital spotting
- Intermenstrual spotting
- Dyspareunia
- Unusual vaginal discharge
- If chronic → cervical stenosis, leukorrhea, granular redness, erythema, vulvar irritation
- Salpingitis
- Edematous or friable cervix

Workup

- STI testing
- Wet prep
- Pap & pelvic

Treatment

- Chlamydia → single azithromycin dose, or doxycycline
- Gonorrhea → ceftriaxone IM or single cefixime oral dose
- HSV → acyclovir
- Trichomoniasis → single metronidazole

5.4 Cervical Dysplasia

<table>
<thead>
<tr>
<th>Histology Grade</th>
<th>Corresponding Cytology</th>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>Normal cervical epithelium</td>
<td><img src="url" alt="Image" /></td>
</tr>
<tr>
<td>CIN 1 (Grade I)</td>
<td>LSL[2]</td>
<td>The least risky type, represents only mild dysplasia, or abnormal cell growth. It is confined to the basal 1/3 of the epithelium. This corresponds to infection with HPV, and typically will be cleared by immune response in a year or so, though can take several years to clear.</td>
<td><img src="url" alt="Image" /></td>
</tr>
<tr>
<td>CIN 2/3</td>
<td>HSIL</td>
<td>Formerly subdivided into CIN2 and CIN3.</td>
<td><img src="url" alt="Image" /></td>
</tr>
<tr>
<td>CIN 2 (Grade II)</td>
<td></td>
<td>Moderate dysplasia confined to the basal 2/3 of the epithelium</td>
<td><img src="url" alt="Image" /></td>
</tr>
<tr>
<td>CIN 3 (Grade III)</td>
<td></td>
<td>Severe dysplasia that spans more than 2/3 of the epithelium, and may involve the full thickness. This lesion may sometimes also be referred to as cervical carcinoma in situ.</td>
<td><img src="url" alt="Image" /></td>
</tr>
</tbody>
</table>
• After HPV infection, epithelia can develop active or latent infection or undergo neoplastic transformation
• HPV types 16 and 18 are more likely to undergo malignant transformation
• Most women will clear HPV infection within 2 years
• CIN = cervical intraepithelial neoplasia (aka cervical dysplasia); premalignant squamous transformation cells (not glandular)
• Bethesda system: ASCUS, LSIL, or HSIL
• Women over 30 who are being screened no more frequently than every 3 years will have HPV testing done automatically with their cytology

Screening
• Begin at age 21 or within 3 years of first sexual contact
• Every 3 years if low risk with 3 consecutive normal paps
• D/c after age 65 if last 3 paps were normal
• Women who have had a total hysterectomy for benign reasons do not need paps

Management
• Differs based on age of patient, as younger women tend to clear the infection before progression to dysplasia
• If ASCUS is detected, specimen will be tested for HPV as well if woman is over 21, or repeat cytology in 6 months if woman is under 21
• LSIL or HSIL or AGC will need referral for colposcopy, where biopsies will be taken
• Biopsies give corresponding histology grade of CIN 1, 2, or 3
• CIN 1 generally observed or may be ablated (cryotherapy or laser)
• CIN 2 or 3 have 5-15% chance of progressing to cervical cancer and these lesions need to be excised via LEEP or conization procedure (↑ risk of preterm labor in future pregnancies)
Management of Women with Atypical Squamous Cells of Undetermined Significance (ASC-US)

- Repeat Cytology @ 6 & 12 mos
  - Both Tests Negative
    - Routine Screening
  - Both Tests Positive
    - ≥ ASC
      - Repeat Cytology @ 6 & 12 mos
    - ≤ ASC
      - Colposcopy
        - Endocervical sampling preferred in women with no lesion, and those with unsatisfactory colposcopy
  - HPV Unknown
    - Repeat Cytology @ 12 mos
  - HPV Positive*
    - HPV DNA Testing
      - Positive
        - CIN
          - NO CIN
            - Repeat Cytology @ 12 mos
          - HPV Positive
            - Repeat Cytology @ 12 mos
        - ≤ ASC or HPV (+)
          - Repeat Colposcopy
          - Manage per ASCCP Guideline
      - Negative
        - ≤ ASC or HPV (+)
          - Repeat Colposcopy
          - Manage per ASCCP Guideline
      - Routine Screening
    - ≤ ASC or HPV (+)
      - Repeat Cytology @ 12 mos
  - ≤ ASC or HPV (+)
    - Repeat Cytology @ 12 mos

Management of Women with Low-grade Squamous Intraepithelial Lesion (LSIL) *

- Colposcopic Examination*
  - Non-pregnant and NO Lesion Identified
  - Unsatisfactory Colposcopic Examination
  - Satisfactory Colposcopy and Lesion Identified
  - Endocervical Sampling "Preferred"
    - Endocervical Sampling "Preferred"
    - Endocervical Sampling "Acceptable"
  - CIN 2,3
    - NO CIN 2,3
    - ≥ ASC or HPV (+)
      - Repeat Cytology @ 6 & 12 mos OR HPV DNA Testing @ 12 mos
    - Negative
      - Routine Screening
    - Cytology @ 6 & 12 mos OR HPV DNA Testing @ 12 mos
    - Manage per ASCCP Guideline
5.5 Incompetent Cervix (Cervical Insufficiency)

- Painless cervical changes in the 2nd trimester leading to recurrent pregnancy loss, stillbirth, or preterm delivery
- Short cervix is defined as < 25 cm from external to internal os

**Causes**
- Congenital: short cervix, Mullerian abnormalities, collagen abnormalities, FH
- Trauma: cervical laceration, instrument dilation, cone biopsy, LEEP
- Elevated serum relaxins (higher in multiple gestations)

**Screening**
- UpToDate recommends routine TVUS screening for short cervix in singleton pregnancies at 16-28 weeks

**Signs & Symptoms**
- Vaginal fullness or pressure
- Spotting or watery or brown discharge
- Vague abdominal and back pain
- Premature cervical effacement and dilation

**Workup**
- Transvaginal US showing shortened endocervical canal and funneling of fetal membranes into endocervix

**Management**
- No evidence for bedrest
- Progesterone supplements
- Indomethacin
- Prophylactic cerclage or pessary
- Early US surveillance for women not meeting criteria for cerclage
5.6 Vaginitis

5.6.1 Bacterial vaginosis
- Polymicrobial overgrowth of normal flora

**Signs & symptoms**
- Fish odor
- Heavy bubbly discharge that is white or gray

**Workup**
- Wet prep: clue cells, alkaline pH
- Whiff test

**Treatment**
- 1st line is metronidazole or clindamycin cream

5.6.2 Trichomoniasis
- Usually sexually transmitted

**Signs & symptoms**
- Copious vaginal discharge
- Pruritus
- Dysuria
- Dyspareunia
- Abdominal pain
- Vaginal and cervical inflammation with punctate hemorrhages - strawberry cervix

**Workup**
- Wet prep: look for motile trichomonads

**Treatment**
- Single dose of metronidazole

5.6.3 Yeast vaginitis
- Agent is Candida albicans
- May be ppt by hormonal changes, oral steroids or abx, nylon panties, hot weather, obesity

**Signs & symptoms**
- Pruritus
- Burning
- Nonfoul cottage cheese discharge
- Dyspareunia
- Vaginal or vulvar erythema
- May be asymptomatic

**Workup**
- KOH wet prep

**Treatment**
- Single dose of butoconazole or fluconazole
- 1st trimester pregnancy use itraconazole
- OTC Monistat only treats Candida albicans and no other 2 species

5.6.4 Atrophic vaginitis
- Inflammation of the vagina due to thinning and shrinking of tissues and decreased lubrication
- Seen in women with decreased estrogen

Signs & symptoms
- Pruritus
- Burning
- Vaginal dryness
- Dyspareunia
- Spotting
- Pale, thin vaginal mucosa

Workup
- Must r/o infectious cause
- Negative wet prep

Treatment
- Estrogen replacement therapy
- Regular sexual activity
- Lubricants and vaginal moisturizers

5.7 Dysmenorrhea

5.7.1 Primary = painful menses with normal anatomy
- Leading cause of school absences
- Incidence decreases after age 20

Cause
- Usually prostaglandins and uterine vasoconstriction

Signs & Symptoms
- Cramping pain radiating to back or inner thighs
- May have associated heavy flow, n/v/d, HA, dizziness

Management
- NSAIDs beginning 1-2 days before expected menses
- OCPs
- Progestosterone
- Mirena IUD
- Acupuncture
- Thiamine supplementation

5.7.2 Secondary = a result of disease or pathology

Causes
- GYN: endometriosis, uterine fibroids, adenomyosis, STIs, endometrial polyps, ovarian cysts, pelvic adhesions, chronic PID, cervical stenosis
- Non-GYN: IBD, IBS, uteropelvic junction obstruction, psychogenic
Signs & Symptoms
- Usually begins well after menarche

Workup
- Refer for laparoscopy

Management
- Treat underlying cause
- NSAIDs
- OCPs
- IUD
- Refer to OB-GYN for uterine artery embolization and evaluation for hysterectomy

5.8 Breast Cancer
- Usually arises from ducts or lobules
- Most commonly diagnosed female cancer
- Only 5-10% are due to genetic mutations

Risk Factors
- Obesity or inactivity
- Use of hormone therapy
- Nulliparity
- First birth after age 30
- ->1 alcoholic drink per day
- Not breastfeeding
- Increasing age
- White
- Hx of chest irradiation
- Hx of atypical hyperplasia on previous biopsy
- FH of breast cancer or inherited mutations

Screening
- Mammography is USPSTF grade C for women 40-49, grade B for women 50-74 every 2 years
- Clinical breast exam
- Breast self-exam is USPSTF grade D
- Dedicated breast MRI for high risk populations

Signs & Symptoms
- Early: single, nontender firm mass with ill-defined margins or possibly no palpable mass but an abnormality is detected on mammogram
- Later: skin or nipple retractions, axillary adenopathy, breast enlargement, erythema, peau d’orange, edema, pain, fixation of mass to chest wall
- Very late: ulceration, supraclavicular adenopathy, arm edema, mets to bone, liver, lung, or brain

Workup
- Biopsy of suspicious lesion
- Pathology and genomic marker assay

Management
- Women with high risk can consider chemoprevention with tamoxifen or raloxifene
- Chemo is typically 3-6 months and is initiated for visceral mets, failed endocrine therapy, or ER-/PR-tumors
- Endocrine therapy with tamoxifen (premenopausal) or aromatase inhibitors (postmenopausal)
- Surgical: breast-conserving vs mastectomy
- Radiation therapy as an adjuvant

5.8.1 Ductal Carcinoma in Situ

- Arises from ductal hyperplasia and fills ductal lumen
- Very early malignancy without basement membrane penetration
- Less than 30% recurrence rate following lumpectomy

**Signs & Symptoms**

- Typically asymptomatic and discovered on screening mammogram as calcifications

**Management**

- Lumpectomy followed by radiation is most common
- Tamoxifen or aromatase inhibitor therapy for 5 years if receptor+ tumor

5.8.2 Invasive Ductal Carcinoma

- The most common breast cancer
- Worst and most invasive

**Signs & Symptoms**

- Pt is typically postmenopausal
- Mammogram detects spiculated margins
- Firm, fibrous, rock-hard mass with sharp margins and small, glandular, duct-like cells

**Management**

- Chemo with Herceptin and Tykerb for HER2+ tumors

5.8.3 Lobular Carcinoma in Situ

- Contains signet ring cells

5.8.4 Invasive Lobular Carcinoma

- 2nd most common breast cancer

**Signs & Symptoms**

- Orderly row of cells in stroma that are fluid and mobile
- Often bilateral

**Management**

- Assessment with US preferred over mammography

5.8.5 Medullary Carcinoma

- Fleshy, cellular, lymphocytic infiltrate
- Good prognosis although it is a rare subtype of invasive ductal carcinoma

**Signs & Symptoms**

- Mammogram detects linear crystallization pattern
5.8.6 Comedocarcinoma
- Subtype of DCIS
- Ductal caseating necrosis

5.8.7 Paget's Disease of the Breast
- Subtype of ductal carcinoma

Signs & Symptoms
- Presents as eczematous lesions on the nipple
- May also be seen on the vulva

5.9 Fibroadenoma
- Common benign neoplasm in young women composed of fibrous and glandular tissue

Signs & Symptoms
- Pt is usually in teens to 30s

Workup
- Consider malignancy or fibrocystic changes in

Management
- Observation if malignancy has been ruled out
- Firm, round, nontender, mobile 1-5 cm nodule that is solitary and unilateral
- Growth is hormonally affected and can be rapid during pregnancy women > 30
- US for younger women
- FNA or needle biopsy for confirmatory diagnosis
- Surgical excision if unable to r/o malignancy or if large

Prognosis
- Can recur after excision

5.10 Vulvar Neoplasia
- Vulvar intraepithelial neoplasia (VIN) is a premalignant lesion that is difficult to distinguish or may exist in association with invasive squamous cell carcinoma, lichen sclerosus, or lichen planus
- Malignant lesions include squamous cell carcinoma (90% of vulvar cancers), melanoma, and basal cell carcinoma

Risk Factors
- HPV infection
- Immunosuppression
- Cigarette smoking
- Lichen sclerosus (can transform to SCC)
Differential
- Flesh-colored lesion: sebaceous gland, vestibular papillae, skin tag, cyst, wart, molluscum contagiosum
- White lesion: lichen sclerosus, lichen simplex chronicus, vitiligo
- Brown, red, or black lesion: could be anything, need to biopsy

Signs & Symptoms
- Vulvar pruritus
- Visible or palpable abnormality, may be in multiple locations
- Pain
- Dysuria

Workup
- Any lesion not previously known on the vulva warrants biopsy via physical exam or colposcopy

Management
- Wide local excision of VIN if high risk based on lesion characteristics and pt age
- Laser ablation or topical therapy with imiquimod for VIN lesions that would cause significant vulvar mutilation if excised
- Excision of malignant lesions with inguinofemoral lymph node evaluation ± chemo or radiation

Prognosis
- VIN recurs in 30% of women and 4-8% will go on to develop locally invasive vulvar cancer

5.11 Leiomyomas (Uterine Fibroids)
- Benign tumors arising from the myometrium
- Varying locations

Risk Factors
- Black
- Obese
- Over age 40
- Nulliparity

Protective
- Multigravida
- Postmenopausal
- Smoker
- Prolonged OCP use
- Depo use

Signs & Symptoms
- Dysmenorrhea and AUB
- Menorrhagia and possible subsequent anemia
- Dyspareunia
- Urinary frequency
- Infertility
- Irregular feeling uterus
- Abdominal mass
- Bloating
Pelvic pain or pressure or feeling of fullness
Acute pain with torsioned pedunculated fibroid
Miscarriage with submucosal fibroids intruding on fetus
Can be asymptomatic
Symptoms improve after menopause

**Workup**
- TVUS is diagnostic
- Consider malignancy workup with rapid growth

**Management**
- Only if symptomatic or pursuing pregnancy
- Surgical myomectomy (should be hysteroscopic if desiring future pregnancy)
- Hysterectomy only for extremely large, painful fibroids with intractable bleeding
- Mirena IUD or Depo injections to reduce bleeding
- Menopause-mimicking agent such as ulipristal
- Uterine artery embolization to starve off fibroids
- Consider shrinking large fibroids with GnRH agonists prior to surgical removal

**Prognosis**
- Not associated with malignant transformation

### 5.12 Ovarian Neoplasia

- Vary from annoying and benign to invasive and malignant
- Functional ovarian cysts (corpus luteum cyst or follicular cysts) are NOT considered to be neoplasms because they are a result of a normal physiologic process
- Ovarian neoplasms are derived from neoplastic growth of ovarian cell layers

#### Benign Ovarian Neoplasms
- Mucinous cystadenoma
- Serous cystadenoma
- Endometrioma (chocolate cyst)
- Fibroma
- Brenner tumor
- Thecoma
- Sertoli-Leydig cell tumors
- Dermoid cyst (teratoma): can contain hair, teeth, sebaceous glands, and thyroid cells producing TH
- Uterine leiomyoma

#### Malignant Ovarian Neoplasms
- Adenocarcinoma
- Granulosa cell tumor
- Dysgerminoma
- Clear cell carcinoma
- Endometrioid carcinoma

**Risk Factors**
- Nulliparity
- Fertility treatments
- FH of breast or ovarian cancer
Protective Factors
- Prolonged OCP use
- Pregnancy
- Tubal ligation or hysterectomy

Signs & Symptoms
- Thyrotoxicosis with dermoid tumor
- Torsioned ovary or cyst - signs of acute abdomen
- Malignancy symptoms are nonspecific like pelvic pain and bloating

Workup
- Transvaginal US: signs indicative of malignancy include large amounts of free fluid in the abdominal cavity, solid ovarian enlargement or mixed cystic and solid enlargement, thick-walled or complex ovarian cysts
- Serum CA-125: will also be elevated in infection, endometriosis, ovulation, and trauma
- Staging and grading of malignancies

Management
- Malignancy: local excision vs total hysterectomy and bilateral
- SO vs partial bowel resection depending on stage of cancer, usually followed by radiation ± Chemo
- Benign neoplasms will persist unless excised, which is usually done to prevent ovarian torsion
- Simple cysts in a postmenopausal woman may be followed by serial US and CA-125s

5.13 Endometrial Neoplasia
- Endometrial neoplasia involves proliferation of the endometrial glands that can progress to or coexist with endometrial carcinoma
- Endometrial carcinoma is the most common GYN cancer in the US and is usually adenocarcinoma

Risk Factors
- Age > 50
- Uopposed estrogen use
- PCOS
- DM
- Obesity
- Nulliparity
- Late menopause
- Tamoxifen use
- HNPCC

Signs & Symptoms
- Abnormal uterine bleeding
- Postmenopausal bleeding
- Abnormal pap cytology

Differential for Postmenopausal Bleeding
- Atrophy (59%)
- Endometrial polyps
- Endometrial cancer
- Endometrial hyperplasia
- Hormonal effects
Cervical cancer

**Workup**
- Endometrial biopsy can be done in clinic and is 99.6% sensitive in premenopausal women and 91% in postmenopausal women
- Transvaginal US to assess endometrial stripe: thin stripe < 4-5 mm associated with low risk of cancer while stripe > 5 mm warrants biopsy

**Management**
- Benign pathology on biopsy watched, no action warranted unless bleeding persists
- Endometrial hyperplasia on pathology without atypia is treated with progesterone cream, ovulation induction, or IUD to induce massive menses and endometrial sloughing
- Atypical endometrial hyperplasia needs D&C or hysterectomy + BSO

### 5.14 Menopause

**Climacteric** = a phase in women transitioning from a reproductive state to a non-reproductive state; includes perimenopause as well as a time before and after

**Perimenopause** = ~4 years before menopause when cycles become irregular and there are increased climacteric symptoms

**Menopause** = time during cessation of menses for 1 year; can be natural due to loss of ovarian estrogen activity, induced via surgery or radiation, temporary due to diet or GnRH therapy, premature if before age 40, or late if after age 55

**Postmenopause** = time following cessation of menses for 1 year
- Average age of natural menopause in US is 51.4 years

**Signs & Symptoms**
- Begin up to several years before cessation of menses and can last for 2-9 years after menopause
- Dry hair and mouth, facial hirsutism
- Menstrual irregularity, postcoital bleeding, intermenstrual spotting
- Loss of adiposity and collagen in vulva, loss of protective covering of clitoris, thinner vaginal surface, vaginal dryness and atrophy, genital itching or burning, dyspareunia, pale or shiny vaginal epithelium with loss of rugae, spare pubic hair, introital stenosis, fusion of labia minora, pelvic organ prolapse, vulvar dermatoses, stress incontinence, urinary frequency, decreased libido
- Hot flashes, vasomotor instability, sleep and mood disruptions
- Reduced breast size and loss of ligamentous supports

**Workup**
- Diagnosis is usually clinical
- FSH > 35 is diagnostic (FSH is ↑ in response to low estrogen)
- Check TSH if there are symptoms of hyperthyroidism
- For women under 45, do oligo/amenorrhea workup: hCG, prolactin, TSH, FSH
- Women under 40 need complete premature ovarian failure workup

**Management**
- Dressing in layers, avoiding food triggers, regular exercise
- Estrogen replacement therapy for moderate to severe symptoms of vasomotor instability: use lowest dose for shortest amount of time possible
- Vaginal moisturizers and lubricants for vaginal atrophy symptoms, may need vaginal estrogen
- SSRIs
5.15 Amenorrhea

5.15.1 Primary Amenorrhea

- Failure to menstruate by age 16 in presence of 2° sex characteristics or failure to menstruate by age 14 in absence of 2° sex characteristics

Etiologies

- Chromosomal abnormality → gonadal dysgenesis
- Central: tumors, infiltration of hypothalamus or pituitary, congenital GnRH deficiency, hypoprolactinemia, disrupted GnRH pulsations
- PCOS
- Anatomic abnormality or absence of uterus, cervix, or vagina

Workup

- Physical exam for sex characteristics and normal anatomy (breast development indicates estrogen effects and functioning ovaries)
- US to look for presence of uterus
- FSH level to determine whether cause is central or ovarian
- Karyotype if breast development not present
- Normal FSH, signs of breast development, and presence of uterus indicate further workup for secondary causes of amenorrhea

Management

- Treat underlying pathology
- Achieve fertility if desired
- Prevent complications of disease process

5.15.2 Secondary Amenorrhea

- Cessation of menses for a period of time = to 3 cycles or 6 months in a woman who previously had menses

Etiologies

- Pregnancy
- Functional hypothalamic amenorrhea: excessive exercise, eating disorder, systemic illness, psychological stress
- Hyperprolactinemia: pituitary tumor, medications, hypothyroidism
- PCOS
- Premature ovarian failure
- Endometrial scarring (Asherman’s)

Workup

- Physical exam for hirsutism, acanthosis nigricans, vitiligo, galactorrhea, and signs of estrogen deficiency or eating disorder
- Serum hCG, FSH, LH, PRL, TSH, progesterone, ?DHEAS (false negs)
- Serum total testosterone with signs of hyperandrogenism
- Other workup based on clinical findings
Management
- All depend on desire for fertility
- Hypothalamic amenorrhea: sufficient calorie intake, CBT, leptin administration
- Hyperprolactinemia: dopamine agonist or surgical treatment
- Premature ovarian failure: OCPs to prevent bone loss
- PCOS treatment
- Hysteroscopic lysis of intrauterine adhesions

5.16 Premenstrual Syndrome
- More severe form is premenstrual dysphoric disorder

Signs & Symptoms
- Symptoms begin with ovulation and last 2 weeks until menses
- Acne, breast swelling, fatigue, GI upset, insomnia, bloating, HA, food cravings, depression, anxiety, irritability

Workup
- PMDD defined by 5+ of the following: sadness, despair, suicidal ideation, tension, anxiety, panic attacks, irritability affecting others, mood wings, crying, disinterest in daily activities, binge eating, cravings

Management
- Exercise
- Regular sleep
- Stress management
- Healthy eating habits
- Avoiding caffeine, sugar, and salt
- OCPs for severe symptoms
- Consider antidepressants or counseling for PMDD

5.17 Fibrocystic Breasts
- The most common benign condition of the breast
- Uncommon in postmenopausal women unless on HRT

Signs & Symptoms
- Patients are usually ages 30-50
- Pain or tenderness in the breasts
- Cysts or multiple transient lumps that are firm, mobile, and tender
- Changes are related to menstrual cycle and can be worsened by caffeine

Workup
Differentiate from fibroadenoma or malignancy by the presence of multiple transient lesions
Further workup via US or mammogram indicated for lesions that persist throughout menstrual cycle

Management
- Counseling to wear supportive bra
- Avoiding trauma and caffeine
- Danazol for severe persistent pain
- Evening primrose oil
5.18 Pelvic Inflammatory Disease

- Inflammation of the uterus, fallopian tubes, and/or ovaries, and possibly surrounding pelvic organs
- Usually polymicrobial, with STIs + endogenous organisms

Risk Factors
- Multiple sex partners
- Douching
- Smoking

Signs & Symptoms
- Pelvic or abdominal pain
- Painful defecation
- Abnormal vaginal bleeding
- Dyspareunia
- Uterine, adnexal, or cervical motion tenderness
- RUQ pain (from perihepatitis)
- Signs of STI infection

Workup
- Testing for GC, Chlamydia,
- IV, hep B, syphilis
- Cervical cultures
- hCG
- Pelvic US if concern for abscess
- CBC
- UA

Management
- If no other cause of pelvic or abdominal pain can be found in a sexually active woman at risk for STIs, always treat for PID
- Begin antibiotic before cultures come back
- Admit for inpatient management if there is pregnancy, nonresponse to oral antibiotics, inability to take PO, severe illness, or tubo-ovarian abscess
- Outpatient treatment of mild-moderate PID: ceftriaxone IM + doxycycline
- Inpatient treatment of severe or complicated PID: IV cefoxitin + PO doxycycline
- Treat partners

Prognosis
- Risk for infertility increases with each episode

5.19 Mastitis

Agents
- Staph aureus, increasingly MRSA

Signs & Symptoms
- Usually unilateral
- Fever and flu-like symptoms
- Erythema, warmth, tenderness, and hardness of affected breast

Workup
- Malignancy workup if occurring in a non-lactating woman
• US to differentiate from abscess if needed

Management
• Continue breastfeeding or pumping
• Ibuprofen
• Cold compresses
• Oral dicloxacillin, 1st generation cephalosporin, or erythromycin if not suspecting MRSA
• Severe infection with MRSA risk → Bactrim, clindamycin, or linezolid

5.20 Contraceptive Methods

5.20.1 Misc. Methods

Withdrawal

Failure Rate
4-27%

Fertility Awareness
• Includes rhythm method, natural family planning, and symptothermal method
• Based on consistent symptoms of ovulation
• Effective if regular cycles
• Must be committed, motivated, vigilant
• Control of fertility
• No chemicals, hormones or foreign objects
• Inexpensive
• Accepted by religious organizations
• Use alternate methods or alternate forms of pleasure during ‘unsafe’ days
• Decreases spontaneity
• Unreliable if irregular cycles
• Perimenopausal years more difficult

Failure Rate
9-25%

5.20.2 Barrier Methods

Spermicide
• Only kind available in US is nonoxyl-9
• Natural alternatives: lemon juice, vinegar, neem oil
• Comes as a vaginal film, suppository, cream, gel, or lubricant
• No STI protection, can actually cause allergies and irritation → ↑ risk of STIs

Failure Rate
10-29%

Cost
$0.50-$1.50 per application
Cervical Cap
- Silicone cap filled with spermicide
- Only kind approved in US is the FemCap (others associated with abnormal paps)
- Requires prescription and fitting
- Can be inserted up to 24 hours before sex and worn for up to 48 hours
- No STI protection
- Increased risk of nonmenstrual toxic shock

Failure Rate
7.6-14%

Cost
$89 + exam & fitting
Free for insured under new ACA legislation

Diaphragm
- Rubber that is filled with spermicide
- Requires prescription and fitting
- No STI protection
- Increased risk of UTIs, vaginitis, and nonmenstrual toxic shock

Failure Rate
10-20%

Cost
$15-$75 + exam & fitting
Free for insured under new ACA legislation

Female Condom
- Synthetic nitrile

Failure Rate
5-20%

Cost
$2-$4 each

Male Condom
- Latex, polyurethane, natural, or “spray on”
- Often prelubricated with spermicide
- Can cause UTIs in female partners
- No STI protection with natural condoms

Failure Rate
3-15%

Cost
$0.25-$2 each
Sponge
- Polyurethane with spermicide
- Does not prevent STIs

Cost
$13-$19 for 3

5.20.3 Hormonal Methods
- Absolute contraindications to all estrogen-containing BC (per CDC):
  - Age > 35 and smoking > 15 cigs/day
  - Known CAD
  - Multiple risk factors for CAD: DM, HTN, smoking
  - HTN
  - H/o DVT, PE, stroke, or migraine with aura
  - Known coagulopathy
  - Complicated valvular heart disease: pulm HTN, afib, h/o bacterial endocarditis
  - SLE
  - Breast cancer
  - Cirrhosis, hepatocellular adenoma, or malignant hepatoma
- Relative contraindications to all estrogen-containing BC:
  - Gall bladder disease
  - H/o cholestatic jaundice in pregnancy
  - Epilepsy
  - Clot risks: leg injury or cast, elective surgery, sickle cell disease
  - Obesity

Combined OCPs
- Estrogen portion suppresses the FSH surge by negative feedback → ovulation inhibition, also alters endometrium and causes degeneration of the corpus luteum
- Progestin portion suppresses LH surge → inhibited ovulation, also thickens cervical mucus to inhibit implantation
- Benefits: improvement of acne, DUB, mittelschmerz pain, endometriosis, ovarian failure, ovarian cysts, uterine fibroids, fibroadenomas or fibrocystic breasts, iron deficiency anemia; decreases risk of ovarian and endometrial cancers, ectopic pregnancy, and acute PID
- Adverse effects: nausea, vomiting, weight changes, spotting, migraines, edema, rash, depression, decreased libido, ↑ risk of breast cancer, ↑ risk benign liver tumors, worsening gallbladder problems, blood clots, stroke
- Need to adjust strength and estrogen/progesterone formulation if adverse effects are present
- Most to least androgenic progestins: norgestrel, levonorgestrel, norethindrone, norethindrone acetate, ethynodiol, norgestimate, desogestrel, drospirenone
- Ethynodiol is the only highly estrogenic estrogen, all others have lower estrogenic effects
- No protection against STIs

Failure Rate
3-9%

Cost
$15-$30 per month
<table>
<thead>
<tr>
<th>Adverse Effect</th>
<th>Causes</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakthrough bleeding</td>
<td>Need higher progestin content to increase endometrial support</td>
<td>Monophasic formulation with a higher progestin dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Triphasic formulation with increasing dose of progestin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>higher dose of estrogen</td>
</tr>
<tr>
<td>Acne, oily skin, and hirsutism</td>
<td>Side effects from progestins</td>
<td>Product with lower risk of androgenic effects</td>
</tr>
<tr>
<td>GI complaints</td>
<td>Estrogen and progesterone</td>
<td>Estrogen – induces nausea and vomiting via the CNS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Progesterone – slows peristalsis, causing constipation and feelings of bloating and distention</td>
</tr>
<tr>
<td>Headaches</td>
<td></td>
<td>discontinue the oral contraception</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lower the dose of estrogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lower the dose of progestin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>eliminate the pill-free interval for 2-3 consecutive cycles</td>
</tr>
<tr>
<td>Decreased libido and depression</td>
<td>Low levels of estrogen ↓ vaginal lubrication</td>
<td>Use of the NuvaRing may help with lubrication disorders</td>
</tr>
<tr>
<td>Dyslipidemias</td>
<td>Estrogen</td>
<td>Replace an androgenic progestin with a more estrogenic progestin</td>
</tr>
<tr>
<td>Mastalgia</td>
<td>Estrogen component</td>
<td>lower-dose estrogen pills</td>
</tr>
<tr>
<td></td>
<td></td>
<td>if tenderness occurs prior to menses, switch to a contraceptive that offers extended cycle length</td>
</tr>
<tr>
<td>Weight gain</td>
<td>High estrogen content</td>
<td>Switch to an estrogen product with &lt;35 mcg of ethinyl estradiol</td>
</tr>
<tr>
<td>Visual changes/contact lens disturbances</td>
<td>Estrogen stimulation of melanocyte production</td>
<td>progestin-only products use sunscreen refer to ophthalmologist if normal saline eye drops do not help</td>
</tr>
</tbody>
</table>

**Progestin-Only Pill**
- Must be taken with obsessive regularity
- Can have irregular bleeding
- A good option for breastfeeding women, smokers > 35, or those who can’t tolerate estrogen

**Failure Rate**
1-13%

**Cost**
Free for insured under new ACA legislation
Vaginal Ring
- May be removed for up to 3 hours during intercourse without backup protection
- Adverse effects: vaginitis, HA, leukorrhea, FB sensation, device expulsion, feeling it during sex

**Failure Rate**
1-2%

**Cost**
$15-$70 per month
Free for insured under new ACA legislation

Transdermal Patch
- Can bathe, swim, or exercise with patch in place
- Must use back-up if patch falls off > 1 day

**Failure Rate**
0.3-8%

**Cost**
Free for insured under new ACA legislation

Medroxyprogesterone Injection
- IM injection q 3 months
- Results in amenorrhea after a year or so of use
- Can use if smoker or nursing
- Decreased risk of PID and endometrial cancer
- AEs: bleeding abnormalities, weight gain, lipid changes, depression, acne, HA, delay in return to fertility
- Black box warning for ↑ risk osteoporosis related to duration of use = should only use < 2 years
- No protection against STIs

**Failure Rate**
1-2%

**Cost**
$35-$75 per injection
Free for insured under new ACA legislation

Progesterone Implantable Rod
- Must be trained by company-approved provider to insert and remove
- Good option for smokers or those who have contraindications to estrogen
- May be less effective in obese patients
- AEs: menstrual irregularity, amenorrhea, weight gain, acne, depression

**Failure Rate**
1-4%

**Cost**
- $400-$800 for insertion
- $75-$150 for removal
• Free for insured under new ACA legislation

**Mirena IUD**

• Changes mucus and sets up hostile environment for sperm
• Questionable use in individuals at risk for STIs
• Often used in later reproductive years before menopause
• Decreased risk of endometrial cancer
• Can be in place up to 5 years
• Women may become amenorrheic after a year of use
• Less bleeding and cramping than with copper IUD
• Increased risk of ovarian cysts
• May want to culture IUD for Actinomyces after removal

**Failure Rate**

0.2%

**5.20.4 Surgical Methods**

**Vasectomy**

• Cutting and sealing the vasa deferentia
• Clinic procedure under local anesthesia
• Recovery period of 2-3 days
• Men will still be fertile for several ejaculations afterwards, need to have semen analysis in 1 month to confirm sterility

**Failure Rate**

0.15%

**Cost**

$350-$1000

**Tubal Ligation**

• An outpatient surgery under general anesthesia
• Recovery period of 1 week
• Benefits: ↓ risk ovarian cancer and possibly breast cancer, can be done immediately postpartum
• Increased risk of ectopic pregnancy
• Need to confirm blockage with hysterosalpingogram

**Failure Rate**

0.5%

**Cost**

$1500-$6000

**5.20.5 Other Methods**

**Paragard IUD**

• Changes mucus and sets up hostile environment for sperm
• Questionable use in individuals at risk for STIs
• Often used in later reproductive years before menopause
• Decreased risk of endometrial cancer
• Can be in place for up to 10 years
• Can cause heavy bleeding and cramping
• May want to culture IUD for Actinomyces after removal

Failure Rate
0.6-1.0%

Lactation
• Most effective if infant is not taking any supplemental formula and mother is nursing at least every 4 hours

5.20.6 Emergency Methods

Morning After Pill
(Plan B One-Step, Next Choice)
• Not an abortifacient = won’t work if already implanted
• No evidence of teratogenic effects
• Best if initiated within 72 hours of unprotected sex but can be taken for up to 5 days afterward
• Rare risks or AEs, but may need prophylactic antiemetics before taking
• Available without a prescription for ages 17+

Ulipristal acetate (Ella)
• Selective progesterone receptor modulator
• Rx only

Mifepristone (RU486)
• Use within 72 hours of unprotected sex
• An abortifacient = will dislodge implanted embryo
• Also inhibits ovulation and changes endometrium

Failure Rate
15%

5.21 Infertility

• Failure to achieve pregnancy within one year of frequent, unprotected sex if < 35 or within 6 months if > 35

Etiologies
• Male issues: 1° hypogonadism (androgen insensitivity, cryptorchidism, meds, varicocele, genetic defect), 2° hypogonadism (androgen excess, infiltrative disorder, meds, pituitary adenoma)
• Female issues: ovulatory dysfunction, tubal damage, endometriosis, cervical factor

Signs & Symptoms
• Men: genital infection, hernia, absence of vas deferens, signs of androgen deficiency, testicular mass, varicocele
• Women: breast formation, galactorrhea, genitalia, signs of hyperandrogenism
Workup
- CBC and CMP for both partners
- GC/Chlamydia
- UA
- Men: consider post-ejaculatory UA for retrograde ejaculation, scrotal US, FSH and testosterone levels, sperm studies, transrectal US
- Women: consider FSH, prolactin, TSH levels, antral follicular count via US, hysterosalpingography, pelvic US, hysteroscopy, laparoscopy

Management
- Treat underlying problem
- Bromocriptine for hyperprolactinemia
- Treat ED
- Varicocele repair
- Referral to fertility specialist for semen abnormality
- Ovulatory dysfunction treatment: ovulation-inducing meds or hormone injections
- Tubal repair
- Laparoscopic ablation of endometriosis
- Fertility monitoring: timed intercourse with fertility awareness methods will result in pregnancy in 90% of couples
- For unexplained infertility, 3-4 cycles of clomiphene followed by intrauterine insemination is recommended
- IVF results in the highest per cycle pregnancy rate in the shortest time interval but is most costly and has a high rate of high order multiple pregnancy

Prognosis
- Overall likelihood of successful treatment is 50%

5.22 Normal Labor & Delivery

Stages of Labor
- 1st stage: onset of labor to full dilation of 10 cm
- 2nd stage: interval between full dilation and delivery of fetus
- 3rd stage: time from fetal delivery to expulsion of placenta

Factors Influencing Course of Labor
- Powers: uterine contractions
- Passenger: fetal size and number, lie, presentation, station, presence of any fetal anomalies (ideally fetus is small and in vertex position, longitudinal lie, with head flexed and in anterior position and passing through pelvic inlet)
- Passage: pelvis and surrounding soft tissues

Signs & Symptoms
- Sequential changes within the myometrium and cervix take place over days to weeks
- Loss of mucus plug - “bloody show”
- Progressive cervical dilation and effacement: should dilate at > 1.2 cm/hr for nulliparous women and > 1.5 cm/hr for multiparous women
- Fetal head can be observed to rotate as it navigates the birth canal (“cardinal movements of labor”)
Management
- Measurement of uterine contractions via tocodynamometer
- Continuous fetal HR monitoring
- Adequate labor for delivery is 3-5 contractions in a 10 minute period
- IV placement
- Pain management: parenteral analgesics vs epidural anesthesia
- Clear liquid diet during labor
- Consider C-section for labor dystocia (“failure to progress”)
- Consider operative vaginal delivery (use of forceps or vacuum assistance) for fetal distress, maternal exhaustion, or prolonged 2nd stage of labor
- Routine episiotomy not recommended, instead repair lacerations if they present
- Deliver placenta within 30 minutes of birth of fetus and examined to be sure it is intact

5.23 Abruptio Placentae (Placental Abruption)
- Partial or complete separation of the placenta from the uterine wall prior to delivery of the fetus

Risk Factors
- High: cocaine use, trauma, polyhydramnios, eclampsia, prior abruption, chronic HTN, PROM, chorioamnionitis, fetal growth restriction, smoking
- Moderate: AMA, multiparity, male fetus

Signs & Symptoms
- Painful vaginal bleeding
- Tender uterine fundus
- Contractions
- Abdominal pain
- Can be asymptomatic
- Can be chronic: light, intermittent vaginal bleeding, oligohydramnios, fetal growth restriction, and preeclampsia

Workup
- US to eval for retroplacental hematoma but sensitivity is only 25-50% = diagnosis is clinical
- Blood type and Rh status
- NST

Management
- Fetal HR abnormality on NST suggests impending distress and emergency management
- Stabilization of maternal hypovolemia with large bore IV access with blood replacement
- Expeditious delivery for nonreassuring fetal HR, maternal instability, or gestational age > 36 weeks (should be C-section if unstable or with malpresentation)
- Expectant management of select cases in pregnancies < 36 weeks with administration of glucocorticoids in fetuses 23-34 weeks

**Prognosis**
- Separation > 50% usually leads to acute DIC and fetal death
- Increased risk of abruption in all future pregnancies

### 5.24 Placenta Previa

- When placenta implants abnormally in the lower uterine segment → partial or total blockage of cervical os

#### Placenta Previa

![Placenta Previa Diagram](https://example.com/placenta-previa.png)

**Risk Factors**
- Multiparity
- AMA
- Asian
- Prior placenta previa
- Smoking
- H/o C-section
- Multiple gestation

**Screening**
- Usually detected in 1st or 2nd trimester US

**Signs & Symptoms**
- Painless vaginal bleeding

**Workup**
- Avoid pelvic exam which can rupture the placenta
- Transvaginal US to assess placental location

**Management**
- Total placenta previa → refer to high risk OB
- Marginal previa → f/u with serial US, avoid cervical US and sex, activity restrictions, deliver via C-section at 36-37 weeks
- Active bleeding → hospitalization with close monitoring, may need emergency C-section
5.25 Ectopic Pregnancy

- Most occur in the fallopian tube
- Others are cornual (interstitial), cervical, fimbrial, ovarian, abdominal
- Rarely heterotrophic (intrauterine and ectopic at the same time)
- The leading cause of pregnancy-related deaths in the 1st trimester

Risk Factors
- High: tubal obstruction or injury (PID, tubal ligation), previous ectopic, DES use, current IUD use
- Moderate: infertility, smoking, older age, non-white ethnicities, previous cervicitis

Signs & Symptoms
- Abdominal or pelvic pain
- Amenorrhea or vaginal bleeding
- Usual pregnancy symptoms
- Shoulder pain from blood pooling under diaphragm
- Urge to defecate from blood pooling in cul-de-sac
- Orthostatic BP
- Fever
- Rebound tenderness
- Adnexal pain on bimanual exam
- Cervical motion tenderness

Workup
- Quantitative serum hCG
- Transvaginal US to examine uterine contents: diagnostic if true gestational sac, yolk sac, or embryo is detected inside or outside of the uterus (should be able to visualize if hCG > 1500 which is the limit of US detection)

Management
- If hCG is < 1500 and US is nondiagnostic, need to repeat US and hCG in 3 days or when hCG level reaches US limit
- Surgical if unable to comply with nonsurgical management, ruptured, or hCG > 5000: best outcome with salpingostomy, but will need salpingectomy if ruptured
- Medical management is the treatment of choice for women who are hemodynamically stable with hCG < 5000 and tubal size < 3-4 cm: methotrexate IM followed by serial hCG measurements
• Expectant management only for asymptomatic women with small tubal pregnancy and low hCG levels who are willing to accept the risk of rupture or hemorrhage

5.26 Molar Pregnancy (Hydatiform Mole) and Gestational Trophoblastic Disease (PROM)

• Rupture of membranes at full term but before onset of labor (normally amniotic sac ruptures well into labor)
• Occurs in 10% of normal pregnancies

PPROM
• Refers to rupture of membranes before 37 weeks
• Usually caused by maternal infection
• Risk factors: intra-amniotic infection, prior h/o PPROM, lower SES, teen mom, smoker, h/o STD, h/o cervical cerclage, multiple gestation, polyhydramnios

Signs & Symptoms
• Feeling “leaking urine” or increased vaginal secretions
• Sx of chorioamnionitis: odor, fundal tenderness, low grade fever, fetal tachycardia

Workup
• Visual exam for pooling of amniotic fluid in vagina with test for ferning of sampled fluid
• GC/Chlamydia testing

Management
• If term, good evidence that labor should be induced after this in order to prevent NICU placement; GBS prophylaxis if > 18 hours since rupture, or with colonization or fever
• If preterm, need inpatient monitoring, treatment of infection if present, deliver if > 34 weeks or with fetal distress, otherwise expectant management with steroids if needed for fetal lung maturation

5.27 Preterm Labor

• Regular, painful uterine contractions with cervical dilation or effacement before 37 weeks

Possible Etiologies
• Dental disease
• Bacterial vaginosis
• Inflammatory response

Risk Factors
• Smoking
• Black
• Extremes of age
• Low SES, poor housing, or other social stress
• Multiple gestation
• Intergestational period < 6 mos
• H/o cervical surgery or short cervix
• Infection: bacteriuria or UTI, BV

Prevention
• Treating infections has not been shown to improve outcomes
• ID of high risk women with early care and enhanced prenatal services also has failed to improve outcomes
- Can follow women with h/o preterm labor with frequent US to assess cervical length
- ACOG recommends offering progesterone to women with cervical length < 15 mm or with h/o preterm delivery
- Cervical cerclage or pessary an option

**Signs & Symptoms**
- Contractions: back pain, abdominal pain, cramping
- Diarrhea
- Leaking fluid

**Workup**
- Check fetal fibronectin, has good NEGATIVE predictive value for assessing risk of delivering in next 7-14 days (can be inaccurate with recent cervical disruption like sex or TVUS)
- US measurement of cervical length; preterm labor likely if < 20 mm
- Evaluation of fetal lung maturity (amniotic fluid specimen): lecithin/sphingomyelin ratio, foam stability index, phosphatidylglycerol, or fluorescence polarization

**Management**
- Progesterone: maintains cervical integrity, opposes oxytocin, and is anti-inflammatory
- Tocolytics (anti-contractants like terbutaline, mag sulfate, CCBs, indomethacin): no evidence that they improve outcomes but they do buy time to administer steroids or transport to NICU facility
- Steroids to mature fetal lungs
- GBS prophylaxis if needed or if culture not recently done
- Bed rest, pelvic rest, and hydration have no evidence to back them up
- Avoid sex and strenuous physical activity
- Outpatient follow-up feasible for reliable patients

### 5.28 Rh Incompatibility

- Maternal immunization can occur as a result of transplacental fetomaternal hemorrhage or blood transfusion with Rh+ blood

**Screening**
- Maternal Rh status and antibody screening done at first prenatal visit and at delivery

**Prevention**
- Rhogam given to all Rh- mothers at 28 weeks, again just after delivery if neonate is determined to be Rh+, and anytime during pregnancy when there is risk of fetomaternal hemorrhage

**Signs & Symptoms**
- Rh incompatibility causes a spectrum of disease from hyperbilirubinemia to hydrops fetalis

**Differential**
- RBC membrane defects: hereditary spherocytosis
- RBC enzyme defects: G6PD deficiency, pyruvate kinase deficiency
- Gilbert’s syndrome

**Workup**
- Maternal and infant blood T&S
- Coombs test
- Infant peripheral smear
- Antibody titers during pregnancy for mothers with known Rh sensitization and Rh+ fetus
**Management**
- Emergent neonatal transfusion at delivery for infants with signs of shock
- Later transfusions for symptomatic anemia
- EPO and iron for mild anemia

**5.29 Induced Abortion**
- 98% of unsafe induced abortions occur in the developing world
- Many US states have limits on abortions after 20 weeks

**Methods**
- Surgical: D&C, vacuum
- Medical: for women < 63 days since LMP

**Workup**
- Confirm pregnancy and gestational age
- CBC and T&S

**Management**
- Antibiotic prophylaxis: doxycycline
- Rhogam if indicated

**Prognosis**
- Surgical complications: cervical laceration, hemorrhage, uterine perforation, incomplete abortion, sepsis
- Psychological complications? Studies show women post-abortion have no higher incidence of mental health disorders
## 5.30  Prenatal Care

<table>
<thead>
<tr>
<th>Week(s)</th>
<th>Initial visit: 8-12</th>
<th>16</th>
<th>20</th>
<th>24</th>
<th>28</th>
<th>30</th>
<th>32 &amp; 34</th>
<th>36</th>
<th>37</th>
<th>38 &amp; 39</th>
<th>40+</th>
<th>Postpartum</th>
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<tr>
<td>Discussion</td>
<td>-History</td>
<td>-Begin fetal</td>
<td>- Importance</td>
<td>-Pregnancy ROS:</td>
<td>-Signs of Pregnancy</td>
<td>-Postterm</td>
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<tr>
<td>highlights</td>
<td>-Counseling</td>
<td>movement of daily fetal movements from here on</td>
<td>-Round ligament spasms à flank pain</td>
<td>-Discuss preterm labor</td>
<td>-Loss of mucus plug</td>
<td>-Postterm</td>
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<td></td>
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<td></td>
<td>-1 week incision check for C-sections</td>
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<tr>
<td>Anticipatory guidance</td>
<td>-Genetic screening options</td>
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<td></td>
<td></td>
<td></td>
<td>-2 week check for vaginal deliveries</td>
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<td>-4-6 week f/u for everyone</td>
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</table>

- **Complete PE** √
- **Pap & pelvic** √
- **Weight, BP** √
<table>
<thead>
<tr>
<th>check, fetal heart tones</th>
<th>Measure fundal height</th>
<th>Follow up with US for height &gt; 3 cm discrepancy from gestational age</th>
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<tbody>
<tr>
<td>Leopold’s maneuvers</td>
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<td>Cervical checks</td>
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<td>Imaging</td>
<td>TVU S for dating</td>
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<tr>
<td></td>
<td>20 week US to assess</td>
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<tr>
<td></td>
<td>fetal anatomy and size</td>
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<td></td>
<td>Consider additional US for select high risk pregnancies or inability to measure accurate fundal heights: h/o preterm labor (cervical length), obesity, DM, multiple gestation</td>
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<tr>
<td>NST</td>
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<td>Consider for high risk women: IDDM, AMA, maternal heart defect, intrauterine growth restriction, multiple gestation</td>
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<td></td>
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<td>√ Biweekly</td>
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<td>Genetic screen</td>
<td>10-13 weeks: CVS</td>
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<tr>
<td></td>
<td>11-14 weeks: CVS</td>
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<td>PAPP-A, NT</td>
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<td>15-22 weeks: window for quad screen and amniocentesis</td>
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<td></td>
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<td>CBC</td>
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<td>T&amp;S</td>
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<td>GC/C</td>
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<td>Hep B surface antigen</td>
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<td>Varicella &amp;</td>
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<td>------------------------------------------------------------------------------</td>
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<tr>
<td>rubella titers</td>
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<tr>
<td>Vit D level</td>
<td>√</td>
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</tr>
<tr>
<td>Glucose tolerance test</td>
<td>Consider for select high risk individuals</td>
<td></td>
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<td>√</td>
<td></td>
</tr>
<tr>
<td>HSV, TB, TSH, urine drug screen</td>
<td>If hypothyroid need to follow TSH q 8 weeks with goal TSH 2-3</td>
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<tr>
<td>Urine dip</td>
<td>Consider repeat or frequent UAs for certain high risk individuals: UTI at initial visit, h/o pyelonephritis or kidney problem, symptoms of preeclampsia or diabetes à culture if + and f/u with test of cure</td>
<td></td>
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<tr>
<td></td>
<td>F/u proteinuria with preeclampsia labs: 24 hour urine, CMP, PT/PTT, uric acid</td>
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</tr>
<tr>
<td>Rhogam administration</td>
<td>Only give for abnormal bleeding during this time</td>
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<tr>
<td>GBS swab</td>
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</tbody>
</table>

Before leaving hospital
5.31 Spontaneous Abortion

- Pregnancy that ends spontaneously before fetus has reached age of viability (=before 22 weeks)
- 80% occur in the first trimester
- Occurs in up to half of all pregnancies, although only half of these are diagnosed

Causes
- Chromosomal abnormalities, esp trisomy 16
- Fibroids, polyps, or scarring
- Thrombosis or other placental complication
- Infection
- Fetal exposure

Risk Factors
- Maternal or paternal age
- Increasing parity
- Smoking
- Cocaine or caffeine
- High BMI
- Submucosal fibroids or other uterine abnormality
- Asherman’s syndrome
- DM
- Thyroid disease
- PCOS
- H/o spontaneous abortion

Signs & Symptoms
- Vaginal bleeding
- Abdominal pain or cramping
- Open cervical os
- Products of conception visualized in the vagina or cervical os
- Signs of hemodynamic instability and fever if septic

Differential
- Physiologic bleeding from implantation
- Ectopic pregnancy
- Cervical polyp
- Cervical infection or neoplasia
- Recent sex

Workup
- US: no cardiac activity in a fetus with CRL > 6 mm or no growth of pregnancy over one week are diagnostic for miscarriage; bad signs indicated miscarriage include yolk sac abnormalities, fetal HR < 100, and large subchorionic hematoma
- Serial quantitative hCGs: normal doubling is reassuring
Management

- Follow quantitative hCG to zero
- May need surgical intervention: D&C
- Medical management (90% efficacy): mifepristone or misoprostol
- Expectant management is an option as long as there is minimal bleeding or discomfort, pt is < 13 weeks, stable VS, and no evidence of infection (80% efficacy but can take days to weeks)
- Administer Rhogam if mother is Rh-
- Methylergonovine maleate to control bleeding
- Broad spectrum abx if septic abortion (clindamycin + gentamicin or Zosyn)
- Grief counseling
- Pelvic rest for 2 weeks
- No evidence for avoiding pregnancy for 2-3 cycles
- Contraception if desired

5.32 Shoulder Dystocia

- When shoulders of infant can’t fit through pubic symphysis because they are wider than the pelvic outlet

Risk Factors

- Maternal obesity
- DM
- H/o or current macrosomic infant
- H/o shoulder dystocia

Prevention

- Routine prophylactic C-section not indicated for suspected macrosomia but can be considered in mothers with h/o shoulder dystocia and brachial plexus injury

Signs & Symptoms

- Prolonged 2nd stage of labor
- Recoil of infant head on perineum ("turtle sign")
- Lack of spontaneous restitution (translation: no natural head turning)

Management

- Get help
- Episiotomy
- McRobert’s maneuver
- Drain bladder and disimpact bowel

Prognosis

- Fetal complications: brachial plexus injury, clavicular or humeral fracture, increased risk of asphyxia
- Maternal complications: hemorrhage, 4th degree tear
5.33  Fetal Distress

**Causes**
- Cord compression
- Placental abruption
- Cord prolapse
- Maternal medication
- Rapid descent of fetal head

**Prevention**
- Continuous fetal HR monitoring vs intermittent auscultation during labor: no evidence one is better than the other
- High risk women should have continuous fetal monitoring during labor

**Signs & Symptoms**
- Prolonged abnormalities on fetal HR monitoring

**Workup**
- Outpatient: NST
- Inpatient: fetal scalp stimulation (FHR acceleration in response is reassuring), fetal ST analysis, fetal scalp blood sampling

**Management**
- Correct underlying abnormality
- Outpatient: monitor with repeat NSTs
- Improve fetal oxygenation
- Rapid operative intervention if needed

5.34  Labor Dystocia

- Failure of labor to progress as anticipated

**Causes and Risk Factors**
- Hypocontractile uterine activity
- Inadequate pelvis
- Fetal malpresentation or macrosomia
- AMA
- Maternal medical issues: DM, HTN, obesity
- Prolonged rupture of membranes
- Chorioamnionitis
- Short maternal stature
- High station at complete dilation

**Signs & Symptoms**
- Labor not following the norms of the Friedman curve (although these values are now debated)
- Uterine contractions < 200 Montevideo units

**Management**
- Administer oxytocin and monitor for 4-6 hours before considering operative delivery
- Intervention not indicated as long as labor is progressing and fetal HR reassuring

5.35  Postpartum Hemorrhage
Defined as blood loss > 1000 mL (or > 1500 mL for C-section)
Avg vaginal delivery EBL is 500 mL (or 1000 mL if section)
Occurs in 5% of deliveries
Can be early (within 24 hours of delivery) or late (up to 6 weeks after delivery)

**Causes**
- Uterine atony (causes 70% of cases)
- Retained placental tissue
- Infection
- Blood vessel damage during C-section
- Congenital coagulopathy

**Risk Factors**
- Chorioamnionitis
- Uterine distension
- Prolonged or induced labor
- Use of mag sulfate
- General anesthesia
- Multiparity
- Previous hemorrhage
- Placenta previa or abruption
- Operative delivery

**Prevention**
- Active management of 3rd stage of labor
- Use of oxytocin after delivery of the anterior shoulder

**Signs & Symptoms**
- Signs of shock and hypovolemia
- Delivery of placenta > 30 min after infant
- Uterine atony
- Signs of uterine rupture: hypotension greater than expected for EBL, increasing abdominal girth

**Workup**
- Check for retained placenta: inspect delivered placenta for missing parts, explore uterus
- Look for traumatic cause of hemorrhage: tear, hematoma, uterine inversion
- Coagulopathy workup: PT/aPTT, fibrinogen, antithrombin III

**Management**
- Treat underlying cause
- Uterine atony → uterine massage, oxygen, large-bore IV access, oxytocin, methylergonovine
- Uterine inversion → manual reduction of uterus, laparotomy
- Uterine rupture → surgical intervention
- Embolization of uterine or hypogastric arteries
- Hysterectomy is last resort

### 5.36 Intrauterine Growth Restriction
- Fetal growth < 10%ile for gestational age and gender
- Multiples share the same growth curve as singletons up to 22-24 weeks
Causes
- Congenital malformations
- Chromosomal abnormalities
- Damage during organogenesis
- Infection: rubella, CMV
- Placenta previa
- Placental infarction or single umbilical artery
- Small placenta
- Multiple gestation

Risk Factors
- Chronic maternal vascular disease
- Smoking
- Fetal abnormalities
- Poor maternal weight gain or malnutrition
- Vaginal bleeding during pregnancy
- Low pre-pregnancy weight
- Prior fetal growth restriction
- Prior stillbirth
- Alcohol, cocaine, or heroin use
- Elevated AFP during 2nd trimester screen

Screening
- Fundal height measurement

Signs & Symptoms
- Fundal height consecutively < 2 than expected

Workup
- US to evaluate fetal growth and %ile, with Doppler of umbilical cord to assess blood flow
- Symmetrically small growth may just indicate small baby
- Asymmetrically small growth indicates placental insufficiency (brain will be larger than body)
- NST and biophysical profile
- Fetal karyotyping if polyhydramnios present

Management
- Delivery with maturity or by 37 weeks if evidence of compromise or poor growth

Prognosis
- High infant mortality within first 2 years of life
- Risk of intellectual deficits

5.37 Preeclampsia (Toxemia) & Eclampsia
- Pregnancy-induced HTN with significant proteinuria ±pathologic edema
- Can also have preeclampsia superimposed on chronic HTN

Risk Factors
- Multiple gestation
- Obesity
- Chromosomal or congenital fetal anomalies
• Pregestational DM
• First pregnancy
• Age < 20 or > 40

Screening
• Urine dip for symptomatic women

Signs & Symptoms
• Lies on a spectrum from mild & asymptomatic to severe
• Only appears after 20 weeks, with majority of cases after 28 weeks
• Irritability
• Hyperreflexia
• End-organ damage: frontal HA, photophobia and visual changes, epigastric pain, oliguria, nondependent edema
• Eclampsia: all s/s of preeclampsia + seizures due to neurologic irritability
• HELLP syndrome: preeclampsia + signs of hemolysis, elevated liver enzymes, and low platelets

Differential
• Exacerbation of underlying renal disease
• Acute fatty liver of pregnancy
• TTP/HUS
• Exacerbation of lupus

Workup
• 24 hour urine
• CBC
• CMP
• Uric acid
• Coags: PT, aPTT
• NST
• Diagnose with BP > 140/90 + proteinuria > 0.3 g in a 24 hour urine specimen

Management
• Deliver if severe preeclampsia or eclampsia
• Expectant management with frequent monitoring with delivery at 37 weeks if mild
• Seizure prophylaxis with mag sulfate if severe
• Labetalol or hydralazine only for BPs > 150/100 to reduce risk of stroke
6 MUSCULOSKELETAL

6.1 Osteoporosis

Causes
- Meds: steroids, anticoagulants, anticonvulsants, aromatase inhibitors, cyclosporine, tacrolimus, GnRH agonists, barbiturates, Li, Depo, chemo, TPN

Risk Factors
- Advancing age
- Prior fx or parental h/o hip fx
- Steroid therapy
- Low body weight
- Current cigarette smoking
- Excessive alcohol consumption
- Rheumatoid arthritis
- Premature menopause
- Malabsorption
- Chronic liver disease
- IBD

Prevention
- 1200 mg Ca daily (diet + supplements)
- Vitamin D (800-1000 IU daily)
- Exercise
- Smoking cessation
- Avoidance of heavy alcohol use

Screening
- Screen women > 65 with DEXA
- Screen men with DEXA only with clinical manifestations of low bone mass: radiographic osteopenia, h/o low trauma fx, loss of > 1.5 in height, long-term steroids, prostate cancer treatment, hypogonadism, hyperthyroidism, etc.

Signs & Symptoms
- Low trauma fracture
- Decreasing height

Workup
- DEXA: diagnostic if BMD is < 2.5
- SD below the young normal mean at the hip or spine
- If premenopausal, also need to check CMP, CBC, Ca, P, vit D, TSH, 24 hour urine for Ca and Cr

Management
- Meds recommended for both osteopenia and osteoporosis treatment
- Bisphosphonates inhibit bone resorption and are 1st line treatment: alendronate, ibandronate, etc.
- Calcitonin nasal spray
- Estrogens like raloxifene
- Estrogen agonists
- PTH for severe cases
- Recheck osteopenic pts in 2 years (T-score 2.00 to -2.49), low bone mass pts in 3-5 years (T-score 1.50 to -1.99), and normal density pts in 10 years
- OCPs for premenopausal women taking steroids who become amenorrheic
7 PSYCHIATRY

7.1 Intimate Partner Violence (Domestic Violence)

- Refers to actual or threatened psychological, physical, or sexual harm by a current or former partner or spouse
- May begin or escalate during pregnancy

**Signs & Symptoms**

- Inconsistent explanation of injuries
- Delay in seeking treatment or missed appointments
- Frequent ED visits
- Late prenatal care
- Inappropriate affect
- Overly attentive partners
- Reluctance to be examined
- Somatization

**Management**

- Provider expression of empathy and continued ability to support and assist patient
- Consult domestic violence advocate to explore resources
- Caution with providing written materials that may be seen by perpetrator
- Don’t confront perpetrator
- Restraining orders have inconsistent effectiveness

7.2 Postpartum Depression

- Can occur in women or men
- Mood changes will develop in 40-80% of women postpartum and are normal as long as duration is < 2 weeks

**Risk Factors**

- Formula feeding
- H/o depression
- Cigarette smoking
- Childcare stress or low social support
- Infant colic
- Low SES
- Unplanned pregnancy

**Screening**

- Edinburgh Postnatal Depression Scale

**Signs & Symptoms**

- Sadness and crying episodes
- Fatigue
- Changes in sleeping and eating habits
- Reduced libido
- Irritability
- Feelings of hopelessness and low self-esteem
• Guilt
• Feeling overwhelmed and inadequate in caring for infant
• Inability to be comforted
• Anhedonia and social withdrawal
• Anxiety and panic attacks
• Anger spells

**Workup**
- DSM-IV criteria is depression symptoms > 2 weeks with onset within 4 weeks of childbirth

**Management**
- Attention to infant by other family members or friends
- Support groups or counseling, home visits
- Psychotherapy
- Healthy diet and sleep patterns
- Meds recommended only if support and adequate rest fail to improve symptoms: sertraline or paroxetine

**Prognosis**
- Can last several months to a year if untreated
8 DERMATOLOGY

8.1 Melasma

- Disorder of hyperpigmentation affecting sun-exposed areas of skin

**Causes**

- Pregnancy (occurs in up to 75% of pregnant women)
- OCPs
- Genetics
- Sun exposure
- Cosmetics
- Thyroid dysfunction
- Antiepileptics

**Signs & Symptoms**

- Usually appears on the face
- More pronounced in those with darker complexions

**Workup**

- Diagnosis is clinical

**Management**

- Broad spectrum sun protection
- Hydroquinone 4% cream
9  HEMATOLOGY

9.1  Normocytic Anemia
- Can occur in pregnancy due to hemodilution with increased circulating volume
- Hb can range from 9.5-11.6 depending on trimester

9.1.1  Microcytic Anemia = MCV < 80

Iron Deficiency Anemia

Etiology
- In an adult, this is due to blood loss, likely GI, until proven otherwise

Signs & symptoms
- Fatigue
- Dyspnea on exertion
- Tachycardia
- Cheilosis
- Spoon-shaped nails
- Pica
- Dysphagia due to webbing of the esophagus

Management
- Treat blood loss
- Oral iron with stool softeners, continue 3-6 months post Hb recovery
- Consider parenteral therapy by heme if pt does not tolerate oral therapy or it is not rapid enough
- Recheck CBC in 3-4 weeks and ferritin in 8 weeks

Chronic Inflammation Anemia

Etiology
- Usually from reduced erythropoietin stimulation of bone marrow

Workup
- A disease of exclusion

Management
- Treat only if pt is symptomatic with folate, iron, EPO

Sideroblastic Anemia

Etiology
- Inherited, acquired, or idiopathic heme synthesis from alcohol, lead, myelodysplasia, leukemia, TB, or drugs

Workup
- BM biopsy showing ringed sideroblasts

Management based on cause

9.1.2  Macrocytic Anemia = MCV > 100
Vitamin B 12 Deficiency

Etiology
- Inadequate diet: vegetarians
- Malabsorption
- Drugs

Signs & symptoms
- Abnormal sensation and peripheral neuropathy in stocking-glove pattern
- Glossitis
- Pallor
- Anorexia
- Diarrhea

Folate Deficiency

Etiology
- Inadequate diet: alcoholics
- Dialysis
- Malabsorption
- Impaired metabolism

Signs & symptoms
- Glossitis
- Diarrhea
- Malnourishment
- Cheilosis
- No neuropathies
10 INFECTIOUS DISEASE

10.1 Chlamydia

- Most commonly reported STI in US
- Frequent coinfection with gonorrhea

**Screening**
- Every year for women < 26
- When there is a new sex partner in last 60 days
- With > 2 new sex partners in a year

**Signs & symptoms**
- May be asymptomatic
- Vaginal discharge
- Dysuria
- Cervical friability or ectropion
- Pelvic or lower abdominal pain
- Ectopic pregnancy
- Perihepatitis
- Lymphogranuloma venereum with L serotypes

**Workup**
- Cervical swab with PCR is best
- Urine test for men

**Treatment**
- 1st line is azithromycin or doxycycline
- 2nd line is erythromycin or levofloxacin
- Sexual abstinence for 7 days from initiation of therapy
- Treat for gonorrhea as well

**Prognosis**
- Need retesting 3 months after treatment
- Complications: PID, epididymitis, urethritis, sterility

10.2 Gonorrhea

**Screening**
- Every year for women < 26
- When there is a new sex partner in last 60 days
- With > 2 new sex partners in a year

**Signs & symptoms**
- Vaginal discharge
- Abdominal pain
- Cervicitis
- Most men will be symptomatic with purulent discharge, dysuria, urethritis
- Pharyngitis

**Workup**
- Cervical swab with PCR is best
• Urine test for men
• May need to culture rectum

**Treatment**
• 1st line is ceftriaxone injection
• 2nd line is cephalosporin
• If pharyngitis is present add azithromycin or doxycycline
• Treat for chlamydia as well

**Prognosis**
• Complications: PID, tubo-ovarian abscess, perihepatitis, vertical transmission

### 10.3 Toxoplasmosis

• Agent is parasite Toxoplasma gondii
• Transmission is through ingestion of contaminated meat or produce, vertical, via blood transfusion or organ transplantation, or by handling contaminated animal feces (cats)

**Signs & Symptoms**
• Infections are generally asymptomatic
• Fevers, chills, sweats
• Cervical lymphadenopathy
• Congenital toxoplasmosis: chorioretinitis, intracranial calcifications, seizures, jaundice, HSM, lymphadenopathy, anemia, thrombocytopenia, abnormal CSF, hearing loss, intellectual disability, motor abnormalities, hydrocephalus

**Differential**
• Lymphoma
• Primary HIV
• Mono

**Workup**
• Toxo IgG antibodies will be present in pts previously exposed/immunized, while IgM indicates active infection

**Management**
• Usually not required in adults
• Congenital toxoplasmosis → treat with pyrimethamine + sulfadiazine for 1 year

**Prognosis**
• Infection will persist in latency for lifetime of infected host but can reactive in times of immunosuppression
• Treated infants remain at risk for long-term sequelae

### 10.4 Syphilis

• Treponema pallidum
• Most cases are MSM
• Can be transmitted vertically from mother to fetus

**Signs & symptoms**
• Primary/acute infection lasts 5-6 weeks: contagious chancre, painless rubbervy regional lymphadenopathy, followed by generalized lymphadenopathy
Secondary infection 6 weeks-6 months after exposure (not all pts will develop this): fever, malaise, HA, arthralgias, bilateral papulosquamous rash on the palms and soles, alopecia, denuded tongue, condyloma lata

Tertiary infection occurs in disease > 4 years’ duration: end organ manifestations, CV symptoms, gummas, neurosyphilis

Latent infection has no clinical manifestations but serology will be reactive

Congenital syphilis of infant: stillbirth, prematurity, low birth weight, hydrops fetalis, large or pale placenta, inflamed umbilical cord, fever, HSM, lymphadenopathy, failure to thrive, edema, syphilitic rhinitis, maculopapular rash, condyloma lata, jaundice, anemia, thrombocytopenia, leukopenia or leukocytosis, pneumonia

**Screening**
- Recommended for pregnant women at the first prenatal visit, with repeat at 28 weeks

**Workup**
- Remember that negative tests do not exclude a diagnosis of syphilis
- Darkfield microscopy of chancre sample
- LP for neurosyphilis
- Direct fluorescent antibody testing
- Serology: RPR (has a 3-6 week latency period)
- HIV test recommended as syphilis facilitates this infection

**Management**
- Mandatory reporting within 24 hours
- Penicillin G
- Recheck serologies at 6 and 12 months after treatment to look for fourfold reduction in titer

### 10.5 Human Papilloma Virus

- Small DNA viruses that are sexually or contact transmitted
- Sexually transmitted strains are associated with squamous neoplasia of the anogenital region and oropharynx

**Risk Factors**
- Multiple sex partners
- Young age at first sexual activity
- H/o STDs
- Multiparity
- Immunosuppression
- Uncircumcised male partner

**Prevention**
- HPV vaccines cover most of the sexually transmitted subtypes

**Signs & Symptoms**
- Condyloma acuminata: caused by HPV type 6 and 11, can also be 16 or 18
- Cervical dysplasia and oropharyngeal lesions: usually HPV 16 and 18
- Common cutaneous warts: HPV types 1, 2, 4
- Anal carcinoma in MSM

**Workup**
- Pap cytology
Colposcopy

Management
- Most sexually transmitted HPV infections will self-resolve
- Follow resolution of infection with sequential Paps

10.6 Herpes Simplex

- Over 85% of adults will be + for HSV-1 and 20% will be + for HSV-2 by serology
- Precipitating factors: sunlight, dental surgery, cosmetic surgery, wind, trauma, fever, stress
- Transmission can be through asymptomatic shedding
- First outbreak will be the worst and can last up to 21 days

Signs & symptoms
- Prodrome of burning or neuralgia
- Swollen regional lymph nodes
- Pain with urination

Differential: chancroid, syphilis, pyoderma, trauma

Workup
- Viral culture is gold standard
- Serology is questionable, as not all + cultures will have + serology and vice versa, and many are asymptomatically +

Complications
- Eczema herpeticum: severe infection in the immunocompromised
- Herpetic whitlow: fingernail or hand infection
- Herpes gladiatorum: infection anywhere not covered by underwear
- Pyoderma
- Proctitis, esophagitis
- Keratitis
- Encephalitis

Management
- Acyclovir
- Valacyclovir
- Famciclovir
- Topical corticosteroid for orolabial herpes
- 7-10 days for first outbreak and 3-5 days for subsequent outbreaks
-Suppressive therapy if needed
11 Obstetrics Exam Notes

11.1 Infertility

11.1.1 Background

- **Infertility**: failure to achieve pregnancy within one year of frequent, unprotected intercourse
- describes 10-15% of couples in the US
- **Causes**
- most cases are due to male factors, ovarian dysfunction, and tubal factors
  - men:
    - 1° hypogonadism: androgen insensitivity, congenital testicular disorder, cryptorchidism, meds (alkylating agents, antiandrogens, cimetidine, ketoconazole, spironolactone), orchitis, radiation, systemic disorder, testicular trauma, varicocele, Y chromosome defect
    - altered sperm transport: absent vas deferens or epididymis or obstruction, ED, retrograde ejaculation
    - 2° hypogonadism: androgen excess, congenital idiopathic hypogonadism, estrogen excess, infiltrative disorder, meds, multiorgan genetic disorder, pituitary adenoma, trauma
- a smaller amount of cases are due to endometriosis, uterine or cervical factors, or other causes
- 26% of cases are unexplained
- Counseling is usually not initiated until after a year of trying has gone by unless there is previous PID, amenorrhea, female is over 35, or there are other suggestions of infertility
- Overall likelihood of successful treatment for infertility is 50%

11.1.2 Infertility H&P

- Partners should be evaluated together and separately to promote divulgence of information
- **History**:
  - frequency and timing of intercourse
  - use of lubricants or other fertility impairers
  - fertility history
- **meds**
  - STI exposure
  - recent high fever
  - substance use
    - marijuana and cocaine in men
    - caffeine use in women
- **toxin exposure**
- **surgical history**
- **PE**:
  - men: genital infection, hernia, presence of vas deferens, signs of androgen deficiency, testicular mass, varicocele
  - women: breast formation, galactorrhea, genitalia, signs of hyperandrogenism

11.1.3 Infertility Investigation

- Both partners:
  - labs: CBC for suspected infection, kidney and liver panels
  - GC/chlamydia
  - UA
- Men: post-ejaculatory urinalysis for suspected retrograde ejaculation, scrotal US, FSH and testosterone levels, sperm studies, transrectal US
- Women: FSH, prolactin, TSH levels, antral follicular count via US, hysterosalpingography, pelvic US, hysteroscopy, laparoscopy

### 11.1.4 Infertility Treatment Options

- Treat underlying problem
- men:
  - hyperprolactinemia, bromocriptine
  - treat erectile dysfunction
  - varicocele repair
  - referral to fertility specialist for semen abnormalities
- women:
  - ovulatory dysfunction treatment
  - ovulation inducing medications
  - hormone injections
  - tubal reparative surgery
  - laparoscopic ablation of endometriosis
  - oocyte donation consultation
- Fertility monitoring: timed intercourse with fertility monitoring will result in pregnancy in 90% of couples
  - basal body temperature charting
  - use of fertility monitors
  - monitoring vaginal mucous
  - Ideal coital frequency: lots of sex during five days preceding ovulation and on day of anticipated ovulation ("fertility window")
- Avoidance behaviors:
  - no lubricants (unless fertility-specific like Proseed or baby oil) or douching
  - avoid alcohol and tobacco and street drugs
  - women should limit caffeine intake
- Stop any fertility-impairing meds
- Emotional support and counseling
- Referral to fertility specialist for IVF, intrauterine insemination, or ovulation induction

### 11.2 Pregnancy Genetics Counseling

#### 11.2.1 Background

- There is a 3-4% risk for birth defects with each pregnancy, most of which are not detected prenatally
- Genetics counselors are midlevel providers that serve as a liaison during pregnancy
- obtain pregnancy history
  - FH
  - risk assessment
  - review risks, benefits, and limitations of available prenatal diagnostic options
  - provide information and support to patient throughout decision-making, testing, and result process
- Why get prenatal testing:
  - some people just want to know
  - previous affected child
  - delivery and postnatal care planning
    - neural tube defects
    - may need to deliver in a tertiary care facility
  - deciding whether to give up affected child for special needs adoption
  - aiding decision to terminate pregnancy
- anticipatory grief
- decision for future reproduction
- Sequence of prenatal diagnosis:
  1.) clinical screening: history, PE, biochemical tests, US
  2.) referral interview and release of MR
  3.) discussion of risks, benefits, and limitations of available testing with genetic counselor
  4.) initial US screen
  5.) invasive testing: chorionic villi sampling, amniocentesis, percutaneous umbilical blood sample
  6.) evaluation of results and perinatal planning

11.2.2 Common Reasons for Referral to Genetics Counselor

- Increased maternal age (over 35 on day of delivery)
  - because at age 35 the risk of having a child with chromosomal abnormality = risk of inducing miscarriage from diagnostic test
  - defined differently in other countries or with multiples
- Abnormal screening results
- Family history of genetic disorder: cystic fibrosis, sickle cell, Ehler-Danlos, club foot, cleft lip, neural tube defect
- Multiple pregnancy losses (3+ losses)
- Exposure to teratogens
  - check on Reprotox (Micromedex) vs using manufacturer inserts that always overestimate risk
    - also don’t use PDR
  - alcohol exposure
  - valproate or Accutane use
  - exposure to excessive heat or hypoxia
  - recreational drug use while pregnant
- Maternal conditions that increase risk for birth defects
  - insulin-dependent diabetes have higher risk of neural tube defects and macrosomia
  - others: lupus, seizure disorders

![Critical Periods for Birth Defects in Human Development](image-url)
- Consanguinity
  - common in certain cultures
  - more likely to have offspring with autosomal recessive disorders
- Ethnicity
  - Mediterranean and black ethnicity: high risk of hemoglobinopathies, G6PD
  - French Canadian: cystic fibrosis, tyrosinemia
  - Ashkenazi Jews: cystic fibrosis, Bloom syndrome, Canavan, Tay-Sachs, Fanconi anemia type C, familial dysautonomia, Neimann-Pick

11.2.3 Preimplantation Genetic Diagnosis
- testing unimplanted embryos or collected oocytes for genetic disorders
- Requires a reproductive endocrinology center
- Most commonly used for single gene diagnosis
- Benefits: reduces selective termination of affected fetuses, gives patients more control
- Limitations: costly, time and labor intensive, centers are limited, patient may not get pregnant, needs to be used in conjunction with chorionic villi sampling or amniocentesis for confirmatory diagnosis

11.2.4 Preconception Counseling & Approach to the Obstetric Patient

Background
- Birth rates declining for all women 15-39
- Teen birth rates declining
- Some pregnancy complications are increasing
- C-section rates are at an all-time high
- Preterm birth rates declining
- Twin and triplet rates are increasing
- Low birth weights holding steady

Preconception Planning Visit
- Don’t make assumptions!
- ask any visitors accompanying the patient what their relationship is to the patient
- know your own biases, if you can’t provide proper care, refer to someone who can
- Counseling for healthy pregnancy:
  - teens:
    - have increased risk of STIs and may need for counseling
    - may need more nutritional or emotional support
  - women > 35 (or paternal age > 55) have increased risk for chromosomal abnormalities
  - prescriptions: avoid pregnancy D or X
    - includes ACEI, ARBs, androgens, testosterone, anticonvulsants, chemotherapeutic agents, DES, statins, isotretinoin, iodine, Li, methotrexate, streptomycin, kanamycin, tetracycline, doxycycline, thalidomide, leflunomide, warfarin, misoprostol, raloxifene
  - recreational drugs, tobacco, and alcohol
    - cocaine causes the most issues with fetal development
  - folic acid: start 4 weeks prior to conception and continue through 3rd month of pregnancy
    - high dose for women having previous child with neural tube defect
  - prenatal vitamins improve fetal outcomes
- Serology for infectious disease
  - Hep B: vaccinate if susceptible
  - HIV: treat to lower viral load and decrease vertical transmission
  - syphilis
  - rubella: contraindications to vaccination during pregnancy, so vaccinate before to avoid congenital rubella syndrome
  - varicella: vaccinate if susceptible
• toxoplasmosis: if serology is negative (therefore no antibodies to protect fetus), need to avoid raw meat and handling cat poop
• Management of chronic disease
• HTN diabetes: needs to be controlled to prevent macrosomia (big baby, > 90th percentile for gestational age)
  o treat to HbA1c within 1% of normal
• hypothyroid: treat to euthyroid as much as possible
• epilepsy: titrate to lowest effective dose and least number of drugs
• Determine if pregnancy is low or high-risk
  • high-risk: multiples, pre-existing HTN

11.2.5 Perinatal Mortality
• rate of stillbirths and neonatal deaths per 1000 total births
• Early neonatal death = first 1-7 days after birth
• Late neonatal death = 8-28 days after birth
• Infant death = birth through first year
• Causes:
  • premature birth: 75% are spontaneous and 25% are medically induced or C-section
    o infection
    o bleeding
    o overdistension of the uterus: fibroids, multiples
• congenital malformations
• growth problems
• multiple pregnancy
• maternal low SES
• lack of prenatal care
• teen pregnancy
• pregnancy in women > 40
• Prevention:
  • prevent preterm labor: β-mimetics, short-term tocolytics
  • smoking cessation: smoking is associated with low birth weight, preterm birth, and perinatal death
  • cessation of alcohol and other drugs
  • infection control
  • diabetes control
  • adequate prenatal care: aid patient in finding transportation assistance to visits, finding social worker

11.2.6 Maternal Mortality:
• deaths of mothers resulting from the reproductive process per 100,000 total births
• Direct if a result from an obstetric complication, treatment, or intervention during pregnancy, delivery, or the puerperium
• Indirect if due to a previously existing condition or disease that developed during pregnancy and was aggravated by physiologic adaptation to pregnancy
• Causes of maternal mortality: hemorrhage, infection, eclampsia-induced HTN, unsafe abortion, ectopic pregnancy, pulmonary embolism
• Risk factors: age under 20 or over 30, no prenatal care, low education, unmarried, nonwhite ethnicity
• Prevention:
  • pre-eclampsia: magnesium sulfate
  • severe bleeding: uterogenic agents
  • anemia: iron supplementation
  • obstructed labor
  • infection control: BV, Listeria, STIs, or chorioamnionitis: treat to prevent transmission to fetus
11.3 Normal Pregnancy

11.3.1 Maternal Physiology in Pregnancy

- Total body water increases by ~2L: fetus, placenta, amniotic fluid, increased maternal blood volume, expanded adipose tissue
  - contributes to maternal weight gain and increased blood volume
- Cardiovascular changes:
  - heart is displaced to the left and upward
  - ↑vol ↑EDV L ventricular hypertrophy ↓cardiac output
  - progesterone secretion cause relaxation of vessels ↓SVR slightly ↓MAP
  - hemodilution ↓oncotic pressure
  - mimics of heart disease:
    - dyspnea is a common complaint prior to 20 weeks
      - considered to be benign as long as it occurs early and does not worsen
    - normal: decreased exercise tolerance, fatigue, occasional orthopnea, chest discomfort, edema
    - abnormal: syncope, chest pain with exertion, progressive orthopnea, hemoptyis
- Respiratory changes:
  - nasopharyngeal hyperemia and edema
  - lots of mucous from estrogen effects
  - often mistaken for a cold or allergies!
- Lung changes:
  - elevation of diaphragm ↓lung vol by 5%
  - max inspiratory volume increases by 5-10%
  - hyperventilation due to progesterone effects ↓PaCO2 ↑kidney compensation by excreting bicarb in order to raise acid levels back up = chronic respiratory alkalosis
    - decreased maternal PaCO2 serves to facilitate removal of fetal CO2
- Hematologic changes:
  - normal hemodilution in pregnancy from increased circulating volume physiologic anemia increased iron demand to 3.5 mg/day
    - supplement with 30 mg of elemental iron or 325 mg of ferrous sulfate in order to maintain normal iron levels
  - decreased platelets due to increased destruction
  - WBCs normally increase to 5600-12,000
    - may be due to estrogen and cortisol effect
    - can spike to 20-30k during labor
  - increased clotting factors and decreased clotting inhibitors hypercoagulable state
    - evolutionarily helps to prevent hemorrhage during delivery
- Urinary tract changes:
  - kidneys enlarge due to increased vasculature and interstitial volume
  - dilation of ureters due to progesterone relaxation effect
- right side more than left can have flank pain on right side that can be confused for pyelonephritis or kidney stone
- causes stasis of urine increased susceptibility to UTIs
- enlarging uterus pushes on bladder decreased capacity urinary frequency and incontinence
- renal plasma flow increases ↓Cr, BUN, and uric acid
- increased renal secretion of glucose, amino acids, calcium, and bicarb
  - no increase in protein secretion

- GI changes:
  - increased appetite by ~200 kcal/day
  - stomach and intestinal tone and motility decreases due to progesterone effect increase in GERD, constipation
  - appendix moved aside
  - increased portal venous pressures hemorrhoids
  - nausea and vomiting
    - onset in 4-8 weeks with improvement by 14-16 weeks
    - treatment: avoidance of trigger foods, frequent small meals, wristband acupressure, ginger, vitamin B6 + doxylamine
    - extreme form hyperemesis gravidarum: associated with weight loss, ketonuria, dehydration, and electrolyte imbalance
      - this is because an hCG component is very similar to TSH, so you need to check for hyperthyroidism
      - also need to rule out pancreatitis, cholecystitis, hepatitis, thyroid disease, and molar pregnancy
      - treatment requires hospitalization with tube feeding if needed
  - increased peripheral resistance to insulin due primarily to human placental lactogen (hPL) hyperglycemia and hyperinsulinemia
    - greatest in 3rd trimester
- Plasma lipids and lipoproteins increase 50-60% increase in total cholesterol and LDL
- Skin & hair changes:
  - hyperpigmentation due to progesterone abdominal linea alba becomes linea nigra, pigmentation of nevi, freckles, and recent scars
  - placental androgen production and increased cortisol mild hirsutism
  - striae
- Weight gain:
  - underweight women should gain 28-40 lbs
  - normal weight women should gain 25-35 lbs
    - or 35-45 lbs if twins
  - overweight women should gain 15-25 lbs
  - obese women should gain 11-20 lbs

11.3.2 Fetal Blood
- Maternal umbilical vein delivers oxygen, nutrients, and hormones to the baby
- Maternal umbilical arteries remove waste and carbon dioxide
- 50% higher concentration of Hb than maternal blood can carry 20-20% more oxygen than maternal blood
- Fetal heart circulation:
  - blood carried in from placenta via umbilical vein liver half the blood bypasses liver via ductus venosus into the IVC right atrium
    - ductus venosus closes after birth to become the ligamentum venosum
  - blood in right atrium:
    - can bypass right ventricle and enter left atrium via foramen ovale shunt to delivery oxygen to brain and upper body of fetus
      - foramen ovale seals shut at birth to become the fossa ovalis
or can enter right ventricle □ pulmonary artery

- bypasses lungs via ductus arteriosus to empty instead into aortic arch and bring oxygenated blood to other parts of the fetus
  - ductus arteriosus is kept open by prostaglandins, so this is why we don’t want women taking NSAIDs during pregnancy
  - closes after birth to become the **ligamentum arteriosum**

11.4 First Prenatal Visit & Ongoing Care

11.4.1 Models of Prenatal Care

A.) **Traditional pregnancy model:** one-on-one clinical care provided to a woman during pregnancy by a clinical care provider with medical assessment and treatment is the main goal.

B.) **Centering pregnancy model:** a multifaceted model of group care that integrates health assessment, education, and support, into a unified program within a group setting

- 8-12 women with similar gestational ages meet together, learning care skills, participating in a facilitated discussion, and developing a support network with other group members
- each group meets for a total of 10 sessions throughout pregnancy and early postpartum
- the practitioner, within the group space, completes standard physical health assessments.
- costs same amount of money as traditional model but provides better outcomes

11.4.2 History

- Walking into a labor or initial meeting with a pregnant woman:
  - don’t make assumptions about who is in the room with them
  - never assume a woman is happy about being pregnant
  - introduce yourself, and ask if woman was planning on being pregnant
    - if yes □ congratulations
    - if no □ ask if they are happy
  - Goal is to identify women at increased risk for maternal medical complications, pregnancy complications, or fetal abnormalities
  - ideally would want to do this at the preconception visit, but this usually happens after a woman is already pregnant
  - OB nomenclature:
    - **gravida** = running total # of pregnancies
    - **para _ _ _ _**
      - first is full-term deliveries (including full-term stillbirths)
      - second is preterm deliveries (including preterm stillbirths after age of viability)
      - third is miscarriages, ectopic pregnancies, and terminations (including stillbirths before age of viability)
      - fourth is the number of total live births
  - History elements:
    - demographic information
    - past OB history: date of delivery, infant gestational age at delivery, location of delivery, sex of child, birth weight, mode of delivery, type of anesthesia, length of labor, outcome and complications
    - personal and FH
    - past surgical history
• genetic history
• menstrual and gynecologic history
  o last normal menstrual period: needed for accurate gestational age estimation
  o previous menstrual period
  o usual cycle length
  o recent use of hormonal contraception
  o history of IUD use
  o current pregnancy history
• psychosocial information
  o screen for domestic violence, which is likely to become worse during pregnancy if it is already existing
  o discuss whether the pregnancy was planned or unintended
  o discuss potential barriers to care: communication, transportation, child care, work schedules, economic constraints
  o does the patient have stable housing
  o mental health and stress level of the patient
• meds, alcohol, smoking, recreational drug use, exposure to radiation or toxins
  o counseling on meds safe for pregnancy: acetaminophen, Benadryl, Claritin, Zyrtec, sudafed (HTN caution), Metamucil, kaopectate
  o avoid NSAIDs, fluoroquinolones
• diet information
• pregnancy ROS: vaginal bleeding, infections, nausea, vomiting, weight loss
• Generation of problem list

11.4.3 Pregnancy Physical Exam

• Early visits:
  • vitals
    • fetal heart tones: heard at 9-12 weeks using Doppler
    • general appearance: obesity or depression?
    • head and neck: thyroid and dental condition (risk of infection)
    • heart: most pregnant women have a murmur
    • lungs
    • breast: nodules, tenderness, nipple characteristics to evaluate for future breastfeeding
    • fundal height and uterine size
    • skin
  • Later pregnancy visits (2nd half of pregnancy):
    • major goals are to detect preeclampsia and fetal malpresentation
    • vitals & auscultation of fetal heart tones
    • measurement of uterine fundus to assess fetal growth
      o fundus growth less than expected can be a sign of fetal growth restriction
    • uterine/pelvic:
      o Leopold maneuver: palpation and pressure at specific places on the abdomen to determine fetal position in uterus
      o uterine size and shape
      o pelvic shape
11.4.4 Tests Done at First Prenatal Visit

1.) Pregnancy testing:
   - options: qualitative hCG (urine), serum quantitative hCG (more sensitive)
   - presence of β-hCG in urine or serum
     - normal pregnancies double levels every 2 days during the 1st trimester
     - low levels in ectopic pregnancies, spontaneous abortion, failed pregnancy
     - high levels in gestational trophoblastic disease
     - 4 groups of hCG configurations: dimeric hCG, free α-hCG, free β-hCG, nicked hCG, and β-hCG core
       - urine and serum essays mostly check for β-hCG core
         - will be detectable in urine 12-15 days after fertilization
         - will be detectable in blood 6-8 days after fertilization
         - rapid tests can detect levels as low as 25-30 mIU/mL
           - false + with levels of 5-25 mIU/mL
           - equivocal results should have repeat testing in 2 days

2.) ABO/Rh and antibody screen
   - need to know blood type in case of hemorrhage
   - no action needed if mom is Rh +
   - if mom is Rh negative:
     - recheck Rh @ 28 weeks
     - give RhoGam at delivery or after a bleeding event

3.) CBC, H/H, and MCV: to look for anemia, platelets, and screen for occult infection
   - Hb electrophoresis if there is a risk for hemoglobinopathies and status is not known
     - Hb S & C associated with tropical Africa, Mediterranean area, Saudi Arabia, Caribbean
4.) Urine culture: to look for asymptomatic bacteriuria as pregnant women are more likely to develop ascending UTIs
   - sensitivity if +
   - may need routine testing during every month of pregnancy if there is a structural urinary abnormality, h/o recurrent UTIs, sickle cell anemia, or > 2 UTIs during pregnancy
   - repeat culture after completion of antibiotics to prove cure
5.) Syphilis testing
   - RPR at first prenatal visit and again early in 3rd trimester or at delivery (or with exposure)
     - any + need confirmatory testing and possibly US surveillance of fetus
6.) HIV testing
   - required to offer to all pregnant patients in NC
   - repeat in third trimester if STI risk factors, exposure to HIV, area of high HIV prevalence, or prior decline for testing
7.) Hepatitis B: test for with Hep B surface Ag
   - repeat again during pregnancy if exposure to Hep B
   - if positive, evaluate for infection with further serological tests
     - fetal surveillance
     - neonate is given Ig
     - reporting to health department
8.) Rubella titer
   - if non-immune or equivocal, vaccinate for rubella after delivery and inform if there are rubella outbreaks
9.) Varicella titer
   - if non-immune, need additional surveillance during pregnancy
     - need to give varicella Ig for passive immunization if exposed
   - give vaccination postpartum
10.) Gonorrhea & Chlamydia
   - repeat at 36 weeks or sooner if risk of exposure
   - cervical, vaginal, or urine sample
   - treat if +, with test of cure one month later
11.) Urine protein & glucose
   - traditionally tested at first prenatal visit and at each routine prenatal visit thereafter
   - urine test now falling out of favor, many now use BP, clinical exam, and risk factors to evaluate for preeclampsia
   - if > 2+ protein:
     - confirm: get cath specimen to avoid vaginal mucus, do 24 hour urine protein, do spot urine protein:creatinine, or do urine microscopy with culture
     - evaluate for preeclampsia: BP, edema, RUQ pain, visual symptoms, headache
       - get labs for thrombocytopenia, uric acid elevation, ALT
12.) Cervical cancer screening
   - only needed if due or overdue for pap
   - modification during pregnancy is to use a broom brush instead of cytobrush in order to reduce bleeding
   - if testing is + during pregnancy, try to delay colposcopy, biopsy, or excisional procedures until postpartum
     - ASCUS that is HPV+ or LSIL can have colposcopy postpartum
     - HSIL or greater should have colposcopy during pregnancy
13.) Toxoplasmosis serology
14.) US if needed for dating
   • transvaginal US: detects fetal cardiac motion by 5-6 weeks

11.4.5 Optional Early Prenatal Tests

1.) Tuberculin skin test
   • done only if there is high risk of exposure or infection with no known h/o TB or positive skin test
     ○ if woman has been positive in the past, need to review MR and make sure treatment was adequate
     ○ if positive, get a CXR
       ▪ if CXR is + or woman has symptoms □ sputum culture and immediate treatment
       ▪ if CXR is neg and woman is asymptomatic □ treat for latent TB after delivery

2.) Thyroid testing
   • controversial during pregnancy, usually only done for evidence of hyperemesis gravidarum or if there is existing thyroid disease or strong FH
   • no evidence that failing to diagnose women with subclinical hypothyroidism is dangerous to the pregnancy

3.) Other tests, indicated based on history:
   • cystic fibrosis carrier status
   • Tay-Sachs carrier status
   • fragile X
   • toxoplasmosis
   • hep C
   • drug screen
   • malaria
   • HSV

11.4.6 Dating the Pregnancy

• Last normal menstrual period:
  • expected date of delivery (EDD): calculated as 40 weeks from LMP (or add 7 days and subtract 3 months)
    □ aka expected date of confinement (EDC)
  • Blood or urine hCG test to correlate levels
  • US estimation of EDD if needed
  • when menses are irregular, if LMP is unknown, patients conceiving while taking OCPs, uterine fibroids or malposition causes discrepancy in size, or in multiples
  • better tech = better estimate
  • use ultrasound landmarks to estimate gestational age
    □ transabdominal US has no landmarks visible until 6-7 weeks
    □ transvaginal US can detect gestational sac alone at < 5 weeks, if yolk sac is also present it is 6-7 weeks
  • Fetoscope: fetal heart tones are heard at exactly 20? weeks

11.4.7 Tests Done at Subsequent Prenatal Visits

1.) Gestational diabetes screening
   • if low risk: screen @ 26-28 weeks
   • if high risk: screen @ 12 weeks (or before 24 weeks), and repeat at 28 weeks if negative
   • h/o complicated deliveries, obesity, h/o gestational diabetes, prior macrosomic infant
     □ initial screen is the 1-hour glucose tolerance test
   • if positive (≥ 140), follow up with diagnostic 3-hour glucose tolerance test
   • can use jelly beans if mother is too nauseous to tolerate the Glucola

2.) Group B strep colonization
• vaginal + rectal specimens needed
• screen at 35-37 weeks or earlier with symptoms of preterm labor
  o done towards end of pregnancy as women tend to fluctuate between + and negative test results
• if +, need antibiotic prophylaxis to prevent transmission to neonate
  o penicillin or clindamycin
• not needed for women with group B strep bacteriuria earlier in pregnancy or women with previous infant with invasive group B strep disease, as these will be treated no matter what the result of the screen

3.) First trimester screening:
• advantages: early risk assessment means patients can opt for earlier prenatal diagnostic procedures, may reduce number of invasive procedures (like amniocentesis), may identify severe anomalies leading to highrisk pregnancy, provides opportunity to estimate gestational age
• limitations: accuracy is dependent on skill of sonographer, not all women enter prenatal care in time for screening, results of screen may arrive too late for available diagnostic testing, cost, can’t detect most neural tube defects or ventral wall defects
• available tests:
  o nuchal translucency screening: US measurement of translucent area behind the fetal neck that is designed to identify 70-90% of fetuses at-risk for trisomies 13, 18, and 21
    ▪ theory: lymphatic and vascular systems run parallel together, and most fetuses with
    ▪ chromosomal abnormalities have heart defects, so one of these systems puts pressures on the other [increased fluid accumulation and increased area of nuchal translucency]
    ▪ nuchal translucency > 3 mm associated with 60% risk of aneuploidy, as well as CHD, skeletal abnormalities, and diaphragmatic hernia
    ▪ measurements obtained between 10-13 weeks gestation
    ▪ combined with other information to increase prognostic value of screen:
      • pregnancy associated plasma protein A (PAPP-A):
      • hCG levels
      • demographic information
  o chorionic villus sampling: biopsy of placental projections transvaginally or transabdominally
    ▪ detects aneuploidy and single gene conditions
    ▪ can’t evaluate fetal anatomy
    ▪ risk of bleeding, loss of amniotic fluid, ruptured membranes, cramping that could lead to labor, miscarriage (1/100), risk of limb anomalies if done before 10 weeks, risk of confined placental mosaicism
    ▪ not any riskier than amniocentesis, contrary to popular belief
    ▪ performed between 10-12 weeks

4.) Second trimester screening:
• maternal serum screening (aka AFP, triple screen, quad screen): blood test for AFP (produced in fetal liver and GI tract), hCG (produced by the placenta), uE3 (produced by fetal adrenals and placenta), dimeric inhibin A (produced by placenta)
  o also takes into account patient demographics: age, weight, gestational age, insulin-dependent DM status, race, h/o neural tube defects, US abnormality
  o detects open neural tube defects and certain aneuploidies
  o advantages: can identify renal agenesis, GI obstruction, ventral wall defects, identifies incorrectly dated pregnancies, can alter pregnancy management and improve fetal outcome for fetuses with neural tube defects, allows patient to consider pregnancy management options
  o disadvantages: can’t rule out all aneuploidies, can’t eliminate risk for Down syndrome, trisomy 18, or neural tube defects, increases maternal or paternal anxiety
    ▪ not diagnostic = + means there is an increased risk that warrants further testing via amniocentesis, neg means there is no increased risk
patients can be confused by this terminology
  - done at 16-18 weeks if desired

- non-invasive aneuploidy screening: fetal cells cross placenta and can be extracted from maternal serum to produce fetal DNA (aka circulating cell-free nucleic acid DNA or ccff-DNA), which can be tested for chromosomal abnormalities
  - what is screened depends on the company
  - some test for trisomy 21, 13, or 18

- positive results require amniocentesis for confirmation
  1. screening ultrasound:
     - initial screen around 16-20 weeks to examine fetal anatomy and determine need for further prenatal diagnostic procedures, growth of fetus, fetal wellbeing
     - can identify ~half babies with Down syndrome, ~1/3 of babies with other chromosome conditions, and malformations:
       - hydrocephaly
       - cystic hygroma
       - cardiac defects
       - kidney and bladder malformations
       - meningomyelocele
       - two-vessel umbilical cord
       - cleft lip
       - hydrops: abnormal fluid collections
         - risk of CV malformations or pressure, fetal death
         - omphalocele: strong association with aneuploidy
         - gastroschisis: less association with aneuploidy
         - club foot: associated with trisomy 13
         - echogenic bowel: can be associated with Down syndrome or cystic fibrosis
         - hypoplastic 5th digit: underdeveloped pinkie finger that some associate with Down syndrome
         - but frequently occurs in genetically normal humans so this is not a good sign to look for
       - no procedure-related risk
       - limitations: can’t detect or rule out all chromosome conditions or birth defects, maternal habitus and fetal position can affect quality of scan

- amniocentesis: needle used to aspirate amniotic fluid
  - detects aneuploidy, > 98% of open neural tube defects, single gene conditions, Rh incompatibility, and lung maturity
  - can be used to evaluate fetal anatomy
  - may be performed weeks 15 through term
  - women may feel some cramping during procedure
  - results in 5-10 days
  - risks: 1/200 risk of causing miscarriage, maternal Rh sensitization

- Percutaneous umbilical blood sampling: US-guided aspiration of fetal blood via the umbilical cord
  - currently used to evaluate fetuses at risk for thrombocytopenia
  - 1/100 risk of causing miscarriage
  - performed after 16 weeks

5.) Additional ultrasound
- done before time of usual screening US if:
  - if fetal heart tones are not heard by 12 weeks
  - to confirm gestational age if LMP is uncertain or uterine assessment is not consistent with LMP
  - risk factors for congenital abnormalities by history or abnormal maternal serum screen exist
  - chronic maternal disease
- done after 20 weeks if fetal movement is not felt
other indications: evaluation of bleeding or suspected placental abruption, f/u placenta previa, multiple gestation, guiding chorionic villi sampling or amniocentesis, evaluation of size-date discrepancy, confirmation of fetal position

6.) Repeat urine protein and glucose
7.) Rh recheck at 28 weeks for moms previously negative
8.) Hb recheck at 26-28 weeks and again at 35-37 weeks
9.) RPR recheck at 26-28 weeks
10.) HIV recheck at 26-28 weeks
11.) Gonorrhea & Chlamydia recheck at 35-37 weeks

11.4.8 Prenatal Counseling

• Occurs throughout prenatal visits
• Encourage healthy habits:
  • smoking is the single most important preventable cause of poor birth outcome
    o causes vasoconstriction in the placenta → infant does not grow as large
    o most effective counseling is 5-15 minutes, going through steps:
      ▪ ask: do you want to quit smoking
        • no → advise to stop smoking, counsel on risks and available services, then stop pushing the issue
        • yes → counsel on available services, set stop date
          o many smoking cessation meds are not studied for use during pregnancy, so this mostly involves behavioral modification
  • exercise during pregnancy: encourage as it decreases risks during pregnancy and shortens labor duration
    o do what you were doing before pregnancy
  • Anticipatory guidance on normal physiological changes in pregnancy:
    o morning sickness from maternal hormones (early) or size of fetus (late)
      ▪ reassure that women who have morning sickness typically have very healthy babies because they have lots of hormones
      ▪ don’t let your stomach get empty, eat right away in the morning
      ▪ prescription meds safe for pregnancy: ondansetron, prochlorperazine, promethazine, metoclopramide, corticosteroids
      ▪ OTC: unisom + B6, ginger, Emetrol, Bonine, Dramamine, Benadryl
  • breast tenderness
  • fatigue
  • GERD from hormones or size of fetus
    o safe for pregnancy: calcium antacids, Mg or Al antacids, H2 receptor agonists, most PPIs
  • varicose veins
  • vulvar veins
  • edema
  • flank pain ~ 20 weeks due to spasms of the round ligament
    o can wear pregnancy support belt to reduce symptoms
  • constipation:
    o safe for pregnancy: Metamucil, stool softeners, Miralax, mag citrate, bisacodyl, senna
  • insomnia: usually due to discomfort
  • carpal tunnel from the edema
  • “sick of being pregnant syndrome”
    o low back pain, general crankiness
  • Braxton-Hicks contractions: false contractions that are not painful, should be < 6 per hour
    o some women never have them
    o need to differentiate from preterm labor, which starts in your back and wraps around, is painful
- Counseling on warning signs: bleeding, decreased fetal movement, preterm labor, preeclampsia, labor
- discussed at different points during prenatal care visits
- decreased fetal movement: lie down on left side, drink something, and wait for fetal movement
- preterm labor: discuss at time of viability (22-24 weeks)
  - warning signs of tightening in uterus, change in fluid coming from vagina, pain or pressure in lower belly/thighs, pain in low back, cramps with diarrhea, broken water
- preeclampsia: occurs after 20 weeks

- Preparation for siblings:
  - no matter how prepared parents try to be their children will have negative feelings about a new baby
  - can try to ameliorate by giving child a baby doll to take care of, making a family book, giving them special duties as a big brother or sister

- Labor preparation
  - come up with birth plan at 34-36 weeks
  - most women end up at the hospital for delivery
  - Lamaze healthy birth practices: let labor begin on its own, walk or move around during labor, bring a loved one, friend, or doula for continuous labor support, avoid interventions that are not medically necessary, avoid giving birth on your back (promotes perineal tearing) and follow your body’s urges to push, keep mother and baby together
    - hard to do with an epidural
  - encourage exploration of other delivery techniques: Bradley method, hypnobreathing

- Educate about postpartum depression
  - incidence is 10-26%
  - highly linked to maternal fatigue
  - mild is totally normal, a kind of mourning
  - abnormal is when a woman can’t get out of bed or take care of herself or her baby
  - can progress to postpartum psychosis, although very rare
  - can take SSRI, usually Zoloft

11.4.9 How to Schedule Follow-Up Visits

- Limited data for optimal number and frequency of prenatal visits
- no evidence that frequent visits improve outcomes for low risk pregnancies
- more frequent visits may be helpful in monitoring women with diabetes, HTN, threatened preterm birth, postterm pregnancies, and complicated pregnancies

- Typical timeframe for uncomplicated pregnancies:
  - every 4-5 weeks until 28 weeks gestation
  - every 2-3 weeks for 28-36 weeks
  - weekly thereafter until delivery

11.5 Early and Mid-Trimester Complications

11.5.1 Spontaneous Abortion

- a pregnancy that ends spontaneously before the fetus has reached a viable gestational age (before 20-22 weeks)
- Background:
  - the most common complication of early pregnancy
    - 80% occur in the first trimester
    - very low risk after first trimester
  - occurs in up to half of all pregnancies, but only half of these are diagnosed
- causes:
  - half may be due to chromosomal abnormalities
    - especially trisomy 16
risk factors: maternal age, paternal age, increasing parity, smoking, cocaine, caffeine, high BMI, submucosal fibroids, uterine abnormality, Asherman’s syndrome, DM, thyroid disease, PCOS, h/o spontaneous abortion

Presentation:
- amenorrhea or vaginal bleeding
- abdominal pain or cramping

Investigation:
- differential: physiologic bleeding from implantation, ectopic pregnancy, cervical polyp, cervical infection or neoplasia, recent intercourse (cervix is more friable during pregnancy)
- hCG + correlative US: look for gestational sac, fetal cardiac activity
- no cardiac activity in an embryo with a crown-rump length > 6 mm is definitive for miscarriage
- no growth of pregnancy over last week is definitive for miscarriage
- presence of sac is reassuring that pregnancy is still there, but absence in a patient with an hCG of at least 2000 is definitive for miscarriage
- other bad signs: abnormal yolk sac (large, small, irregular, or calcified), fetal HR < 100, large subchorionic hematoma

serial hCGs:
- normal doubling is reassuring

Treatment:
- follow serum quantitative hCG to negative
- surgical interventions: dilation & evacuation, dilation & curettage
- medical: misoprostol, mifepristone
- expectant management ok as long as there is minimal bleeding or discomfort, patient is < 13 weeks, vitals are stable, and there is no evidence of infection
- RhoGam if mother is Rh negative
- methylergonovine maleate to control bleeding
- grief counseling
- pelvic rest for 2 weeks
- many advise no pregnancy for 2-3 cycles, although there is no evidence for the benefit
- contraception if desired

11.5.2 Threatened Abortion

- general, catch-all term for any bleeding in the first half of an intrauterine pregnancy
- Background:
  - a presumptive diagnosis until you call it something different
  - pregnancy is still viable at this time, but half will proceed to a spontaneous abortion
- Presentation:
  - cervix is closed
  - uterus is appropriate gestational size
- Investigation:
  - fetal heart tones
  - STI testing
- Treatment: reassurance and pelvic rest (no sex or tampons)
- Prognosis:
  - fetal heart tones heard at 10 weeks are associated with better outcome

11.5.3 Inevitable Abortion

- occurs with rupture of membranes or open cervix; pregnancy loss is unavoidable
- Pregnancy is not viable
- Presentation:
  - dilated cervix
- increased bleeding and cramping

11.5.4 Incomplete Abortion
- when fetal tissue passed but placental tissue is retained
- More likely to be incomplete if abortion is after 12 weeks
- Presentation:
  - open cervix
  - gestational tissue seen in cervix
  - uterus is smaller than expected gestational age
  - bleeding can be severe

11.5.5 Complete Abortion
- all conception products have been passed
- More likely to be complete if before 12 weeks
- Presentation:
  - uterus has contracted
  - diminished bleeding
  - closed cervix
- Investigation:
  - fallen hCG levels
  - US shows no pregnancy tissue

11.5.6 Missed Abortion
- products of conception have been retained for some time after a failed pregnancy
- AKA blighted ovum or anembryonic pregnancy
- Presentation:
  - uterus is less than gestational age
  - loss of pregnancy symptoms
- Prognosis: risk of DIC if pregnancy is lost in 2nd trimester and products are retained > 6 weeks

11.5.7 Recurrent Abortion
- when there are more than 2 consecutive or 3 total spontaneous abortions
- AKA recurrent pregnancy loss or habitual abortion
- Investigation: medical workup should be considered after 2 miscarriages

11.5.8 Induced Abortion
- termination of an intact pregnancy before the time of viability
- May be elective/not medically necessary or therapeutic/necessary to safeguard the health of the mother

11.5.9 Ectopic Pregnancy
- Background:
  - most occur in the fallopian tube, others are cornual (interstitial), cervical, fimbrial, ovarian, abdominal, and (rarely) heterotopic = intrauterine & ectopic at the same time
    - unusual location more common with IVF and other assisted reproductive technologies
  - can cause tubal rupture and profound hemorrhage or tubal abortion (expulsion of embryo through the fibria, leading to tissue regression or reimplantation in the abdomen or ovary), or can spontaneously resolve
  - the leading cause of pregnancy-related deaths in the 1st trimester
  - incidence was increasing in early 1990s (association with PID), although deaths are decreasing
    - CDC is no longer reporting on incidence
• **risk factors:**
  - high = tubal obstruction or injury (like PID, especially *Chlamydia*), previous ectopic, DES use, tubal surgery
  - moderate = infertility, multiple sex partners, smoking, vaginal douching, older age, non-white ethnicities
• **protective (???):** IUD, progestin-only contraceptives, sterilization

#### Presentation:
- abdominal or pelvic pain, amenorrhea, vaginal bleeding
- usual pregnancy symptoms
- shoulder pain from blood pooling under diaphragm
- rupture [lightheadedness and shock
- urge to defecate from blood pooling in cul-de-sac
- or can be asymptomatic before tubal rupture!
- PE may be unremarkable, or have orthostatic vitals, occasional fever, pain to abdominal palpation, rebound tenderness, adnexal pain on bimanual exam, cervical motion tenderness

#### Investigation:
- quantitative serum hCG
- transvaginal US

#### Treatment:
- surgical needed if ruptured, with inability or unwillingness to comply with nonsurgical treatment, or problems with accessing follow-up care
  - laparoscopic is preferred
    - best outcome with salpingostomy and healing by secondary intention
    - salpingectomy needed if rupture, with uncontrolled bleeding, tubal damage, or desire for sterilization
- medical:
  - methotrexate IM ± leucovorin stops growth of rapidly dividing cells and has an efficacy of 78-96%
  - treatment of choice for women with no active bleeding or hemoperitoneum
  - can’t be used in breastfeeding women, immunocompromised, alcoholics, PUD, or those with kidney, lung, or liver disease or a blood dyscrasia
  - need to monitor for toxicities
  - must avoid sex, alcohol, NSAIDs, or folic acid supplements until hCG is undetectable
- expectant management: only consider for asymptomatic patients with falling hCG levels who are willing to accept the risk of rupture or hemorrhage
  - best candidates are those with small tubal pregnancy and low hCG levels

### 11.5.10 Gestational Trophoblastic Disease
- a group of rare pregnancy-related tumors arising from tissue that grows to form the placenta during pregnancy as a result of abnormal fertilization of an oocyte
- Types of trophoblastic tumors:
  - *hydatidiform mole*: develops when an egg that is missing its nucleus is fertilized and that may or may not contain fetal tissue
  - *invasive mole*: hydatidiform mole that burrows further into the uterus, considered to be malignant
• **choriocarcinoma**: trophoblastic cancer as result of untreated hydatidiform mole, spontaneous abortion, ectopic pregnancy, or normal pregnancy

• **placental-site trophoblastic tumor (PSTT)**: malignant tumor arising from the placenta

• **Investigation:**
  - hCG, US for staging:
    - stage I = persistently elevated hCG with tumor only in uterus
    - stage II = tumor outside uterus but in vaginal or pelvis
    - stage III = pulmonary mets
    - stage IV = mets to liver, brain or kidney
  - workup for metastatic disease

• **Treatment:**
  - D&C
  - methotrexate
  - chemo if malignant or with malignant potential
  - f/u with serial hCGs

11.5.11  **Cervical Insufficiency**

- painless cervical changes that occur in the 2nd trimester → recurrent pregnancy loss, still birth, or preterm delivery

• **Causes:**
  - congenital: short cervix (< 35 mm), Mullerian abnormalities, collagen abnormalities, FH
  - trauma: cervical laceration, instrument dilation, cone biopsy, LEEP
  - elevated serum relaxin levels → connective tissue remodeling
    - higher in twin pregnancies and pregnancies induced by menotropins

• **Presentation:**
  - vaginal fullness or pressure
  - vaginal spotting or bleeding
  - watery or mucousy brown vaginal discharge
  - vague abdominal or back pain
  - h/o acute, painless 2nd trimester pregnancy loss
  - premature cervical effacement and dilation

• **Investigation:**
  - transvaginal US showing shortened endocervical canal and funneling of fetal membranes into endocervix

• **Treatment:**
  - bedrest? no good evidence
  - progesterone has the best evidence
  - indomethacin
  - prophylactic cerclage (purse-string suture closing cervix shut)
    - must remove before labor or C-section or risk uterine rupture

11.5.12  **Twins**

• **Types:**
  - monozygotic = one fertilized egg splits into 2 embryos
    - incidence is 1/250
    - can occur during division of the fertilized egg at various times after conception
      - risk to fetuses depends on when this occurs
  - dizygotic = fertilization and implantation of more than one egg
    - increased with age and parity
    - highest incidence in Africa, lowest in Asia
    - familial pattern follows maternal lineage

• Can have separate placenta, amnion, and chorion, or can share one or more of these
• Risks in multifetal gestation: preterm labor and delivery, low birth weight, intrauterine growth restriction, polhydramnios (excess amniotic fluid), preeclampsia, anemia, congenital anomalies, postpartum hemorrhage, placental or umbilical cord accidents, increased risk of spontaneous abortion and infant mortality

11.6 Later Complications of Pregnancy

11.6.1 Hypertensive Disorders

A.) Preexisting or chronic HTN: underlying chronic HTN that precedes pregnancy

B.) Pregnancy-induced HTN: develops as a consequence of pregnancy and regresses postpartum
• there is NO proteinuria or pathologic edema

C.) Pregnancy-aggravated HTN: underlying HTN that becomes worsened by pregnancy
• mixed = chronic HTN plus something else on top of that

D.) Preeclampsia: pregnancy-induced HTN with significant proteinuria ± pathologic edema
• aka toxemia
• lies on a spectrum:
• mild: no symptoms
• severe: on the way to eclampsia
• risk factors:
  • during pregnancy: multi-fetal gestation, hydrops fetalis, hydatiform moles, chromosomal anomalies, structural congenital anomalies, gestational diabetes
  • preconceptional: first pregnancy with a new partner, limited sperm exposure (teen, donor insemination), partner fathering preeclamptic pregnancy with another woman, first pregnancy in general, personal or FH of preeclampsia, age < 20 or > 40, interval between pregnancy, underlying maternal disorders
• prevention: studies show there isn’t much we can do to prevent, focus is on screening
• presentation:
  • after 20 weeks
  • irritability
  • hyperreflexia
  • end-organ signs:
    • headache that is usually frontal and won’t go away with treatment
    • visual changes: photophobia, seeing spots or stars
    • epigastric pain from elevated liver enzymes
    • kidneys: oliguria
• placenta: fetal growth restrictions
• edema of face, hands, abdomen
• treatment:
  • antihypertensives to get out of stroke range
  • corticosteroids to replace platelet count and assist with fetal lung maturity
  • anticonvulsants: magnesium sulfate given as seizure prophylaxis
  • bed rest: to improve blood pressure and increase blood flow to placenta
  • delivery is the only cure
  • prognosis: risk of progression to eclampsia or HELLP

E.) Eclampsia: all conditions of preeclampsia with seizures due to neurologic irritability
• seizure can cause hypoxia ☐ disrupted fetal blood flow ☐ fetal distress, growth restriction
• prognosis: can lead to both death for mother and child
• worse outcome if before 28 weeks, if mother is > 25, multigravida, or with pre-existing renal or hypertensive disease
• treatment: same as preeclampsia
F.) HELLP: hemolysis, elevated liver enzymes, and low platelets = pre-eclampsia or eclampsia with a severe liver component

- see hemorrhage lecture

**Antihypertensives safe for pregnancy:** methyldopa, beta blockers, labetalol, clonidine, Ca channel blockers, hydralazine, diuretics

### 11.6.2 Fetal Growth Restriction

- fetus < 10th percentile for gestational age and gender
- Causes: congenital malformations, chromosomal abnormalities, maternal genetic disorders, damage during organogenesis, rubella, CMV, or other infection, placenta previa, placental infarction, single umbilical artery, small placenta, multiple gestation
- multiples share the same growth curve as singletons up to 22-24 weeks
- monozygotic twins at greater risk than dizygotic
- Risk factors: chronic maternal vascular disease, smoking, fetal abnormalities, poor maternal weight gain or malnutrition, vaginal bleeding during pregnancy, low pre-pregnancy weight, prior delivery of fetal growth restricted infant, prior stillbirth, alcohol, cocaine, or heroin use, elevated AFP during 2nd trimester screen

**Screening:**
- measuring fundal heights
- What to do when fundal size is ≥ 2 cm than date:
  - evaluate trend
  - US to evaluate fetal growth and percentile
    - if fetal growth restriction is symmetrically behind, it may just be a small baby
    - if fetal growth restriction is asymmetrically behind, there is likely a placental insufficiency
      - shunted blood flow to most important parts of fetus
      - smaller abdomen with larger brain
  - nonstress test
  - biophysical profile
  - umbilical Doppler:
    - look for increased systolic:diastolic ratio (because vasoconstriction causes diastolic velocity to approach zero), absent or reverse diastolic flow (ominous sign where diastole causes reverse flow from placenta back to mom)

- Treatment: delivery with maturity or by 37 weeks if evidence of compromise or poor growth
- Prognosis: high infant mortality within first 2 years of life, decreased height and head circumference measurement at age 4, risk of intellectual deficits

### 11.6.3 Gestational Diabetes

- carbohydrate intolerance induced by human placental lactogen
- Occurs in 3-5% of all pregnancies
- “Rule of 15s” is that 15% of pregnant women will have abnormal initial OGTT, then 15% of these will have abnormal 3 hour OGTTs, and then 15% of these women will have diabetes that persists postpartum
- Risk factors: > 25, prior gestational diabetes, FH of DM, prior macrosomic infant, prior stillbirth, BMI ≥ 27, chronic HTN, glycosuria, obesity, nonwhite ethnicity
- Screen for using oral glucose tolerance test
  - follow-up positive results with 3 hour oral glucose tolerance test
- Classification of pregnant diabetics via White’s classification: used to assess maternal and fetal risk
  - **type A**: abnormal OGTT without clinical signs or symptoms of DM = gestational diabetes
    - A1: controlled by diet
    - A2: controlled by insulin
  - **type B**: pre-existing DM with age at onset ≥ 20 years, duration < 10 years, no vascular disease
• **type C**: pre-existing DM with age at onset 10-19 years or duration 10-19 years, no vascular disease
• **type D**: pre-existing DM with age at onset < 10 years or duration ≥ 20 years or background retinopathy or HTN
• **type E**: nephropathy present
• **type H**: atherosclerosis present
• **type R**: proliferative retinopathy present
• **type T**: post renal transplant

**Treatment & monitoring:**
- change diet
  - referral to diabetic nurse educator if possible
- blood glucose monitoring 4x daily
- exercise
- insulin if BS control is inadequate
- glyburide and metformin can be considered but are not FDA approved for use during pregnancy
- higher rates of placental insufficiency: monitor fetus with BPPs, US, early NSTs
- deliver by 40 weeks or consider delivering earlier if fetus is nearing 4000 g (8.8 lb)

**Prognosis:**
- development of gestational diabetes increases risk for preeclampsia, bacterial infection, macrosomia with difficult delivery (need for c-section, forceps, or vacuum delivery), neonatal complications (hypoglycemia or ↑bili, cardiac anomalies, neural tube defects, skeletal anomalies), polyhydramnios, ketoacidosis, preterm labor, and overall perinatal mortality
- child will be predisposed to develop DM later in life
- mothers with gestational diabetes have a 30-50% chance of developing DM2 in 10 years and a 60-100% chance of developing it in 20 years

11.6.4 Fetal Macrosomia

• Associated risks:
  - brachial plexus injury: may never resolve
  - clavicular fracture
  - facial nerve injury
  - shoulder dystocia
  - white male babies

11.6.5 Amniotic Fluid Abnormalities

• Amniotic fluid is essentially baby pee, so if there isn’t the correct amount of it then either the baby isn’t peeing or it isn’t swallowing the pee
• Normal amniotic fluid vol is 800-1000 mL as determined via US
  - **oligohydramnios**: too little fluid
    - occurs in postdates, with fetal growth restriction, fetal renal abnormalities, or premature rupture of membranes
  - **polyhydramnios**: too much fluid
    - occurs with diabetes, fetal abnormalities (esp GI), and twins

11.7 Preterm Labor & PROM

11.7.1 Background

• **Labor**: regular contractions, cervical effacement (becomes like paper), and dilation ≥ 2 cm
• **Preterm labor**: same characteristics but < 37 weeks
• **Premature rupture of membranes (PROM)**: rupture of membranes at full term but before onset of labor
• normally amniotic sac ruptures well into labor
  - this happens in 10% of normal pregnancies (sudden gushing or “my water broke”)
11.7.2 Preterm Delivery

- delivery < 37 weeks
- Possibly causes:
  - infections: dental disease, bacterial vaginosis
    - but treating these things has not impacted outcomes at all
  - inflammatory response
  - underlying biological mechanism not well understood
- The leading cause of hospitalization among pregnant women
  - US rate has increased progressively from 9 to 12% and is especially high among black women
    - 13.3% in NC over all, and 18.5% in black women
  - Risk factors: smoking, black, extremes of age, poverty, poor housing, crime, other social stress, multiple gestation, intergestational period < 6 months, h/o cervical surgery, short cervical length, infection (bacteriuria, UTI, bacterial vaginosis)
    - even when correcting for other confounders, black women still have higher rates of preterm birth
    - half of preterm births will have no risk factors
- Prevention:
  - even identifying high risk women with early care and enhanced prenatal services have generally failed to improve outcomes
- Presentation:
  - contractions: back pain, abdominal pain, cramping
  - rupture of membrane can be insidious and just look like a change in discharge
  - diarrhea
- Investigation:
  - home monitoring of uterine contractions has shown to have no benefit
  - check fetal fibronectin: protein produced by fetal cells not normally detectable in vagina after 21 weeks
    - usually elevated in women with preterm labor
    - aids in assessing likelihood of preterm delivery in next 7-14 days
    - high negative predictive value but low positive predictive value = useful to r/o risk of preterm birth and avoid unnecessary interventions
    - needs to be the first swab
    - inaccurate results with recent cervical disruption (sex, vaginal US, cervical exam), placental abruption, placenta previa, vaginal bleeding, contamination with lubricants, soaps, or disinfectants
- US measurement of cervical length:
  - may be predictive, don’t recommend looking at this # alone to make a decision due to high variability
- evaluation of fetal lung maturity:
  - specimen is amniotic fluid (after water breaks or via amniocentesis)
    - lecithin/sphingomyelin ratio (L/S ratio): surfactant level in amniotic fluid estimates pulmonary surfactant levels
      - lecithin rises slowly in first 2 trimesters than rapidly after 35 weeks
      - sphingomyelin level is consistent throughout pregnancy
      - mature lung function correlations with L/S ratio ≥ 2
    - foam stability index (FSI): evaluates functional ability of pulmonary surfactant in amniotic fluid to stabilize bubbles in foam
    - Options:
mature lung function correlates to FSI ≥ 0.47
  - phosphatidylglycerol (PG): a minor constituent of surfactant
  - increases in amniotic fluid several weeks after the rise in lecithin
  - more indicative of fetal lung maturity
  - infrequently used due to high false + rate
  - fluorescence polarization (TDx-FLM): ratio of surfactant to albumin
  - true direct measurement of surfactant concentration
  - mature lung function correlates to elevation > 55 mg surfactant/g albumin

Treatment:
- progesterone: maintains cervical integrity, opposes oxytocin, and has anti-inflammatory effects
  - ACOG recommends offering this to patients with h/o preterm delivery or cervical length < 15mm
- tocolytic therapy (anti-contractants): no evidence that they improve outcomes but they do buy time to be able to administer steroids or transport to a facility that has a NICU
  - options (no clear first-line therapies):
    - terbutaline can delay delivery for ~48 hours and needs to be limited to < 72 hours due to side effects
    - mag sulfate: risk of pulmonary edema
    - Ca channel blockers: risk maternal hypotension
    - prostaglandin synthetase inhibitors (indomethacin): risk of constriction of ductus arteriosus and oligohydramnios
- steroids:
  - benefits: shown to reduce risk of respiratory distress syndrome, decreased mortality, less interventricular hemorrhage and necrotizing enterocolitis
- GBS prophylaxis:
  - if recent test (within 5 weeks) is negative, no need to treat again during preterm labor
  - otherwise do a swab and start antibiotics while waiting for results come back
- bed rest: does not work
  - hydration: does not work
  - pelvic rest: does not work
  - routine antibiotics: no need

Prognosis:
- leading cause of developmental disability, can cause blindness and chronic lung problems

11.7.3 Preterm Premature Rupture of Membrane

- rupture of membranes before 37 weeks
- Background:
  - half will enter preterm labor within 24 hours, and 80% within a week
    - causes 1/3 of preterm deliveries
  - more serious, we are not sure if infant’s lungs are developed
  - causes: up to 60% of women with PPROM will have an infection
    - ascending bacteria from vagina
    - abdominal bacteria
    - placental
  - risk factors: intra-amniotic infection, prior h/o PPROM, lower SES, teens, smokers, h/o STD, h/o cervical cerclage, uterine overdistension (multiple distensions, lots of fluid)
- Presentation:
  - feeling leaking “urine” or increased vaginal secretions
  - chorioamnionitis: odor, fundal tenderness, low grade fever, fetal tachycardia
- Investigation:
  - visual exam for pooling of amniotic fluid in vagina
  - test for ferning: drop of amniotic fluid will crystallize into a fern pattern on slide while normal vaginal mucus will not
    - beware: may be hard to find this pattern, need to look all over
  - amniotic fluid will have a basic pH = Nitrazine blue color
• always want an accurate date to be able to properly evaluate situation
• consider gonorrhea/chlamydia cultures

**Treatment & management:**

• typically inpatient
• monitor daily CBCs and vitals for signs of infection
• daily fetal testing
• antibiotics to treat infection if present: ampicillin, then amoxicillin + erythromycin
• further management depends on gestational age:
  o if > 34 weeks □ GBS prophylaxis if needed and delivery
  o if 32-33 weeks □ expectant management, GBS prophylaxis if needed, steroids for fetal lung maturity, antibiotics to prolong latency
  o if 23-31 weeks □ expectant management, GBS prophylaxis if needed, steroids, tocolytics?, antibiotics
  o if < 23 weeks □ patient counseling, expectant management, no steroids, no GBS prophylaxis or antibiotics

**Prognosis:**

• complications: infection, premature birth, abruption, fetal pulmonary hypoplasia, cord compression □ fetal distress

### 11.8 Hemorrhage

#### 11.8.1 Background

• Severe hemorrhage is the #1 cause of maternal deaths both worldwide and in the US
• We are focusing on postpartum hemorrhage
• Uterus and placenta are highly vascularized

#### 11.8.2 Causes of Antepartum Hemorrhage

A.) Ectopic pregnancy

B.) HELLP syndrome

• presentation:
  • prepartum: preeclampsia, RUQ pain, placental abruption, severe range blood pressures, exhaustion, headache, nausea, vomiting, malaise, fatigue
  • postpartum: not feeling well after delivery, and then sudden downward spiral of abnormal labs, DIC, pulmonary edema, liver hemorrhage, renal failure
• investigation:
  • diagnostic criteria of HTN, 3+ proteinuria, spot urine:creatinine ratio, ↑AST and ALT, ↓platelets
  • may have elevated hematocrit
• treatment: same as preeclampsia

C.) Placenta previa: where placenta implants abnormally in the lower uterine segment □ partial or total blockage of cervical os
• risk factors increasing parity, increasing maternal age, Asian women, previous placenta previa, smoking, h/o c-section
• screening: 1st or 2nd trimester US will catch this
• presentation: painless vaginal bleeding
• investigation:
  • DON’T do a pelvic exam- this can rupture the placenta and cause bleeding!
  • US
• treatment & management:
  • risky referral
  • lower risk (marginal previa) f/u with serial US, avoid cervical exams and sex, activity restrictions
  • delivery can be vaginal if edge is clearly > 2-3 cm from os
D.) Placenta abruption: disruption of placenta from uterine wall

![ABRUPTIO PLACENTAE (Premature Separation)](image)

• presentation: painful vaginal bleeding
• risk factors: HTN, trauma, smoking, cocaine use, PPROM, chorioamnionitis, rapid decompression of the uterus, thrombophilia
• investigation
  • evaluate blood flow from fetus to mother
  • US to look for obvious placental abruption
  • BPP
  • blood type and Rh status
  • NST to monitor fetal HR in relationship to contractions

11.8.3 Postpartum Hemorrhage
• Background
  • average blood loss with vaginal delivery is ~500 mL; hemorrhage is > 1000 mL
  • average blood loss with c-section is 1000 mL; hemorrhage is > 1500 mL
    • problem: physicians tend to underestimate blood loss, abdominal or pelvic bleeding can be hidden
  • postpartum hemorrhage occurs in 5% of deliveries
  • “early” hemorrhage occurs within 24 hours of delivery
    • death from hemorrhage typically occurs 5 hours after delivery
  • “late” hemorrhage occurs 24 hours to 6 weeks after delivery
    • usually due to infection or retained placental tissue
• Risk factors: most women have none!
  • preeclampsia, previous postpartum hemorrhage, multiple gestation, previous c-section, multiparity
• Prevention of hemorrhage:
  • active management of third stage of labor: use of oxytocin after delivery of anterior shoulder
  • Presentation: classic signs of hypovolemia and shock depending on amount of blood lost
  • Investigation & management/treatment must be simultaneous:
    • check for uterine atony: loss of uterine muscle tone causing loss of vessel compression and decreased clotting ability
causes 70% of hemorrhages!
- risk factors: chorioamnionitis, uterine distension, prolonged or induced labor, use of mag sulfate, general anesthesia, multiparity, previous hemorrhage, placenta previa or abruption, operative delivery
- treatment:
  - uterine massage: bimanual exam compressing uterus between hands
  - oxygen
  - start large bore IVs
  - meds:
    - first-line: IV Pitocin
    - second-line: misoprostol or Hemabate
    - third-line: Methergine, works by causing tetanic uterine contraction
      - contraindicated in HTN or preeclampsia
- check for retained placenta:
  - presentation: delay of placental delivery > 30 min
  - risk factors: prior retained placenta, prior c-section, curettage after pregnancy, uterine infection, increased parity
  - investigation: inspect delivered placenta for missing parts, explore the uterus
  - treatment: gentle pulling on umbilical cord with pressure on fundus
    - if this takes > 30 minutes there is probably abnormal placental implantation
      - may need Pitocin, surgical removal of placenta, last resort is blunt curettage or suction due to high risk of perforation
      - prophylactic antibiotics if taking any invasive measures
- look for traumatic cause of hemorrhage:
  - traumatic tear or episiotomy: does not usually cause severe bleeding
    - risk factors: instrumented deliveries, primiparity, pre-eclampsia, multiple gestation, vulvovaginal varicosities, prolonged second stage, clotting abnormalities, macrosomia
    - treatment: suture lacerations (starting at the apex to control arteries)
  - hematomas:
    - less common than lacerations
    - if small, can just keep an eye on it
    - if large, may need to drain it
  - uterine inversion:
    - associated with uterine atony, fundal placenta, first birth
    - presentation: shock out of proportion to blood loss
    - treatment: manual reduction of uterus, laparotomy
  - uterine rupture:
    - risk factors: prior uterine surgery, prior c-section, hyperstimulation with oxytocin, trauma, increasing parity, epidural, placental abruption, forceps delivery, breech
    - prepartum presentation: abdominal tenderness, vaginal bleeding, maternal tachycardia, abnormal fetal HR, cessation of uterine contractions
    - postpartum presentation: hypotension greater than expected for amount of blood loss, increasing abdominal girth
    - treatment:
      - watchful waiting if small
      - if symptomatic: IVF, surgical intervention
  - coagulopathy: rare, suspect if there is oozing from puncture sites
    - investigation: platelets, PT/PTT, fibrinogen, antithrombin III
11.8.4 Surgical Interventions to Stop Hemorrhage
1.) Curettage
2.) Embolization of uterine arteries or hypogastric arteries
3.) Compression sutures around uterus
4.) Balloon pump
5.) Hysterectomy

11.9 Labor & Delivery, Complications, and Postterm Pregnancy

11.9.1 Labor

- physiologic process by which fetus is expelled from the uterus
- Components:
  - increased myometrial uterine contractions
    - early contractions dilate the cervix
    - later contractions serve to push the fetus through the vagina
    - measurement of contractions
      - qualitative:
        - observation of the mother and palpation of the uterine fundus
        - external tocodynamometry: measures # of contractions in 10 min timeframe as well as intensity and duration of contractions
      - quantitative: measurement of intrauterine pressure via internal uterine pressure transducers (IUPC)
- no evidence that one form of measurement is better than the other
- progressive cervical effacement and dilation
  - active labor = ~3-4 cm dilation
- bloody discharge known as a “bloody show”
- Defining adequate labor
  - classically, 3-5 contractions in 10 minutes
  - IUPC: 200-250 Montevideo units (area under peak curve)
- Stages of labor:
  - first stage: onset of labor to full dilation (10 cm)
  - second stage: interval between full dilation and delivery
  - third stage: time from delivery to expulsion of placenta
- Cardinal movements of labor:
  - **engagement**: passage of widest diameter of presenting part to the below plane of the pelvis
  - **descent**: downward pressure of presenting part through the pelvis
  - **flexion**: passive flexion of fetal head as it descends due to resistance from pelvis
  - **internal rotation**: rotation of presenting part so that it either faces mom’s back or front
    - preferred position is facing the back
    - can which position by checking for anterior fontanelle
  - **extension**: head extends toward pubic symphysis
    - delivery position
  - **external rotation (restitution)**: rotation to the correct anatomic position in relation to the fetal torso
    - let the baby do it on its own
  - **expulsion**: delivery of rest of body of the baby

11.9.2 Induction of Labor

- iatrogenic stimulation of uterine contractions to achieve vaginal delivery before onset of spontaneous labor
- Overall rate has increased to 20% of all births
- Indications: gestational HTN, preeclampsia or eclampsia, postterm pregnancy, maternal medical conditions, fetal compromise, PROM, chorioamnionitis, history of rapid labor while residing far away from hospital
- Contraindications: prior classical C-section, active genital herpes, placenta or vasa previa, umbilical cord prolapse, transverse lie
- **Bishop score**: the higher score, the higher the likelihood for successful induced labor
  - scores ≥ 6 are favorable

<table>
<thead>
<tr>
<th>Cervix</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Position</td>
<td>Posterior</td>
</tr>
<tr>
<td>Consistency</td>
<td>Firm</td>
</tr>
<tr>
<td>Effacement</td>
<td>0-30%</td>
</tr>
<tr>
<td>Dilation</td>
<td>Closed</td>
</tr>
<tr>
<td>Baby's Station</td>
<td>-3</td>
</tr>
</tbody>
</table>

- Methods:
  - cervical ripening agents: misoprostol
  - membrane stripping: using finger to separate amniotic sac from cervix ± release of prostaglandins oxytocin
  - mechanical dilation: inflating a Foley catheter ± oxytocin in the cervix e.) amniotomy: artificial rupture of membranes
11.9.3 Options for Pain Management in Labor

1.) No analgesics

2.) Parenteral analgesics:
   - fentanyl is most common
   - risk of maternal aspiration and respiratory depression
   - risk of fetal respiratory depression

3.) Regional anesthetics:
   - epidural: shown to slow down labor, but it does not affect C-section rates
   - less effects on fetus

4.) Spinal anesthesia

11.9.4 Fetal Variables That Influence Course of Labor

1.) Size of head

2.) Lie: longitudinal axis of fetus to uterus
   - transverse
   - oblique
   - longitudinal

3.) Presentation of infant: vertex, breech, shoulder, compound
   - breech: need to rotate baby using external cephalic version (manual turning fetus using pressure on mother’s abdomen) if still breech at 36 weeks
     - or do a C-section

4.) Station of the infant: relationship of presenting part in relation to the pelvis
   - $0 =$ head is right at level of pubic symphysis
11.9.5 Pelvic Variables That Influence Course of Labor

1.) Bony pelvis
   • determine if pelvic outlet is big enough for baby to come out using manual pelvimetry
   • gynecoid shape is most conducive to vaginal delivery

2.) Soft tissues of birth canal: cervix, pelvic floor muscle

11.9.6 Labor Dystocia

• slow, abnormal progression of labor
• Old term “failure to progress”
• Can mean that labor has stopped altogether or is just progressing too slowly
• Causes: inadequate power, passage, or passenger
• The leading indication for C-section
• Risk factors: older maternal age, medical issues like DM, HTN, obesity, macrosomia, prolonged rupture of membranes, chorioamnionitis, short maternal stature, high station at complete dilation, occiput posterior position (baby facing mother’s front), pelvic abnormalities
• When to call it labor dystocia?
  • any previous vaginal deliveries = less time allowed before calling it dystocia
    o because this should make another vaginal deliver easier
  • want the same person to be examining mother over time, as all measurements are estimates and subject to systematic error

11.9.7 Episiotomy

• surgical incision of the perineum and posterior vaginal wall
• 30% of women giving birth will have this done
• Use:
  • historical purpose was to facilitate completion of second stage to improve maternal and fetal outcome
  • recent trials fail to show any improvement in maternal or fetal outcome with use of episiotomies
• Technique:
  • midline is most common but associated with greater risk for extension to anal sphincter and rectum
11.9.8 Operative Vaginal Delivery

- use of forceps or vacuum to assist in delivery
- Indications:
  - fetal distress
  - need to shorten second stage for maternal reason
  - with prolonged second stage
    - first baby: no progress for 3 hours with regional anesthesia or 2 hours without
    - subsequent deliveries: no progress for 2 hours with regional anesthesia or 1 hour without

11.9.9 Shoulder Dystocia

- shoulders of infant can’t fit through pubic symphysis
- Occurs when child’s shoulders are wider than the pubic outlet
- Risk factors: maternal obesity, diabetes, h/o macrosomic infant, current macrosomia, h/o shoulder dystocia
- Presentation:
  - warning signs during delivery: prolonged 2nd stage, recoil of head on perineum (turtle sign), lack of spontaneous restitution (no natural head turning)
- What to do:
  - get help
  - McRobert’s maneuver: flexion of maternal hips, application of moderate suprapubic pressure at 45° (not a straight downward motion!) to disimpact the anterior shoulder, insertion of hand to sweet posterior arm across chest and over perineum using even pressure
- episiotomy
- other maneuvers: Rubin’s screw, Wood’s screw, Zavenilli

Prognosis:
- fetal complications: brachial plexus injury, clavicular or humeral fracture, increased risk of asphyxia
  - 10% will have permanent injuries
- maternal complications: 11% risk of postpartum hemorrhage, 3.8% risk of 4th degree tear

11.9.10 Postterm Pregnancy
- Pregnancy over 40 weeks but < 42 weeks
- options: do a non-stress test to evaluate fetus
- Postterm is considered to be > 42 weeks gestational age
- Most frequent cause is error in dating
- Risk factors: first pregnancy, prior postterm pregnancy
- Evaluation begins at 41 weeks
  - why intervene?
    - increased risk of fetal death after 42 weeks
    - risks to fetus residing in uterus postterm: stillbirth, meconium aspiration, intrauterine infection, uteroplacental insufficiency
    - risks to mother carrying postterm fetus: increased labor dystocia, perineal injury related to macrosomia, increased c-section rate
- options:
  - biweekly nonstress test (NST): fetal heart tracing and uterine activity tracking
    - office or hospital
    - reactive test = reassuring result of ≥ 2 fetal HR accelerations with movement at least 15 bpm above baseline that last at least 15 secs within a 20 min time period
    - nonreactive test = further evaluation needed, possible induction of labor
  - biophysical profile (BPP): assesses NST, fetal breathing movements, fetal movement, fetal tone, and amniotic fluid volume on a points system = a kind of in utero “Apgar”
    - normal = 8-10 points
    - equivocal = 6 points
    - abnormal = ≤ 4 points
  - modified BPP: NST + amniotic fluid index (US measurement of amniotic fluid vol)
    - amniotic fluid index < 50 mm needs intervention

Interventions:
- induction indications: favorable cervix, fetal compromise, low amniotic fluid
- natural techniques: nipple stimulation to release oxytocin, sweeping the cervical membrane, castor oil

11.10 Infections in Pregnancy

11.10.1 GBS
- Background:
  - 10-30% of women are colonized
  - colonization can be acute, chronic, or intermittent
- Presentation:
  - mother: GBS bacteriuria indicates heavy colonization, may also have endometritis
  - neonate: sepsis with 50% mortality rate
    - “early” infection if within 6 days of life
      - accounts for most cases
      - risk factors: preterm labor, PROM or PPROM
    - “late” infection if after first week of life
      - may be nosocomial or community-acquired rather than maternal transmission
Treatment:
- prophylax positive screens with penicillin G, ampicillin, cefazolin, or clindamycin, or vancomycin if resistant

11.10.2 Bacterial Vaginosis

- Background:
  - BV during pregnancy increases risk for preterm birth or low birth weight, placental infection, and amniotic infection
  - Screening: not shown to improve outcome for fetus
  - Presentation: thin, watery, fishy discharge
  - Investigation: clue cells on wet prep, fish odor with KOH
  - Treatment: not shown to improve outcome for fetus, but is done for maternal symptoms

11.10.3 UTI

- First line treatment in pregnancy: amoxicillin, ampicillin, cephalexin, nitrofurantoin before 38 weeks
- AVOID: nitrofurantoin after 38 weeks, sulfonamides in 3\textsuperscript{rd} trimester, tetracyclines, quinolones, Septra

11.10.4 Hep B

- Background:
  - risk of vertical transmission to fetus with chronic infection
- Investigation:
  - acute vs chronic infection
    - check LFTs, hep B core AB
    - E antigen suggests increased infectivity
- Treatment: give neonate hep B vaccine and hep B Ig after birth to interrupt transmission
- Prognosis: can breastfeed as long as infant had received vaccination

11.10.5 HIV

- Background
- Treatment: risk of perinatal HIV transmission can be reduced from 15-40\% to 0-2\% with proper antiretroviral therapy and avoidance of breastfeeding and vaginal delivery
  - most antiretrovirals safe for pregnancy
  - c-section at 38 weeks is an option as most transmission is intrapartum

11.10.6 Teratogenic Infections

- Toxoplasmosis
- Rubella
  - congenital rubella syndrome: ocular defects including cataracts, heart defects, hearing impairment, CNS effects including mental retardation, growth retardation, bone disease, hematologic disease, endocrine dysfunction
- CMV
- HSV
  - no strategy to completely eliminate risk of neonatal herpes
  - acyclovir is pregnancy category C
- Varicella
  - congenital varicella syndrome: microcephaly and limb abnormalities
  - prevention: vaccinate after childbirth if not immune
  - treatment:
    - perinatal exposure in nonimmune mother: varicella Ig
    - active disease in mother: acyclovir
11.11 Postpartum Care

11.11.1 Hospital Discharge Planning and Counseling

- Discharge for normal vaginal birth typically after 24-48 hours, or 48-72 hours after c-section
- Review delivery summary for type of birth, interventions or complications, information about infant
- Maternal H&P:
  - check vitals:
    - HR > 100 could be sign of infection, anemia, or hemorrhage
    - high BP could be chronic HTN, postpartum induced HTN, preeclampsia/eclampsia, or normal elevation for 4-5 days
    - low BP could be anemia or hemorrhage
    - temp is elevated immediately postpartum but should stabilize within first 24 hours and stay below 100.4
  - ask about delivery, general wellbeing, pain
    - look for signs of mother bonding to child
  - postpartum ROS: chest pain, difficulty breathing, swelling, leg pains, feeding difficulties
    - increased risk of blood clot, especially after C-section
      - check DTRs and test for Homan’s if suspecting
      - prevent with early ambulation
  - PE: heart, lungs, breasts, lower extremities, perineum, abdomen
  - Vaccination check: influenza, pertussis boosters, MMR
  - make sure mother got RhoGam if needed
  - Education on normal postpartum changes:
    - hematologic changes:
      - pregnancy-induced hypovolemia allows for toleration of considerable blood loss
      - increased blood volume and cardiac output postpartum □ increased plasma volume □ diuresis and diaphoresis over a 2-week period
    - normal uterine involution should occur after 4-6 weeks
      - goes back up to level of umbilicus
      - “afterpains” as uterus returns to normal position
        - worsen with subsequent pregnancies
        - increases with nursing
        - can take comfort measures and pain meds
        - should resolve within 3 days
    - diastasis recti: separation of abdominal wall muscle, can cause back pain due to decreased muscular support
    - skin:
      - striae
      - expect slight edema from pregnancy fluids shifting
    - renal:
      - fluid shift □ diuresis = expect to pee a lot for the first 5 days postpartum
      - keeping bladder empty helps uterus return to normal position
      - may need catheter for 1-7 days if edema prevents normal urination
    - GI:
      - decreased peristalsis in first 24 hours □ increased risk of ileus
      - should have BM within 2-3 days after birth
      - senna docusate can be taken for easier bowel movements with women who have had a tear
      - perineum: may be edematous, ↓ tone, redness, ecchymosis, erythema, drainage
        - need good peri care: soft wipes instead of toilet paper, pat dry front to back, change pads frequently
        - hemorrhoids are common postpartum
        - lacerations should heal in 1-3 weeks
    - vaginal discharge:
comes in stages
- days 1-3 are lochia rubra: red discharge similar to heavy menstrual flow
- days 3-10 are lochia serosa: paler, serosanguineous to serous in color
- days 10-35 are lochia alba: white to yellowish color with thick consistency
- flow may increase with activity but should progressively decrease
- total amount should be 150-400 mL

Education on abnormal postpartum events:
- reddish discharge beyond 2 weeks: could be indicative of subinvolution, retained placenta, endometritis
- pain
- foul smelling discharge
- incisional or laceration pain
- fever
- Sex, birth control, menses, and breastfeeding:
  - no sex for 6 weeks
  - exclusive breastfeeding recommended for 6 months
    - avoid engorgement by feeding often, warm compresses before feeding, cool compresses after feeding, supportive bras
    - mastitis will need antibiotics
    - if not breastfeeding, wear a tight bra with ice packs and use pain meds
- birth control:
  - breastfeeding will supply some birth control as long as it is exclusive and every 2-4 hours
    - will only provide protection for up to 6 months
    - can’t have anything with estrogen, will decrease milk supply
      - options: depo provera, Implanon, condoms, minipill
      - permanent options: tubal ligation, vasectomy
  - if not breastfeeding, hormonal shifts to stimulate ovulation will occur 3-6 weeks postpartum
    - birth control options: IUD, minipill, permanent options
      - combination OCPs only after 4-6 weeks due to risk of DVT

menses:
- not breastfeeding: menses typically occurs within 5-8 weeks
- breastfeeding: menses typically occur 2-18 months after weaning
- first menses may be heavier than normal

Schedule f/u postpartum visit: typically after 6 weeks if everything is normal

**11.11.2 Special Considerations for C-Section**

- Twice as much blood is lost
- Progressive diet
- Foley catheter for 12 hours
- Surgical bandage for ~24 hours
- Patient education: gas pains, no driving for 2 weeks, limit stairs, slowly increase activity as tolerated

**11.11.3 Postpartum Abnormals**

A.) Subinvolution
- presentation: prolonged discharge, enlarged, boggy, soft, possibly displaced uterus
- investigation:
  - labs: CBC, bHCG
  - US
  - cultures

B.) Endometritis
- the most common postpartum infection
- presentation: lower abdominal or back pain, fever, unusual bleeding, foul discharge, constipation, tachycardia, tenderness on bimanual exam, soft or subinvoluted uterus
• investigation:
  • labs: CBC, bHCG
  • US
  • UA

C.) Nonlochial bleeding: BRB that comes in spurts
  • could be coagulation disorder

D.) Incisional or laceration infection
  • treatment: Keflex and hygiene

E.) Gestational trophoblastic disease

F.) Postpartum thyroiditis
  • presentation: fatigue, palpitations, emotional lability, thyroid enlargement or pain, depression, memory/concentration problems

11.11.4 Postpartum Visits

• First visit done at 6-8 weeks postpartum
• review prenatal and delivery information
• vital signs
• general assessment and psychosocial adjustment
• ROS
• infant wellbeing
• resumption of sex
• full physical exam including pelvic
  • cervix should gradually close by 4 weeks
• counseling on postpartum changes:
  • linea nigra and areolar hyperpigmentation may persist
  • fine hair and nail growth regresses but coarse hair remains
• Labs if needed:
  • Hb
  • GC/Chlamydia if at risk
  • pap if due
  • fasting blood sugar or 2 hour postprandial glucose if there is h/o gestational diabetes

11.12 Postpartum Mood Disorders

11.12.1 Background

• Cultures with rare postpartum depression have a distinct postpartum period, have protective measures in place for the presumed vulnerability of the new mother, mandate rest, and promote social seclusion and assistance from relatives and midwives for the postpartum period
• Inability to breastfeed can cause a lot of guilt for a woman
• need to counsel on breastfeeding and assure woman that it is ok to not breastfeed and they can still have a healthy baby without it

11.12.2 Maternity Blues

• Background:
  • prevalence of 26-85%
  • risk factors: depressive symptoms during pregnancy, previous depression, pre-menstrual depression
  • Presentation: mild depressive feelings, sadness, irritability, crying, and anxiety
  • peaks 4th-5th day after delivery
  • Treatment: self-limiting with time and support of family and friends
  • Prognosis: subsides by 10th day postpartum
11.12.3 Postpartum Depression

- **Background:**
  - can occur in women or men
  - risk factors: formula feeding, h/o depression, cigarette smoking, low self-esteem, childcare stress, prenatal depression (strongest association), low social support, poor marital relationship, infant colic, low SES, unplanned pregnancy, troubled childhood with little love, complications during pregnancy, teen pregnancy
  - possible causes: hormonal changes during pregnancy
  - half of cases are minor depression
  - the most underdiagnosed postpartum condition!
- **Screening:**
  - Edinburgh Postnatal Depression Scale (EPDS): short 10 question scale
    - for pregnant as well as postpartum women
    - validated in Spanish
- **Presentation:**
  - sadness, fatigue, changes in sleeping and eating patterns, reduced libido, crying episodes, anxiety, irritability, hopelessness, low self-esteem, guild, feeling overwhelmed, inability to be comforted, anhedonia, social withdrawal, feeling inadequate in caregiving for infant, anger spells, panic attacks
- **Investigation:**
  - DSM-IV criteria: depression onset within 4 weeks of childbirth
- **Treatment:**
  - attention to infant by other family members or friends
  - support group or counseling
  - home visits with listening counselors
  - psychotherapy
  - meds
  - healthy diet and sleep patterns
- **Prognosis:**
  - can last several months to a year if untreated
  - infants of depressed mothers are more prone to difficult temperaments, cognitive deficits, and strained interpersonal relationships

11.12.4 Postpartum Obsessive Compulsive Disorder

- **Presentation:**
  - symptoms are mostly disabling intrusive thoughts to harm the baby
  - usually within 2 weeks postpartum
  - usually no psychosis
- **Treatment:**
  - very responsive to SSRIs

11.12.5 Postpartum Psychosis

- **Background:**
  - risk factors: previous episode of psychosis, bipolar disorder, FH
- **Presentation:**
  - severe; marked anxiety, sadness, or irritability which progresses or does not get better, inability to sleep, emotion difficulties prevention care for self or baby, suicidal feelings, fears of hurting baby
  - onset within several days to 2 weeks postpartum
- **Treatment:**
  - inpatient