**Day 2**  
**Thursday, February 20**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:00 – 8:00 am</td>
<td>Breakfast Provided</td>
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<tr>
<td>8:00 – 8:30 am</td>
<td>Common Newborn Issues – Janalynn Beste, MD, FAAFP</td>
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<tr>
<td>8:30 – 9:15 am</td>
<td>ACS &amp; Hyperlipidemia – Margaret Helton, MD, FAAFP</td>
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<tr>
<td>9:15 – 9:45 am</td>
<td>Well-Child Care &amp; Adolescent Issues – Janalynn Beste, MD, FAAFP</td>
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<tr>
<td>9:45 – 10:15 am</td>
<td>Hypertension – Margaret Helton, MD, FAAFP</td>
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<tr>
<td>10:15 – 10:30 am</td>
<td>Q&amp;A</td>
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<tr>
<td>10:30 – 10:45 am</td>
<td>Break</td>
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<tr>
<td>10:45 – 11:15 am</td>
<td>Fever &amp; Infectious Diseases in Children – Janalynn Beste, MD, FAAFP</td>
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<tr>
<td>11:15 – 11:45 am</td>
<td>Heart Failure – Margaret Helton, MD, FAAFP</td>
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<tr>
<td>11:45 am – 12:15 pm</td>
<td>Common ENT Problems – Teresa Holt, MD</td>
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<tr>
<td>12:15 – 12:30 pm</td>
<td>Q&amp;A</td>
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<tr>
<td>12:30 – 1:30 pm</td>
<td>Lunch Provided</td>
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<tr>
<td>1:30 – 2:00 pm</td>
<td>Challenging Issues in Hematology – Teresa Holt, MD</td>
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<tr>
<td>2:00 – 2:30 pm</td>
<td>Managing Dysrhythmias – Margaret Helton, MD, FAAFP</td>
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<tr>
<td>2:30 – 3:00 pm</td>
<td>Common Neurological Disorders – Teresa Holt, MD</td>
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<tr>
<td>3:00 – 3:30 pm</td>
<td>Emergency Medicine I – Robert Dachs, MD, FAAFP</td>
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<tr>
<td>3:30 – 3:45 pm</td>
<td>Q&amp;A</td>
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<tr>
<td>3:45 – 4:00 pm</td>
<td>Break</td>
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<tr>
<td>4:00 – 4:30 pm</td>
<td>Emergency Medicine II – Robert Dachs, MD, FAAFP</td>
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<tr>
<td>4:30 – 5:00 pm</td>
<td>STI’s, Vaginitis, &amp; Vaginosis – David Weismiller, MD, ScM, FAAFP</td>
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<tr>
<td>5:00 – 5:30 pm</td>
<td>Peripheral Vascular Disease – Robert Dachs, MD, FAAFP</td>
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<tr>
<td>5:30 – 5:45 pm</td>
<td>Q&amp;A</td>
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Common Newborn Issues

Janalynn Beste, MD, FAAFP
Associate Professor of Family Medicine
Program Director and Chair
New Hanover Regional Medical Center Residency in Family Medicine
Wilmington, North Carolina
Disclosure Statement

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Learning Objectives

1. Discuss the components of routine newborn care
2. List recommended newborn screening tests
3. Describe appropriate nutrition for newborns
4. Identify and treat common newborn problems
Newborn Screening Tests

• No longer USPSTF recommendations for screening for heritable disorders
• Now-Department of Health and Human Services Advisory Committee on Heritable Disorders in Newborns and Children
• Recommended Uniform Screening Panel of 34 core disorders and 26 secondary disorders
# Newborn Screening Tests

<table>
<thead>
<tr>
<th>Metabolic disorders</th>
<th>Hemoglobinopathies</th>
<th>Other Conditions</th>
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<tbody>
<tr>
<td><strong>Amino acid disorders</strong></td>
<td><strong>S, β-thalassemia</strong></td>
<td><strong>Endocrine</strong></td>
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<tr>
<td>Argininosuccinicaciduria</td>
<td><strong>S,C disease</strong></td>
<td>Congenital adrenal hyperplasia</td>
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<tr>
<td>Citrullinemia type I</td>
<td><strong>S,S disease (sickle cell anemia)</strong></td>
<td>Primary congenital hypothyroidism</td>
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<tr>
<td>Classic phenylketonuria</td>
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<td>Homocystinuria</td>
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<td>Maple syrup urine disease</td>
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<td>Tyrosinemia type I</td>
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<tr>
<td><strong>Fatty acid oxidation disorders</strong></td>
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<tr>
<td>(Multiple)</td>
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<tr>
<td><strong>Organic acid disorders</strong></td>
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<td><strong>Miscellaneous Multisystem diseases</strong></td>
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<tr>
<td>(Multiple)</td>
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<td>Biotinidase deficiency</td>
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<td>Classic galactosemia</td>
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<td><em>Critical congenital heart disease</em></td>
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<td></td>
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<td>Cystic fibrosis</td>
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<td></td>
<td></td>
<td>Glycogen storage disease type II</td>
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<td></td>
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<td><em>Hearing loss</em></td>
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<td></td>
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<td>Mucopolysaccharidosis I</td>
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<td></td>
<td></td>
<td>Severe combined immunodeficiencies</td>
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<td></td>
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<td>X-linked adrenoleukodystrophy</td>
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</table>

Newborn Screening

Critical Congenital Heart Defects (CCHD)

- Main screening targets
  - Hypoplastic left heart
  - Pulmonary atresia
  - Tetralogy of Fallot
  - Total anomalous pulmonary venous return
  - Transposition of the great arteries
  - Tricuspid atresia
  - Truncus arteriosus

- Performed via pulse oximetry on right hand and foot >24 hours of life
- Screening passed if pulse oximetry is >95% in both right hand and foot and there is ≤3% difference between the two
- Failed screen should be repeated in 1 hour
- 3 repeated failed screens and/or oximetry ≤90% at any time should be followed up with cardiac echo

Universal Screening for Newborn Hearing Loss

- 50% of newborns with permanent hearing loss have no risk factors
- Common protocol is acoustic emissions (OAE) followed by auditory brainstem response (ABR) if OAE failed
- Infants who do not pass newborn screening need follow-up evaluation prior to 3 months of age
- Targeted screening is recommended for infants who have symptoms consistent with congenital CMV, and/or who are cared for in the NICU, as this subpopulation has a higher risk of CMV

Developmental Dysplasia of the Hip

Infant risk factors (poor predictive values)

- Breech position in 3rd trimester (even if turns vertex)
- Family history of DDH
- History of improper swaddling (with hips extended and adducted)

Evaluate using Ortolani maneuver – “Clunk” is positive (not “click”)

Orthopedic consult recommended at time of diagnosis

Ultrasound – not accurate for 6 weeks

Plain radiographs at 4-6 months of age

Recommend serial exams until walking

1. How much daily vitamin D supplementation do infants need during the first month of life?

A. Breastfed infants should have 400 IU of Vitamin D
B. Infants fed milk-based formula should have 100 IU of Vitamin D
C. Infants fed combined breastmilk and milk-based formula should have 200 IU of Vitamin D
D. Infants fed soy formula do not require any supplementation
Newborn Screening Tests: USPSTF

<table>
<thead>
<tr>
<th>A Recommendation</th>
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<tbody>
<tr>
<td>Ocular Prophylaxis for Gonococcal Ophthalmia Neonatorum</td>
</tr>
</tbody>
</table>
Vitamin D

- Breastmilk contains small amounts of vitamin D
- **ALL** infants should have 400 IU vitamin D/day starting in first few days of life
- Formula-fed infants can stop when taking 1 L or 32 oz. vitamin D-fortified infant formula
- Breastfed infants should continue until on vit D-fortified milk

*Alternatively, breastfeeding mothers can take 6400 IU of vit D

Iron Supplementation

• Breastfed infants – 1 mg/kg/day of a liquid iron supplement from 4 months until 1 year or adequate iron-containing solid foods
• Formula-fed infants – use iron-fortified formula
• Premature infants – begin iron (2 mg/kg/day) in premature infants at 2 weeks of age until 1 year
Feeding and Nutrition

Breastfeeding: Best food, recommended for 1 year

Infant – Benefits
• Protection from infectious disease (UTI, OM)
• Reduction in atopic diseases and obesity
• Protection from SIDS
• Preterm infant: protection from NEC and sepsis

Maternal – Improved health risks
• Decreased breast and ovarian cancer risk
• Decreased cardiovascular disease risk
• Emotional health improvement
• Postpartum weight loss

Few contraindications
• Galactosemia
• Maternal conditions (HIV, TB)
• Medications/chemotherapy
Storage and Handling of Breastmilk

- May be safely stored up to 4-10 hours at room temperature
- May be stored up to 4-8 days in the refrigerator
- May be frozen for up to 3-6 months
- After freezing, should be thawed slowly and not refrozen
Feeding Pearls

• Bottle-feed with iron-containing formula
• Formula at room temperature, not in microwave
  • Vitamin D fortified cow’s milk: beginning at 1 year
  • Soy: not as allergenic, vegetarian
• Starting foods
  • Cereals (4-6 months)
  • Vegetables and fruits, then table foods
  • No honey for first year
Wet diapers ≥6/day

Other Nutrition Pearls

- Regain birth weight by 14 days
- Acceptable weight loss in first 2 weeks of life is <10%
- Double birth weight by 4-6 months, triple at 1 year

Stools 1-3/day
2. Following a scheduled repeat C-section delivery, a term infant has a respiratory rate >60. What is the most common cause of this presentation?

A. Meconium aspiration
B. Pneumonia
C. Respiratory distress syndrome
D. Transient tachypnea of the newborn
Respiratory Issues

• Transient tachypnea of newborn (TTN) respiratory rate >60/min
  • CXR – diffuse parenchymal infiltrates and fluid in the pulmonary fissures
  • 93% resolve in 2 hours; may last for 2 days
  • Most common cause of respiratory distress (>40%)
  • Diagnosis of exclusion
  • Treatment is supportive (oxygen)

• Other common causes
  • Respiratory distress syndrome in premature infants
  • Meconium aspiration
  • Pneumonia

Newborn Respiratory Distress Am Fam Physician. 2015 Dec 1;92(11):994-1002.
Heart Murmurs

• Most are transitional and benign
• Usually not associated with other signs or symptoms
• Pathologic murmurs
  • Grade III or louder
  • Harsh
  • Continuous
  • Abnormal second heart sound
  • Diastolic
• Other signs or symptoms – poor feeding, cyanosis
Physiologic Jaundice

Newborns conjugate bilirubin slower, have higher RBC turnover, and have decreased excretion

**Phase one**
- Term infants – peaks at 3-5 days and lasts about 10 days with a rapid rise of serum bilirubin in range of 3-12 mg/dL
- Preterm infants – lasts for about two weeks, with a rapid rise of serum bilirubin up to 15 mg/dL

**Phase two**
- Bilirubin levels decline to about 2 mg/dL for two weeks, eventually mimicking adult values
- Preterm infants and exclusively breastfed infants – can last more than one month
3. Breastfeeding jaundice is characterized by:

A. Onset after 7 days of life
B. Persistence longer than 1 month of life
C. Insufficient feeds
D. Frequent stools
Neonatal Hyperbilirubinemia

Hyperbilirubinemia – total serum or plasma bilirubin [TB] >95th percentile on the hour-specific Bhutani nomogram

Screening: AAP – recommends universal screening with transcutaneous bilirubin, followed by blood draw or targeted screening

Evaluation and Treatment of Neonatal Hyperbilirubinemia Am Fam Physician. 2014 Jun 1;89(11):873-878
Severe Hyperbilirubinemia

• Severe neonatal hyperbilirubinemia is defined as a TB >25 mg/dL

• Associated with an increased risk for bilirubin-induced neurologic dysfunction (BIND), which occurs when bilirubin crosses the blood-brain barrier and binds to brain tissue

• Acute bilirubin encephalopathy (ABE) – the acute manifestations of BIND

• Kernicterus – the chronic and permanent sequelae of BIND
# Hyperbilirubinemia Risk Factors

<table>
<thead>
<tr>
<th><strong>MATERNAL</strong></th>
<th><strong>NEONATAL</strong></th>
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<tbody>
<tr>
<td>Breastfeeding</td>
<td>Prematurity</td>
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<tr>
<td>Hemolytic disease</td>
<td>Cephalohematoma</td>
</tr>
<tr>
<td>Ethnicity-Asian, Native American</td>
<td>Infrequent feedings</td>
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<tr>
<td>Prematurity</td>
<td>Male gender</td>
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<tr>
<td>Maternal DM</td>
<td>Infections-TORCH</td>
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<tr>
<td>Infection</td>
<td></td>
</tr>
<tr>
<td>Characteristic</td>
<td>Breastfeeding Jaundice</td>
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<td>--------------------------------</td>
<td>-------------------------------------------------------------</td>
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<tr>
<td></td>
<td>Exaggeration of physiologic jaundice</td>
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<tr>
<td>Onset</td>
<td>2-5 days of age</td>
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<tr>
<td>Duration</td>
<td>Transient – up to 10 days</td>
</tr>
<tr>
<td>Feeding Pattern</td>
<td>Insufficient intake of breastmilk</td>
</tr>
<tr>
<td>Stool Pattern</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Other</td>
<td>Interrupting breastfeeding ↓ chances of success</td>
</tr>
</tbody>
</table>
Treatment of Hyperbilirubinemia

- Treat the underlying cause
  - Increase breastfeeding if insufficient

- Risk stratify to determine total bilirubin level at which to initiate interventions
  - Use BiliTool™
  - Phototherapy – decreases the need for exchange transfusion
  - Exchange transfusion used for signs of encephalopathy at any bilirubin level

Constipation Treatments

- Rectal stimulation with thermometer
- Glycerin suppositories
- 100% fruit juice (apple, pear, prune)
- Miralax (polyethylene glycol) if >6 months
- High-fiber foods if older (cereals, fruits, vegetables)
Failure to Stool

- 70% of infants pass meconium in first 12 hours of life
- After 24 hours consider secondary causes
  - Hirschsprung’s
  - Imperforate anus
  - Cystic fibrosis
- Necrotizing enterocolitis
  - Most common cause of acute intestinal obstruction and septic abdomen in neonates
Gastroesophageal Reflux

• Gastroesophageal reflux (GER)
  • Normal exam and weight gain, no symptoms besides spitting up
  • Treatment is reassurance

• Gastroesophageal reflux disease (GERD)
  • Can be characterized by poor weight gain/loss, pain with feeding, chronic cough/wheezing
  • Histamine H2 blockers are an option
  • Poor evidence for PPIs in infants
  • Trial of hydrolyzed formula in formula fed infants/maternal diet changes in breastfed infants

Pyloric Stenosis

- Over first 2-8 weeks of life, boys > girls, white > black/Asian
  - Nonbilious and projectile vomiting
  - Infant appears hungry and feeds often
- Other causes of vomiting
  - Overfeeding
  - Reflux – small amounts of vomiting; normal weight gain
  - Midgut volvulus: bilious vomiting with “double-bubble” sign
  - Gastroenteritis: fever, diarrhea
  - CNS injury: other neurological signs
Infantile Colic

Unknown cause

Uncontrolled crying using the “rule of three”
- Crying more than *three hours per day*
- More than *three days per week*
- For longer *than three weeks*

Appropriate weight gain and normal exam

Treatment
- Elimination of allergens (e.g., cow’s milk, eggs, fish, peanuts, soy, tree nuts, wheat) from the diet of breastfeeding mothers may relieve colic symptoms
- The probiotic *Lactobacillus reuteri* (strain DSM 17938) may reduce crying in breastfeeding but not formula-fed infants with colic.
- Switching formula-fed infants to a hydrolyzed formula may improve colic symptoms.
- Majority outgrow this by 6 months

Nondescended Testes

- More common in premature boys
- Most will descend by 9 months
- Refer by 6 months if still not able to palpate
- If needed, surgery will help preserve fertility
- Testicular atrophy is complication of surgery
- Higher risk of testicular cancer (not eliminated by surgery)

Signs of Sepsis in the Newborn

- Feeding problems
- Temperature instability
- Respiratory distress
- Vomiting/diarrhea
- Abdominal distension
- Jaundice
- Pallor
- Skin rash/petechiae
- Hypotension
- Tachycardia

- Apnea and bradycardia
- Irritability
- High-pitched cry
- Lethargy
- Weak suck
- Convulsions
- Bulging or full fontanelle
Torch Syndrome

Agents

- **Toxoplasmosis**
- **Other infections** (syphilis, Zika, varicella)
- **Rubella** (congenital infection causes deafness, cataracts and cardiac malformations)
- **Cytomegalovirus** (most common infection)
- **Herpes simplex**

Common symptoms

- Lymphadenopathy
- Hepatosplenomegaly
- Hemolytic anemia and thrombocytopenia with jaundice
- Stillbirth and neonatal death

Evaluation

- Complete blood count with platelets
- Liver function tests
- Blood, urine, cerebral spinal fluid cultures (viral, fungal, bacterial)
- Eye and hearing evaluation
- Neuroimaging
Herpes Simplex

Manifests one of three ways: 1/3 each

• Disseminated disease involving multiple organs, primarily liver and lungs (60% mortality)
• Localized central nervous system disease
• Localized to skin, eyes, and mouth

Treatment

• IV acyclovir 10-20 mg/kg q8 hours (premie 10 mg/kg) for 2-3 weeks
Hepatitis B

• HBsAg+ mother
  • Hepatitis B immune globulin within 12 hours of birth
  • Hepatitis B vaccine within 12 hours

• Mother’s status unknown
  • Hepatitis B vaccine given within 12 hours of age
  • Mother tested for Hepatitis B, and if positive, HBIG given as soon as possible (prior to 1 week)
Congenital Zika Syndrome

Differentiating features

- Severe microcephaly with partially collapsed skull
- Thin cerebral cortices with subcortical calcifications
- Macular scarring and focal pigmentary retinal mottling
- Congenital contractures
- Marked early hypertonia with symptoms of extrapyramidal involvement
4. What advice would you give parents to reduce the risk of death from sudden infant death syndrome (SIDS) in their infant?

A. Stop breastfeeding
B. Avoid exposure of the infant to second-hand smoke
C. Place baby in the prone position for sleep
D. Discourage the use of a pacifier
Sleep – AAP Recommendations

• Back to sleep for every sleep
• Skin-to-skin care for at least the first hour of life for healthy newborns
• Firm, safe sleep surface
• Breastfeeding recommended
• Return infant to own bed after breastfeeding
• Avoid overheating and head coverings

• “It is recommended that infants sleep in the parents’ room, close to the parents’ bed, but on a separate surface designed for infants, ideally for the first year of life, but at least for the first 6 months”
• Discontinue swaddling when shows signs of rolling over
• No naps in car seats, strollers

SIDS and Other Sleep-Related Infant Deaths: Updated 2016 Recommendations for a Safe Infant Sleeping Environment
TASK FORCE ON SUDDEN INFANT DEATH SYNDROME Pediatrics Nov 2016, 138 (5) e20162938; DOI: 10.1542/peds.2016-2938
Sudden Infant Death Syndrome (SIDS)
(subcategory of Sudden Unexpected Infant Deaths)

- Peak incidence at 2-3 months of age
- Increased risk associated with
  - Prone position
  - African-Americans, Native and Alaskan American ethnicity
  - Bed sharing
  - Cigarette smoke exposure
- Protective → pacifiers, fans, breastfeeding
5. The majority of failure to thrive cases in infants is due to:

A. Celiac disease
B. Malabsorption syndrome
C. Hyperthyroidism
D. Inadequate caloric intake
Failure to Thrive

- Inadequate physical growth diagnosed by observation of growth over time using standard growth chart
- Occurs in 5-10% primary care practices
- Weight falls below the 5th percentile, or crosses two major percentile lines
- Weight for length less than 75% of the median
- Growth charts at [www.cdc.gov](http://www.cdc.gov) or [www.who.int/childgrowth](http://www.who.int/childgrowth)
- Neglect is most common form of child abuse (60%)

Failure to Thrive: an Update Am Fam Physician. 2011 Apr 1;83(7):829-834.
Failure to Thrive Etiology

Inadequate caloric intake
- Inadequate or inappropriate feeding by parents
- Poverty, neglect
- Mechanical feeding problems

Inadequate absorption
- Celiac disease or milk allergy
- Cystic fibrosis
- Vitamin or mineral deficiencies
- Biliary atresia or liver disease

Increased metabolism
- Hyperthyroidism
- Chronic infection (HIV)
- Hypoxemia/congenital cardiac disease

Defective utilization
- Genetic abnormalities (Down’s)
- Metabolic disorder (storage diseases)
- Congenital infections

Psychosocial
Failure to Thrive Treatment

- High-calorie diet (150% of recommended)
- Feeding behaviors
- Hospitalization
- Referral – multidisciplinary interventions with home nursing visits (SORA)
- Parents may need treatment
Lacrimal Duct Obstruction

- Persistent tearing, usually unilateral
- Can try “milking” the duct
- Antibiotics or steroids are not indicated
- Usually resolves by 6 months
- Treat if not resolved in 1 year – referral to ophthalmologist
Positional Plagiocephaly

- Unilateral occiput flattening
- Due to continuous supine positioning
- Fixed by routine switching of head position and supervised “tummy time” daily
- Check for torticollis
Frequent Flyers

- Hip dysplasia screening
- Breastfeeding jaundice and breastfeeding in general
- Vitamin D
- Newborn sepsis – causes and treatment
- SIDS prevention
Answers

1. A
2. D
3. C
4. B
5. D

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Learning Objectives

1. Review the physiology of Acute Coronary Syndrome and how it is classified
2. Treatment approaches to Acute Coronary Syndrome and post-MI
3. Review the guidelines for statin treatment for both treatment and prevention of cardiovascular disease
Acute Coronary Syndrome (ACS)

- STEMI (ST-elevation myocardial infarction)
- NSTE-ACS
  - Unstable angina (UA)
  - Non-ST-elevation myocardial infarction (NSTEMI)

Etiology: reduced myocardial perfusion due to reduced \( \text{O}_2 \) supply (more common) \textit{or} increased \( \text{O}_2 \) demand
Plaque Rupture
Most common cause of ACS

- Coronary atherosclerotic plaque rupture occurs when the fibrous cap ruptures
  - Nearly 50% at sites with <50% luminal narrowing

- Thrombus develops on top of the disrupted plaque
- Statins, exercise and ACE inhibitors stabilize the fibrous cap of a coronary atheroma, reducing the likelihood of rupture
Acute Coronary Syndrome

Other etiologies

- Spasm at site of atherosclerotic plaque
- Normal coronary arteries with spasm
  - Prinzmetal’s angina (may have transient ST elevation)
  - Arterial inflammation (Kawasaki disease)
- Cocaine-induced (treat with NTG and benzodiazepines; avoid beta-blockers)
Acute Coronary Syndrome

- NSTE-ACS (Unstable Angina and NSTEMI) have similar clinical presentations but differ in severity:
  - NSTEMI and sometimes UA cause ST-segment depression or prominent T-wave inversion but not ST-segment elevation on EKG
  - NSTEMI = Ischemia severe enough to cause myocardial injury with release of biomarkers (troponin)

- STEMI has ST-segment elevation on EKG (with Q wave later)
  - Warrants immediate reperfusion therapy
Troponin (I or T)
Biomarker of Choice for ACS

- High sensitivity and specificity for myocardial necrosis
- Detected 3-6 hours after the onset of ischemia and remains elevated for 7-14 days post-MI
- Normal levels exclude myocardial infarction, but do not exclude unstable angina
- Non-ischemic causes that elevate troponin levels:
  - Chronic kidney disease
  - Heart Failure
  - Pulmonary embolism
  - Sepsis
  - Stroke
  - Myocarditis
  - Cardiac toxicity from chemotherapy
  - Subarachnoid hemorrhage
  - Amyloidosis, Sarcoidosis

CK-MB and myoglobin no longer used in ACS
1. A 52 yo man presents with 45 minutes of squeezing substernal chest pressure radiating to his left arm. EKG from a physical two months ago was normal. This is his current EKG:
1. His history and EKG are most consistent with which one of the following?

A. Esophageal spasm
B. ST segment elevation myocardial infarction (STEMI)
C. Non-ST segment elevation – Acute Coronary Syndrome
D. Pericarditis
EKG: ST segment depression (not elevation) in inferior and lateral precordial leads (NSTE-ACS or NSTEMI)
2. A 72 yo man with NSTE-ACS (NSTEMI) presents to your rural emergency room with onset of pain two hours ago. What is an appropriate immediate intervention?

A. Intravenous metoprolol  
B. Intravenous Fibrinolysis within 2 hours  
C. Oral Enteric-coated aspirin 81 mg  
D. Oral Chewable aspirin (162-325 mg)
Management of NSTE-ACS (NSTEMI)

Ischemia-guided strategy: (lower risk patients, preference for low intervention)
1. Aspirin (non-enteric coated, chewable)
2. P2Y$_{12}$ inhibitor (clopidogrel, ticagrelor)
3. Anticoagulation (heparin)

Early invasive strategy: (higher risk patients)
1. Aspirin (non-enteric coated, chewable)
2. P2Y$_{12}$ inhibitor (clopidogrel, ticagrelor)
3. Anticoagulation (heparin)
4. Consider Glycoprotein IIb/IIIa receptor blockers [Tirofiban (Aggrastat), Eptifibatide (Integrilin), Abciximab (ReoPro)] before invasive treatment
Management of NSTE-ACS (NSTEMI)

Invasive strategy in higher risk patients

- Symptoms or ischemia despite adequate medical therapy
- Previous PCI or CABG, unless prior coronary angiography data indicate that no further revascularization is feasible
- Evidence of significant cardiac disease (EF <40%, large anterior or multiple perfusion defects or wall motion abnormalities on echocardiography, high-risk TIMI or GRACE scores, Duke treadmill score ≤−11, Markedly elevated troponin levels, ventricular arrhythmias)

Fibrinolytic therapy has no role in NSTE-ACS

ST-elevation MI (STEMI)
Q waves and ST-segment elevation with T-wave inversion
Here, in the anterior leads ($V_2 - V_5$)
ACS: STEMI

• **ST segments**
  - Elevation occurs immediately post plaque-rupture and is consistent with myocardial *injury*.
  - Resolution of ST elevation suggests reperfusion.
  - Persistent ST elevation may be seen with aneurysm formation.
  - ST depression indicates myocardial *ischemia*.

• **Q waves**
  - Develop ~12 hours post plaque-rupture, and are indicative of (electrically) dead myocardium (MI).
  - Typically permanent.
ACS: Anatomy and EKG

- **Anterior/anteroseptal**
  - LAD (Left Anterior Descending)
  - Leads V₁ – V₄

- **Lateral**
  - Circumflex Artery
  - Leads V₅ – V₆

- **Inferior**
  - RCA (Right Coronary Artery)
  - Leads II, III, aVF

*By Bruce Blaus on Wikipedia*
https://commons.wikimedia.org/w/index.php?curid=29140356
Management of ST-Elevation Myocardial Infarction (STEMI)
2014 AHA/ACC Guidelines

• Reperfusion as quickly as possible, within 12 hours (if no contraindications)
• Percutaneous coronary intervention (PCI) is preferred
• Fibrinolytic therapy is indicated
  • If onset of symptoms plus time to transport to a PCI-capable hospital is more than 12 hours
  • If time from first medical contact at the non-PCI capable hospital to device time at PCI-capable hospital is more than 2 hours
Percutaneous Coronary Intervention (PCI) With Stent

Bare metal stent (BMS)
- Bare metal acts as foreign body, increasing risk of in-stent *thrombosis*
- Endothelialization may progress to in-stent *stenosis*

Drug-eluting stent (DES)
- Delay endothelialization, maintaining bare metal longer and reduce the rate of in-stent stenosis
- Sirolimus (Cypher), tacrolimus (Mahoroba), paclitaxel (Taxus)
3. A 55 yo male is a former smoker with type 2 diabetes mellitus, hypertension, and hyperlipidemia. He had an ST-elevation myocardial infarction 2 years ago treated with a drug-eluting stent. He is currently asymptomatic with unremarkable physical exam, Hgb A1c of 6.8%, blood pressure 130/78 mm Hg and heart rate 65 beats/min. His medications include metformin 2000 mg daily; metoprolol succinate 25 mg daily; losartan/hydrochlorothiazide 50 mg/12.5 mg daily; rosvastatin 20 mg daily; clopidogrel 75 mg daily; and aspirin 81 mg daily.

He would like to reduce the number of medications he is taking. You agree and explain that guidelines recommend that he may stop taking which of the following?

A. Aspirin
B. Clopidogrel
C. Aspirin and clopidogrel
D. Metformin
Dual Antiplatelet Therapy (DAPT)

Aspirin 81 mg plus P2Y$_{12}$ inhibitor: clopidogrel (Plavix), prasugrel (Effient), ticagrelor (Brilinta)

In patients with ACS treated with BMS or DES implantation, DAPT should be given for at least 12 months (Class I). After one year, may stop P2Y$_{12}$ inhibitor but continue aspirin indefinitely.

If stents placed for stable coronary artery disease (scheduled catheterization rather than ACS)

• After BMS implantation, DAPT for at least 1 month (Class I).
• After DES implantation, DAPT for at least 6 months (Class I).
Clopidogrel (Plavix)

• Delayed onset of antiplatelet activity compared to aspirin; if used alone need to first treat with heparin or glycoprotein IIb/IIIa inhibitor
• Comparable to aspirin in reducing ischemic events (CAPRIE)

• Loading dose 600 mg before PCI then continued at 75 mg/day, along with aspirin (DAPT): better than aspirin alone (CURE).
• Metabolized to active form by cytochrome p450 enzyme CYP2C19; poor metabolizers risk therapeutic failure due to non-activation.
• Currently, prasugrel and ticagrelor have no genetic links to response and are “reasonable” alternatives.
Dual Antiplatelet Therapy (DAPT) (aspirin plus a P2Y$_{12}$ inhibitor)

Extending DAPT *beyond one year* following a myocardial infarction decreases the risk of a major cardiovascular event without increasing the likelihood of a major bleeding event, especially with clopidogrel (LOE 1a).

This treatment “*may be reasonable*” (SOR IIb).

*Am Heart J* 2016;176:36-43
CABG
(Coronary Artery Bypass Graft)

Improved survival for
- Left main coronary artery stenosis
- 3-vessel disease with abnormal left ventricular function (LVEF <50%)
- 2- or 3-vessel disease with >75% stenosis of the proximal left anterior descending artery (LAD).
- Patients with diabetes have better 8-year survival with CABG than with PTCA.
- After CABG, DAPT for at least one year to reduce graft occlusion

Acutely
- Use only if coronary anatomy is not suitable for PCI
4. A 52 yo man has an acute myocardial infarction for which he had cardiac catheterization and percutaneous coronary intervention with placement of two drug-eluting stents. Echo shows an EF of 35%.

He is started on numerous medications at discharge. Which one of the following medications is more useful for symptom control than for improving mortality for this patient?

A. Atorvastatin (Lipitor)  
B. Clopidogrel (Plavix)  
C. Lisinopril (Prinivil, Zestril)  
D. Metoprolol tartrate (Lopressor)  
E. Nitroglycerin
Post-MI Survival

- ACE-inhibitors, β-blockers, statins, and ASA improve survival post MI.
- Dual anti-platelet therapy for at least a year if stents or grafts placed.
- Nitrates, calcium-channel blockers, and digoxin may improve symptoms but do not affect survival.
Left Bundle Branch Block

Can mask the EKG changes of lateral, inferior or anteroseptal ischemia or infarction

- Old guidelines (2004): LBBB with symptoms of MI managed as STEMI
- New guidelines (2013): LBBB often not new and often not due to ACS, so use more judicious approach. Determine need for reperfusion with clinical picture, troponin, echo, and EKG interpretation with Sgarbossa criteria.
Sgarbossa Criteria

1. ST segment elevation ≥1 mm that is in the same direction (concordant) as the QRS complex in any lead – score 5
2. ST segment depression ≥1 mm in any lead from V1 to V3 – score 3
3. ST segment elevation of ≥5 mm that is discordant with the QRS complex – score 2

Score of ≥3 highly specific for ACS (few false positives), but much less sensitive.
Pericarditis – Diffuse ST elevation

Keep this EKG in mind for the next question…
5. A 45 yo man complains of acute, sharp chest pain relieved by leaning forward. On examination, you hear a pericardial friction rub. The EKG shows diffuse ST elevation. Which of the following is the most appropriate treatment?

A. Nitrates
B. Beta blockers
C. Glucocorticoids
D. Adenosine
E. NSAIDs
Pericarditis

• Common cause of chest pain in young adults, usually viral or idiopathic cause.
• Relieved is typically by sitting forward.
• Pain is due to inflammation.
• Treatment is NSAIDs (such as indomethacin or high-dose aspirin (2-4 g/day).
Hyperlipidemia
2018 ACC/AHA Cholesterol Treatment Guidelines

• 2013 Guidelines were a paradigm shift (did not focus on LDL level) and emphasized lack of long-term RCT outcomes and lack of safety/side effect considerations.

• 2018 did not change the core recommendations, but reconsidered LDL levels and non-statin therapies.

Cholesterol Treatment Guidelines
Four statin benefit groups in both 2013 and 2018 Guidelines

1. Atherosclerotic cardiovascular disease (acute coronary syndrome, past myocardial infarction, angina, coronary or other arterial revascularization, past stroke, TIA, or peripheral artery disease)

2. Primary elevations of LDL $\geq 190$ mg/dL (usually familial)

3. Diabetes age 40-75 yrs and LDL $\geq 70$ mg/dl

4. Without clinical ASCVD or diabetes, age 40-75, LDL 70-189, and estimated 10-year ASCVD risk of $\geq 7.5\%$
Selecting Statin Intensity

1. Individuals with clinical ASCVD
   High-intensity or maximally tolerated statin. Goal: lower LDL by ≥50%

2. Primary elevations of LDL ≥190 mg/dL (usually familial)
   High-intensity statin

3. 40-75 yrs with diabetes and LDL ≥70 mg/dl
   Moderate or high-intensity statin. Goal: lower LDL by ≥50%

4. 40-75 yrs without clinical ASCVD or diabetes and LDL ≥70, and estimated 10-year ASCVD risk of ≥7.5%
   Moderate intensity statin if a discussion of options favors statins
High-intensity Statins  
(>50% LDL-C reduction)  
Atorvastatin 40-80 mg  
Rosuvastatin 20 mg

Moderate-intensity Statins  
(30% to <50% LDL-C reduction)  
Atorvastatin 10-20 mg  
Rosuvastatin 5-10 mg  
Simvastatin 20-40 mg  
Pravastatin 40-80 mg  
Lovastatin 40 mg  
Fluvastatin 40 mg bid
ASCVD Risk Calculators
(use to calculate the 10-year risk for atherosclerotic cardiovascular disease in patients without clinical ASCVD, diabetes, or familial hyperlipidemia)

Information used in ASCVD risk calculators

<table>
<thead>
<tr>
<th>Age</th>
<th>Total cholesterol</th>
<th>Systolic blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>HDL cholesterol</td>
<td>Blood pressure lowering medication use</td>
</tr>
<tr>
<td>Race</td>
<td>Diabetes status</td>
<td>Smoking status</td>
</tr>
</tbody>
</table>

http://tools.acc.org/ASCVD-Risk-Estimator/
http://my.americanheart.org/cvriskcalculator
For Patients Without Clinical ASCVD

Cholesterol Treatment Guideline vs. USPTSF Guideline

**CTG 2018:** calculate 10 yr CV risk and if >7.5%, have a statin discussion

**USPSTF:** for ages 40-75 with one risk factor...

[Dyslipidemia (LDL > 130 or HDL < 40), Diabetes, Smoking, Hypertension]

...calculate 10 yr CV risk and

if >10% start statin (low-moderate dose)

if 7.5-10% selectively start statin (low-moderate dose)

Insufficient evidence re: benefits and harms of initiating statin use in adults >75 years.

Statin Use for Primary Prevention of Cardiovascular Disease in Adults. USPSTF Recommendation. JAMA 16;316(19)
Risk-enhancing Factors in Statin Decision

- Family history of premature ASCVD (male <55, female <65)
- Persistently elevated LDL levels ≥ 160 mg/dl
- Metabolic Syndrome
- Chronic kidney disease
- History of preeclampsia or early menopause (age ≤40)
- Chronic inflammatory disorders
- High-risk ethnic groups (South Asian)
- Triglycerides ≥175 mg/dl
- Highly sensitive C-reactive protein >2.0 mg/L.
- Ankle-brachial index (ABI) <0.9
- Lipoprotein (a) ≥50 mg/dl
- Apolipoprotein B ≥130 mg/dl

- Also consider lifestyle changes, side effects, cost, and patient preference
Coronary Artery Calcium (CAC) Testing

New in 2018 Guidelines

In select adults 40-75 yo without diabetes and with LDL ≥70 mg/dl and 10-year ASCVD risk of ≥7.5% to 19.9%, consider measuring CAC to add to the decision discussion.

- CAC = 0, may withhold statins
- CAC 1-99 and age ≥55, reasonable to start statin
- CAC ≥100 or ≥75th percentile, reasonable to start statin
Non-statin Therapies

New in 2018 Guidelines

- In very high-risk ASCVD and LDL still ≥70 mg/dl on maximally tolerated statin, consider adding ezetimibe.

- If LDL still ≥70 mg/dl, consider adding a PCSK9 inhibitor.
PCSK9 Inhibitors

• Proprotein convertase subtilisin/kexin type 9 (PCSK9) is a natural protein that binds/destroys LDL receptors in liver, preventing them from removing LDL-C.

• Loss-of-function mutation in the PCSK9 gene is associated with significantly reduced levels of LDL-C and a lower lifetime risk for cardiovascular disease.

• Mutations of PCSK9 gene identified with familial hypercholesterolemia.

• Injectable monoclonal antibodies bind to PCSK9 allowing the receptors to continue clearing LDL-C: evolocumab (Repatha), alirocumab (Praluent).

• 2018 Guidelines: “these drugs are of low value due to their high cost”
Statin-related Myopathy

- Myalgia (muscle complaints without CK elevations)
- Myositis (muscle complaints with CK elevations)
- Rhabdomyolysis (elevated CK levels, elevated creatinine)

- Risk increased in liver or renal failure, hypothyroidism, diabetes mellitus
- Risk increased with macrolides, azoles, cyclosporine, gemfibrozil, niacin, HIV protease inhibitors, nefazodone, verapamil, diltiazem, and amiodarone.
- Risk increased with drinking more than a quart of grapefruit juice a day.

- Routine monitoring of CK not required.
- Discontinue statin if CK more than 10 times upper limit of normal (ULN)
Answers

1. C
2. D
3. B
4. E
5. E
Well-Child Care and Adolescent Health Issues

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Program Director and Chair
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Wilmington, North Carolina
Disclosure Statement

It is the policy of the AAFP that all individuals in a position to control content disclose any relationships with commercial interests upon nomination/invitation of participation. Disclosure documents are reviewed for potential conflicts of interest. If conflicts are identified, they are resolved prior to confirmation of participation. Only participants who have no conflict of interest or who agree to an identified resolution process prior to their participation were involved in this CME activity.

All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.
Learning Objectives

1. Discuss components of routine well-child care
2. Review USPSTF recommended screening guidelines for children and adolescents
3. Identify and manage common issues that present at well-child and adolescent visits
The Well-Child Visit

• History from parents
• Growth and development (milestones)
• Physical exam
• Health screenings (vision, fluoride, lead)
• Parental guidance: sleeping, feeding, behavior, safety, health, parenting
• Immunizations

Bright Futures 2017 Recommendations for Preventive Pediatric Health Care
1. The developmental examination on a 6-month-old boy reveals an infant who follows past midline, laughs, turns toward your voice, and has clenched fists. With these findings you:

A. Schedule the next well-child exam for 9 months
B. Check a CPK aldolase
C. Refer to a specialist for further evaluation
D. Recommend a muscle biopsy
## Development

<table>
<thead>
<tr>
<th>1 Month</th>
<th>4 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Looks at face</td>
<td>• Holds head at 90°</td>
</tr>
<tr>
<td>• Responds to voice</td>
<td>• Laughs</td>
</tr>
<tr>
<td>• Moves extremities equally</td>
<td>• Follows past midline</td>
</tr>
<tr>
<td>• Lifts head</td>
<td>• No persistent fist clenching</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 Months</th>
<th>6 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vocalizes</td>
<td>• No head lag</td>
</tr>
<tr>
<td>• Smiles</td>
<td>• Bears weight on legs</td>
</tr>
<tr>
<td>• Follows to midline</td>
<td>• Rolls over</td>
</tr>
<tr>
<td>• Responds to sounds</td>
<td>• Turns toward voice</td>
</tr>
<tr>
<td></td>
<td>• Transfers hand to hand</td>
</tr>
</tbody>
</table>
## Development

<table>
<thead>
<tr>
<th>9 Months</th>
<th>1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sits without support</td>
<td>• Stands alone</td>
</tr>
<tr>
<td>• Stands holding on</td>
<td>• Walks with help</td>
</tr>
<tr>
<td>• Cruises</td>
<td>• Babbles</td>
</tr>
<tr>
<td>• Imitates speech/single syllables</td>
<td>• Specific dada mama</td>
</tr>
<tr>
<td>• Thumb finger grasp</td>
<td>• Responds to “no”</td>
</tr>
<tr>
<td>• Dada, mama</td>
<td>• Pincer grasp</td>
</tr>
<tr>
<td>• Peek-a-boo</td>
<td>• Waves bye-bye</td>
</tr>
<tr>
<td></td>
<td>• Bangs 2 blocks together</td>
</tr>
<tr>
<td>Development</td>
<td>18 Months</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
| 18 Months   | • Walks backward  
             | • Knows 1 body parts  
             | • Drinks from cup  
             | • Imitates household chores  
             | • Speaks 3-6 words  
             | • Scribbles  
             | • Stacks 2 blocks  
             | • Understands simple commands | • Kicks ball  
             | • Takes off clothes  
             | • Speaks 2 words together  
             | • Speaks 50 words  
             | • Understands 2-part command  
             | • Uses own name  
             | • Stacks 4 blocks  
             | • Knows 6 body parts |
# Development

<table>
<thead>
<tr>
<th>3 Years</th>
<th>4 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Washes hands</td>
<td>• Dresses self</td>
</tr>
<tr>
<td>• Draws vertical line</td>
<td>• Plays games (tag)</td>
</tr>
<tr>
<td>• Understands “tired, hungry”</td>
<td>• Speech understandable</td>
</tr>
<tr>
<td>• Names four pictures</td>
<td>• Names four colors</td>
</tr>
<tr>
<td>• Throws ball</td>
<td>• First and last name</td>
</tr>
<tr>
<td>• Pedal tricycle</td>
<td>• Up and down stairs alternating feet</td>
</tr>
<tr>
<td>• Asks “Why?”</td>
<td>• Balances each foot 2 sec</td>
</tr>
<tr>
<td></td>
<td>• Draws a circle</td>
</tr>
</tbody>
</table>
Autism Screening

• Autism-specific tool should be administered at 18- and 24-month visits (Modified Checklist for Autism in Toddlers – MCHAT) – recommended by AAP, USPSTF I recommendation
• Autism is more prevalent in siblings of autistic children
• Interventions have been shown to improve outcomes

Childhood Screening Tests: USPSTF

Strength of Recommendation: A

- NONE!!!!!
Childhood Screening Tests: USPSTF

Strength of Recommendation: B

• Oral fluoride supplementation if water supply deficient
  • Beginning at 6 months through age 16
• Fluoride application starting at tooth eruption
  • To age 5 years
• Vision screening for all children once between ages 3-5 to detect amblyopia or its risk factors
• Obesity screening – ages 6-17
• Skin cancer prevention counseling – ages 6 months – 24 years
Dental

- Dental caries are most common chronic disease of young children
- Brush twice with fluoride toothpaste daily as soon as teeth erupt
  - “Rice-sized” amount of toothpaste until age 2, then “pea-sized” amount
- Floss as soon as teeth are touching
- Dental home no later than age 3

U.S. Preventive Services Task Force Prevention of Dental Caries in Children from Birth Through Five Years of Age: Recommendation Statement Am Fam Physician.2015Feb1;91(3)
# Dietary Fluoride Supplementation Schedule

American Academy of Pediatric Dentistry

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;0.3 ppm F</th>
<th>0.3-0.6 ppm F</th>
<th>&gt;0.6 ppm F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth to 6 months</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6 months to 3 years</td>
<td>0.25 mg</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3-6 years</td>
<td>0.50 mg</td>
<td>0.25 mg</td>
<td>0</td>
</tr>
<tr>
<td>6 years up to at least 16 years</td>
<td>1.00 mg</td>
<td>0.50 mg</td>
<td>0</td>
</tr>
</tbody>
</table>

[http://www.aapd.org/media/policies_guidelines/g_fluoridetherapy.pdf](http://www.aapd.org/media/policies_guidelines/g_fluoridetherapy.pdf)
Vision

Refer for

• Visual acuity <20/50 age 3, <20/30 age 5
• Asymmetry at any age
• Strabismus (“lazy eye”) >3-6 mo
• Any abnormal red reflex

• Amblyopia due to strabismus is the leading cause of monocular vision loss in children

AAP recommends screening yearly at ages 3-5, “instrument-based” at 12 and 24 months
Obesity Screening

• Screen for obesity in children and adolescents age >6 years and offer/refer them to comprehensive, intensive behavioral interventions to promote improvements in weight
  – 17% of children and adolescents ages 2 to 19 years in the United States have obesity (defined as an age- and sex-specific body mass index [BMI] in the ≥95th percentile).
  – Almost 32% of children and adolescents are overweight (defined as an age- and sex-specific BMI in the 85th to 94th percentile) or have obesity.
Obesity Screening

Overall rate of child and adolescent obesity has stabilized over the last decade after increasing steadily for three decades except in certain populations, such as African American girls and Hispanic boys.

The proportion of children who meet the criteria for severe obesity (class II obesity [BMI ≥35 kg/m\(^2\) or ≥120% of the 95th percentile] or class III obesity [BMI ≥40 kg/m\(^2\) or 140% of the 95th percentile]) also continues to increase.
Obesity

Associated morbidity
- Mental health and psychological issues
- Asthma
- Obstructive sleep apnea
- Orthopedic problems
- Adverse cardiovascular and metabolic factors (e.g., high blood pressure, abnormal lipid levels, and insulin resistance).

Obesity

• Children and adolescents may also endure weight-based victimization (e.g., teasing and bullying).

• Obesity in childhood and adolescence may continue into adulthood and lead to cardiovascular outcomes or other obesity-related morbidity, such as diabetes.

Risk increases if active <1 hour a day and/or drink >5 cans soda a day

Childhood Screening Tests: USPSTF
Strength of Recommendation: D

• NONE!!!
Childhood Screening Tests: USPSTF

Strength of Recommendation: I

• Screening for lead in children ages 1-5
• Primary care interventions to prevent child maltreatment
• Routine risk assessment for dental disease
• Primary care-based, behavioral interventions to prevent illicit drug use
• Routine iron screening or supplementation for asymptomatic children ages 6-12 months at average risk (AAP recommends)
Childhood Screening Tests: USPSTF

Strength of Recommendation: I

- Routine screening for lipid disorders up to age 20 (AAP recommends)
- Routine screening for primary hypertension to prevent disease
- Primary care-based, behavioral counseling to promote physical activity
- Counseling for proper use of motor vehicle restraints
- Depression screening ages 7-11
- Use of brief formal screening instruments to detect speech/language delay up to age 5 (AAP recommends)
- Vision screening before age 3
# Differences Between USPSTF and AAP

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>USPSTF</th>
<th>AAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening for anemia ages 6-12 months</td>
<td>I Recommendation</td>
<td>Universal screening at 12 months</td>
</tr>
<tr>
<td>Screening for lipids up to age 20</td>
<td>I Recommendation</td>
<td>Universal screening once from 9-11 years and again from 17-21</td>
</tr>
<tr>
<td>Use of brief formal screening instruments to detect speech/language delay up to age 5</td>
<td>I Recommendation</td>
<td>Developmental and autism screening at specified intervals</td>
</tr>
</tbody>
</table>
Anemia

• Affects 50% of children under age of 5 worldwide
• Microcytic anemia – most common
  – Causes: *Iron deficiency*, chronic disease, lead poisoning, thalassemia
  – Management: Treat presumptively as iron deficiency, & confirm at least a 1 g/dL increase in Hgb 1 month after starting iron therapy
• Normocytic anemia
  – Causes: Chronic disease, hemolysis, bone marrow disorders, acute blood loss, sickle cell disease, RBC membrane and enzyme defects
• Macrocytic anemia – rare
  – Causes: Vitamin B12/folate deficiencies, hypothyroidism, congenital aplasia

2. A mother brings her 9-month-old daughter in for routine care. Which of the following should be addressed at this visit?

A. Starting table food  
B. Sleeping on back  
C. Hearing test  
D. Toilet training
<table>
<thead>
<tr>
<th>2-4 weeks</th>
<th>6 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Issues: sleep (position), feeding, crying, growth</td>
<td>• Issues: introducing solid food</td>
</tr>
<tr>
<td>• Safety: car seats, avoid exposure to smoking, don’t shake baby</td>
<td>• Safety: child-proofing house, poisons, don’t use walkers, car seats</td>
</tr>
<tr>
<td>2 Months</td>
<td>9 Months</td>
</tr>
<tr>
<td>• Issues: sleep (position), feeding, growth</td>
<td>• Issues: introducing table food, using cup, teeth care</td>
</tr>
<tr>
<td>• Safety: burns, sun exposure, car seats, avoid exposure to smoking, don’t shake baby</td>
<td>• Safety: drowning, burns, car seats</td>
</tr>
<tr>
<td>4 Months</td>
<td></td>
</tr>
<tr>
<td>• Issues: introducing solid food, sleep, talking to baby</td>
<td></td>
</tr>
<tr>
<td>• Safety: falling, car seats</td>
<td></td>
</tr>
</tbody>
</table>
## Parental Guidance

<table>
<thead>
<tr>
<th>12 Months</th>
<th>2 Years</th>
</tr>
</thead>
</table>
| • Issues: weaning, brushing teeth, playing with baby  
  • Safety: child-proofing house, choking, car seats, drowning risk | • Issues: talking with child, toilet training, TV, games, language  
  • Safety: Car seats, guns, lifejackets/drowning risk, traffic, poisons, matches |

<table>
<thead>
<tr>
<th>15 Months</th>
<th>3 Years</th>
</tr>
</thead>
</table>
| • Issues: nutrition, feeding self, development  
  • Safety: falls, car seats, drowning risk | • Issues: nutrition, hand-washing, talking, TV, peers, dentist  
  • Safety: home safety, car seat, helmets |

<table>
<thead>
<tr>
<th>18 Months</th>
<th></th>
</tr>
</thead>
</table>
| • Issues: nutrition, TV, toilet-training, language development  
  • Safety: guns, lifejackets/drowning risk, traffic, poisons, matches |                           |
Discipline

• **Age-appropriate techniques**
  - Positive reinforcement to increase appropriate behavior
  - Extinction (planned ignoring) for most low-level problematic behaviors
  - Time-out from reinforcement for more problematic behaviors.
  - Written contracting (charts)
  - Parents should be cautioned about the use of punishment (e.g., scolding, taking away privileges or possessions) because it suppresses behavior only temporarily.

• **Spanking – commonly used, not recommended**
  - Associated with increased aggression in preschool/school-aged children
  - Children less than 18 months rarely understand connection between behavior and punishment
  - May make adolescence discipline difficult
  - Related to negative parent-child relationships, antisocial behavior, lower cognitive ability, lower self-esteem, mental health problems, and increased risk of physical abuse

<table>
<thead>
<tr>
<th>SCREEN TIME</th>
<th>&lt;18 mos</th>
<th>18 to 24 mos</th>
<th>2 to 5 years</th>
<th>≥6 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Avoid use of screen media other than video-chatting</td>
<td>• Parents should choose high-quality programming, and watch it with their children to help understand what they're seeing</td>
<td>• Limit screen use to 1 hour/day of high-quality programs • Parents view media with children to help understand what they see and apply it to world around them</td>
<td>• Place consistent limits on time and types of media • Media should not take the place of adequate sleep, physical activity and other behaviors essential to health</td>
<td></td>
</tr>
</tbody>
</table>

Media and Young Minds Pediatrics Oct 2016, e20162591; DOI: 10.1542/peds.2016-2591
Toilet Training

• Child is ready to toilet train when
  • Able to pull clothes up and down
  • Able to imitate parents
  • Can follow 2-step command
  • Expresses interest in toilet training (usually ages 2-3)
3. At his well-child check, a 5-year-old boy is noted to have occasional bedwetting. You advise the parents that:

A. This problem indicates abuse or emotional problems
B. This problem is rare in absence of a family history
C. This problem rarely resolves spontaneously
D. This occurs in 20-25% of boys this age
## Enuresis/Encopresis

<table>
<thead>
<tr>
<th>Enuresis (bedwetting after age 5)</th>
<th>Encopresis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Incidence is higher if parent had enuresis</td>
<td>• More common in boys</td>
</tr>
<tr>
<td>• Higher in boys than girls</td>
<td>• Most common cause is constipation</td>
</tr>
<tr>
<td>• Usually resolves on its own</td>
<td>• Increase fiber</td>
</tr>
<tr>
<td>• Treatment – alarms, desmopressin</td>
<td>• Start reward system for healthy toileting habits</td>
</tr>
</tbody>
</table>

Constipation

- Most common cause is FUNCTIONAL
- Daily use of polyethylene glycol more effective than lactulose, senna, magnesium hydroxide in head to head studies
- No adverse effects noted
- 0.3 g/kg/day too 1.5 g/kg/day
- Fiber supplementation has no effect

Sleep

- 6 months: majority sleep through the night
- Nightmares during the second half of the night
- Sleepwalking, night terrors during the first half
- Benign nocturnal limb pain within hours of falling asleep
  - Ages 4-6 in knees, shins, calves (sometimes thighs)
- Sleeplessness in child can be major indication of stressors
- Lack of data for insomnia meds in children
- No screens in the bedroom
Unintentional Death Prevention

- Motor vehicle accidents: #1 cause of unintentional death ages 0-18
- Suffocation: #1 cause ages 0-1 year
- Drowning: #1 cause of unintentional death ages 1-5 years
- Motor vehicle accidents: #1 cause of unintentional death ages 5-18 years
4. What is the most appropriate automobile seating for a 7-year-old who is 50 inches tall?

A. Rear seat, using lap and shoulder belt alone
B. Rear seat in belt-positioning booster seat with lap/shoulder belt
C. Rear seat in forward-facing child seat with 5-point harness
D. Center of rear seat in booster seat with lap belt alone
Car Seats

- Infants/toddlers – rear seat, rear-facing car seat until they reach the maximum weight/height for the seat (at least 2 years)
- Preschool – rear seat, forward-facing car seat with harness until maximum weight/height for the seat
- School aged kids – rear seat, belt-positioning booster seat using lap and shoulder belt until the vehicle’s lap and shoulder seat belt fits properly. (At least 4’9” and over age 8)
- Front seat?? Age 13!

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>9 mos</th>
<th>12 mos</th>
<th>15 mos</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hepatitis B</strong> (HepB)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose</td>
<td></td>
<td></td>
<td>Catch up doses 1 &amp; 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rotavirus</strong> (RV) RV1 (2-dose series); RV5 (3-dose series)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; dose</td>
<td></td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; dose if on 3 dose series</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Diphtheria, tetanus, &amp; acellular pertussis</strong> (DTaP: &lt;7 yrs)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; dose</td>
<td></td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; dose</td>
<td>Catch up doses 1 - 3</td>
<td></td>
<td>←4&lt;sup&gt;th&lt;/sup&gt; dose→</td>
<td></td>
</tr>
<tr>
<td><strong>Haemophilus influenzae type b</strong> (Hib)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; dose</td>
<td>If using 4 dose series give 3&lt;sup&gt;rd&lt;/sup&gt; dose</td>
<td>Catch up doses 3&lt;sup&gt;rd&lt;/sup&gt; or 4&lt;sup&gt;th&lt;/sup&gt; dose, depending on series</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pneumococcal conjugate</strong> (PCV13)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; dose</td>
<td></td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; dose</td>
<td>Catch up doses</td>
<td>←4&lt;sup&gt;th&lt;/sup&gt; dose→</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inactivated poliovirus</strong> (IPV: &lt;18 yrs)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; dose</td>
<td></td>
<td></td>
<td>←3&lt;sup&gt;rd&lt;/sup&gt; dose→</td>
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<tr>
<td><strong>Influenza</strong> (IIV)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Measles, mumps, rubella</strong> (MMR)</td>
<td></td>
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<tr>
<td><strong>Varicella</strong> (VAR)</td>
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<tr>
<td><strong>Hepatitis A</strong> (HepA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>←2-dose series→</td>
</tr>
</tbody>
</table>

May vaccinate early for international travel
<table>
<thead>
<tr>
<th>Vaccines</th>
<th>18 mos</th>
<th>19-23 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16 yrs</th>
<th>17-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hepatitis B</strong> (HepB)</td>
<td>←3rd dose→</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Diphtheria, tetanus, &amp; acellular pertussis</strong></td>
<td>←4th dose→</td>
<td></td>
<td></td>
<td></td>
<td>5th dose</td>
<td></td>
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<tr>
<td><strong>Haemophilus influenzae type b</strong> (Hib)</td>
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<tr>
<td><strong>Pneumococcal conjugate</strong> (PCV13)</td>
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</tr>
<tr>
<td><strong>Inactivated poliovirus</strong> (IPV: &lt;18 yrs)</td>
<td>←3rd dose→</td>
<td></td>
<td></td>
<td></td>
<td>4th dose</td>
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<tr>
<td><strong>Influenza (IIV)</strong></td>
<td></td>
<td>Annual vaccination 1 or 2 doses</td>
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<tr>
<td><strong>Influenza (LAIV)</strong></td>
<td></td>
<td>Annual vaccination 1 or 2 doses</td>
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</tr>
<tr>
<td><strong>Measles, mumps, rubella</strong> (MMR) – slight increase febrile seizure risk</td>
<td>Catch up</td>
<td>2nd dose</td>
<td></td>
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</tr>
<tr>
<td><strong>Varicella</strong> (VAR)</td>
<td>Catch up</td>
<td>2nd dose</td>
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<tr>
<td><strong>Hepatitis A</strong> (HepA)</td>
<td>←2-dose series</td>
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</tr>
<tr>
<td>Vaccines</td>
<td>18 mos</td>
<td>19-23 mos</td>
<td>2-3 yrs</td>
<td>4-6 yrs</td>
<td>7-10 yrs</td>
<td>11-12 yrs</td>
<td>13-15 yrs</td>
<td>16 yrs</td>
<td>17-18 yrs</td>
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<tr>
<td><strong>Meningococcal</strong></td>
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<td></td>
<td></td>
<td>1&lt;sup&gt;st&lt;/sup&gt; dose</td>
<td>Catch up</td>
<td></td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; dose</td>
</tr>
<tr>
<td>(MenACWY-D: ≥9 mos; MenACWY-CRM: ≥2 mos)</td>
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<tr>
<td>Anatomic or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, eculizumab use</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Tetanus, diphtheria, &amp; acellular pertussis</strong> (Tdap: ≥7 yrs)</td>
<td></td>
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<td></td>
<td></td>
<td>Tdap</td>
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<tr>
<td>Catch up</td>
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<td></td>
<td></td>
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<tr>
<td><strong>Human papillomavirus</strong> (HPV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 dose series if started 9-14</td>
<td>3 dose series if started &gt;15</td>
<td></td>
<td></td>
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<tr>
<td>2 dose series if started 9-14</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Meningococcal B</strong> (MenB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anatomic or functional asplenia (including sickle cell disease), persistent complement component deficiency, eculizumab use</td>
<td></td>
</tr>
<tr>
<td><strong>Pneumococcal polysaccharide</strong> (PPSV23)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>May be offered</td>
<td></td>
</tr>
<tr>
<td>Chronic heart disease (particularly cyanotic congenital heart disease and cardiac failure); chronic lung disease (including asthma treated with high-dose, oral corticosteroids); DM, CSF leak, cochlear implant, Sickle cell disease and other hemoglobinopathies; anatomic or functional asplenia; congenital or acquired immunodeficiency; HIV infection; chronic renal failure; nephrotic syndrome; malignant neoplasms, leukemias, lymphomas, Hodgkin disease, and other diseases associated with treatment with immunosuppressive drugs or radiation therapy; solid organ transplantation; multiple myeloma, Chronic liver disease, alcoholism</td>
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</tbody>
</table>
Adolescent Health Care
Health Care in Adolescents

- Screening in adolescents
- Yearly exams may not be cost-effective
- BiHEADS screening
  - Body image
  - Home/Health
  - Education/Employment
  - Activities
  - Drugs/Depression
  - Safety/Sexuality
Vaccinations

Age 11-12

- HPV (2 doses if first dose given before age 15, 3 doses if first dose given after age 15)
- Tdap
- Meningococcal (MCV4) #1

Age 16-18

- Meningococcal (MCV4) #2
- Meningitis type B vaccine (recommended)
- Influenza — yearly (even with egg allergy!)
Adolescent Screening Tests: USPSTF

Strength of Recommendation: A

- Pap tests
  - Beginning at age 21
- Folic acid supplementation for females
- HIV screening for adolescents >15 or younger if at increased risk for HIV infection
- Syphilis screening for those at increased risk
Adolescent Screening Tests: USPSTF
Strength of Recommendation: B

- Gonorrhea/chlamydia infection in sexually active females
- Counseling on sexually transmitted infections (STIs) for all sexually active adolescents at increased risk
- Screening of adolescents (12-18 years of age) for major depressive disorder (MDD)
- Obesity screening for children 6-17 years
Adolescent Screening Tests: USPSTF

Strength of Recommendation: B

• Counseling (ages 6 months to 24 years) about minimizing UV exposure
• Intimate partner violence screening for females of childbearing age
• Interventions to prevent initiation of tobacco use in school-aged and adolescents
• Hepatitis B screening if at high risk
Adolescent Screening Tests: USPSTF

Strength of Recommendation: D

- Testicular cancer screening – asymptomatic adolescent males
- Pap tests in females younger than 21
- Cervical HPV testing in females less than 30
- Screening for herpes in asymptomatic adolescents
Adolescent Screening Tests: USPSTF

Strength of Recommendation: I

- Screening for lipid disorders (ages 1-20) *(AAP recommends)*
- Primary interventions to prevent physical abuse or neglect
- Counseling re: alcohol misuse or illicit drug use by adolescents
- Asymptomatic adolescents for idiopathic scoliosis
- Primary HTN in asymptomatic children and adolescents
- Chlamydia/gonorrhea screening for males
- Screening for suicide risk
- Screening for celiac disease in asymptomatic adolescents
### Differences Between USPSTF and AAP

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>USPSTF</th>
<th>AAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening for anemia ages 6-12 months</td>
<td>I Recommendation</td>
<td>Universal screening at 12 months</td>
</tr>
<tr>
<td>Screening for lipids up to age 20</td>
<td>I Recommendation</td>
<td>Universal screening once from 9-11 years and again from 17-21</td>
</tr>
<tr>
<td>Use of brief formal screening instruments to detect speech/language delay up to age 5</td>
<td>I Recommendation</td>
<td>Developmental and autism screening at specified intervals</td>
</tr>
</tbody>
</table>
Bullying

- Decreases throughout adolescence
- For early/mid adolescents, bullying is a greater problem than pressure to use alcohol/drugs
- Adolescents who are bullied are more likely to carry a weapon to school
- Adolescents who are bullied are more likely to have suicidal thoughts
- Internet is a game-changer

# Blood Pressure

Age, sex & height factors determining percentile rank of adolescent’s blood pressure

<table>
<thead>
<tr>
<th>Normal</th>
<th>Children Aged 1-13 years</th>
<th>Children Aged &gt;13 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;90th percentile</td>
<td>&lt;120/80 mm Hg</td>
<td></td>
</tr>
</tbody>
</table>

| Elevated blood pressure | ≥90th percentile to <95th percentile or 120/80 mm Hg to <95th percentile (whichever is lower) | 120/80 to 129/80 mm Hg |

| Stage 1 hypertension | ≥90th percentile to <95th percentile + 12 mm Hg or 130/80 to 139/89 mm Hg (whichever is lower) | 130/80 to 139/89 mm Hg |

| Stage 2 hypertension | ≥95th percentile + 12 mm Hg or ≥140/90 mm Hg (whichever is lower) | ≥140/90 mm Hg |

NHLBI Blood Pressure Tables for Children
Hypertension

• Causes - Primary hypertension now most common cause
• Need to confirm on 3 separate occasions
• Recommended testing for all hypertensive children:
  • Bilateral upper arm and leg BP measurement
  • UA and BMP
  • Lipids
  • Drug screening
  • Ambulatory blood pressure monitoring

• Additional testing
  • Obese children
    • TSH, A1C, LFTs, sleep study?
  • Age <6 or abnormal urine results
    • Renal ultrasonography is first choice of imaging
    • Renal parenchymal diseases – glomerulonephritis, congenital abnormalities, reflux nephropathy
  • If considering treatment – ECHO
Hypertension Treatment

Stage 1
– Therapeutic lifestyle changes and follow up in 2-3 weeks

Stage 1 with end-organ damage OR persistence OR Stage 2
– Thiazide diuretics/Ace inhibitors/ARB/CCB (contraception for your female adolescents)
Consent

- Age of consent is usually 18 years old
- Either parent/guardian can consent
- No parental consent usually required for
  - Contraception, treatment of STIs, rape, incest, pregnancy
  - Drug and alcohol treatment, mental health treatment
  - Emergency where delay in treatment could cause harm
  - Some states allow younger youth to make decisions if living independently of parents/guardians
Unintentional Death

Motor vehicle accidents accounted for 73% of all deaths from unintentional injury in adolescents

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homicide</td>
<td>13%</td>
</tr>
<tr>
<td>Suicide</td>
<td>11%</td>
</tr>
<tr>
<td>Cancer</td>
<td>6%</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>3%</td>
</tr>
</tbody>
</table>
5. You are seeing a young girl for her pre-high school physical. The form asks for Tanner stage. She has small but developed breasts and a small amount of dark, straight pubic hair. She is Tanner stage:

A. II
B. III
C. IV
D. V
# Tanner Staging

Allows physicians to give anticipatory guidance

<table>
<thead>
<tr>
<th></th>
<th><strong>Females</strong></th>
<th><strong>Males</strong></th>
</tr>
</thead>
</table>
| Stage 2| Begins with breast buds (ages 8-12, average age 10)  
       | Peak height velocity                             | Begins with scrotal enlargement (ages 9.5-14, average age 11.5)  |
| Stage 3| Peak height velocity  
       | Acne                                             | Peak height velocity  
       |                                  | Ejaculations begin |
| Stage 4| Menarche (ages 9-15, average age 12.5)  
       | Acne                                             | Peak height velocity  
       |                                  | Facial hair  
       |                                  | Voice changes  
       |                                  | Acne |
| Stage 5|                                                  | Strength peaks                                    |
6. Which of the following is true of bulimia nervosa in adolescent females?

A. It is more prevalent than anorexia nervosa  
B. Restriction of food intake leading to weight loss 
C. Characterized by low body mass index 
D. Most common in white, upper middle class females
Bulimia Nervosa

- Prevalence 1-19%
- Diagnostic criteria (DSM-5)
  - Recurrent episodes of binge eating
  - Recurrent inappropriate compensatory behavior in order to prevent weight gain.
  - Binge eating and compensatory behaviors occur at least once weekly for 3 months
  - Self-evaluation unduly influenced by body shape and weight

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Underlying Pathophysiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental enamel erosions and gum disease</td>
<td>Recurrent vomiting washes mouth with acid and stomach enzymes; mineral deficiencies</td>
</tr>
<tr>
<td>Edema</td>
<td>Laxative abuse, hypoproteinuria, electrolyte imbalances</td>
</tr>
<tr>
<td>Parotid gland enlargement</td>
<td>Gastric acid and enzymes from vomiting cause parotid inflammation</td>
</tr>
<tr>
<td>Scars or calluses on fingers or hands (Russell sign [knuckle calluses])</td>
<td>Self-induced vomiting</td>
</tr>
<tr>
<td>Weight fluctuations; not underweight</td>
<td>Alternating between bingeing and purging</td>
</tr>
</tbody>
</table>
Anorexia Nervosa

- Prevalence 0.3-3% (90% white, middle to upper class; 75% started in adolescence)
- High-risk sports – Ballet, wrestling, swimming, gymnastics, skating
- Diagnostic criteria (DSM-5)
  - Restriction of food intake leading to weight loss or failure to gain weight
  - Intense fear of gaining weight
  - Distorted body image
  - Restricting vs. binge/purging type

<table>
<thead>
<tr>
<th>Clinical Signs</th>
<th>Underlying Pathophysiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amenorrhea</td>
<td>Hypothalamic dysfunction, low fat stores, malnutrition</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>Electrolyte disorders, heart failure, prolonged corrected QT interval</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>Heart muscle wasting, associated with arrhythmias and sudden death</td>
</tr>
<tr>
<td></td>
<td>(common in anorexia nervosa)</td>
</tr>
<tr>
<td>Brittle hair and nails</td>
<td>Malnutrition</td>
</tr>
<tr>
<td>Edema</td>
<td>Heart muscle wasting, associated with arrhythmias and sudden death</td>
</tr>
<tr>
<td></td>
<td>(common in anorexia nervosa)</td>
</tr>
<tr>
<td>Hyperkeratosis</td>
<td>Malnutrition, vitamin and mineral deficiencies</td>
</tr>
<tr>
<td>Hypotension</td>
<td>Malnutrition, dehydration</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>Thermoregulatory dysfunction, hypoglycemia, reduced fat tissue</td>
</tr>
<tr>
<td>Lanugo (fine, white hairs on the body)</td>
<td>Response to fat loss and hypothermia</td>
</tr>
<tr>
<td>Marked weight loss</td>
<td>Self starvation, low caloric intake</td>
</tr>
<tr>
<td>Osteoporosis at a young age</td>
<td>Malnutrition</td>
</tr>
</tbody>
</table>
Frequent Flyers

- Blood pressure issues
- Development in younger kids (0-4)
- Car seats
- Enuresis
- USPSTF recommendations
- Causes of death in different age groups
- Vaccines – review ACIP schedules
Answers

1. C
2. A
3. D
4. B
5. B
6. A

Thank you!
Hypertension

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Disclosure Statement

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Learning Objectives

1. Review current guidelines for treatment of hypertension
2. Discuss causes of secondary hypertension
3. Discuss antihypertensive medications and how to choose them
4. Review heart murmurs
BP and Cardiovascular Risk

• HTN is an independent risk factor for ischemic cardiovascular events.
• Risk of vascular death increases in a log-linear fashion from a blood pressure of 115/75 mm Hg.
• For every 20 mm Hg systolic or 10 mm Hg diastolic increase in blood pressure, the risk of major cardiovascular events and stroke doubles.
• Treatment reduces all-cause mortality
• Left ventricular hypertrophy regresses with treatment.
## JNC 8 Practice Guidelines 2014

<table>
<thead>
<tr>
<th>Clinical Condition</th>
<th>BP Threshold for treatment</th>
<th>BP Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>General population &lt;60 years or &gt;18 years old with CKD or diabetes</td>
<td>SBP ≥140 or DBP ≥90</td>
<td>SBP &lt;140 and DBP &lt;90</td>
</tr>
<tr>
<td>General population ≥60 years old</td>
<td>SBP ≥150 or DBP ≥90</td>
<td>SBP &lt;150 and DBP &lt;90</td>
</tr>
</tbody>
</table>

Evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed the Eighth Joint National Committee (JNC 8) *JAMA*. 2014;311(5):507–520
## ACC/AHA Task Force on Clinical Practice Guidelines 2017

<table>
<thead>
<tr>
<th>Clinical condition(s)</th>
<th>BP Threshold for treatment</th>
<th>BP Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical CVD or 10-year ASCVD risk ≥10%, Diabetes, CKD, CHF, CAD, PAD</td>
<td>≥130/80</td>
<td>&lt;130/80</td>
</tr>
<tr>
<td>Secondary Stroke prevention</td>
<td>≥140/90</td>
<td>&lt;130/80</td>
</tr>
<tr>
<td>No clinical CVD and 10-year ASCVD risk &lt;10%</td>
<td>≥140/90</td>
<td>&lt;130/80</td>
</tr>
<tr>
<td>Older persons (≥65 years; noninstitutionalized, ambulatory, community-living adults)</td>
<td>≥130/80</td>
<td>&lt;130 (SBP)</td>
</tr>
</tbody>
</table>

AAFP Decides to Not Endorse AHA/ACC Hypertension Guideline

December 12, 2017 03:44 pm Chris Crawford – The AAFP has decided to not endorse the recent hypertension guideline from the American Heart Association (AHA), the American College of Cardiology (ACC) and nine other health professional organizations.

The AAFP wasn’t involved in the development of the new guideline (hyper.ahajournals.org) and continues to endorse the 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults, (jamanetwork.com) developed by panel members appointed to the Eighth Joint National Committee (JNC8).

David O’Gurek, M.D., chair of the AAFP’s Commission on Health of the Public and Science (CHPS), which recommended non-endorsement of the AHA/ACC guideline, told AAFP News the commission used the same

Reasons:

• Would diagnose 46% of U.S. adult population with HTN

• Not based on a systematic evidence review

• Too much weight was given to the Systolic Blood Pressure Intervention Trial (SPRINT), while other trials were minimized.

• The chair of the SPRINT trial chaired the AHA/ACC guideline panel, among other conflicts of interest.
Diagnosing Hypertension

• Ambulatory blood pressure monitoring is recommended for confirming a diagnosis of hypertension.
• Home blood pressure monitoring is a reasonable alternative when ambulatory monitoring is not a viable option.
• Both ambulatory and home blood pressure monitoring have a stronger association with cardiovascular disease outcomes than blood pressure measurement in a clinical setting.
• Differences between ambulatory and in-office BP can be 19/11 mg Hg, which is enough to affect treatment decisions (N Engl J Med 2018:378:1509-20).

<table>
<thead>
<tr>
<th></th>
<th>White coat hypertension</th>
<th>Masked hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office/Clinic/Healthcare Setting</td>
<td>Hypertension</td>
<td>No Hypertension</td>
</tr>
<tr>
<td>Home/Nonhealthcare/ABPM Setting</td>
<td>No Hypertension</td>
<td>Hypertension</td>
</tr>
<tr>
<td>CVD risk</td>
<td>Minimal/slightly increased</td>
<td>Similar to sustained HTN</td>
</tr>
<tr>
<td>Prevalence</td>
<td>Up to 35%</td>
<td>Limited data</td>
</tr>
</tbody>
</table>
Hypertension in Children

• Defined as ≥95\textsuperscript{th} percentile BP for age, gender, and height per AAP tables
• Measure at annual check-ups starting at age 3
• In United States, now usually primary HTN due to obesity
• No need to work-up for secondary cause if child is obese, has a family history, or does not have clinical signs suggestive of a secondary cause such as:
  • Renal vascular or parenchymal disease
  • Endocrine or rheumatologic disorders, coarctation of aorta, drugs
• Evaluate with fasting glucose and lipids, echocardiogram, retinal exam
• Treatment – weight loss, exercise, medications

1. A 42 yo woman has a BP 162/98 in both arms; BMI 24; CV exam unremarkable. She reports adherence to her daily regimen of hydrochlorothiazide 25 mg, lisinopril 40 mg, and amlodipine 10 mg. Blood tests: Na 144 mEq/L, K 3.3 mEq/L, Cr 0.68 mg/dL. Which one of the following tests is most likely to reveal the cause of her refractory hypertension?

A. 24-hour urine metanephrine catecholamine level  
B. Plasma aldosterone/renin ratio  
C. MRA of the renal arteries  
D. Sleep study (polysomnography)  
E. Renal biopsy
Secondary Hypertension

- Primary hyperaldosteronism is present in 5-10% of hypertensive patients and 7-20% of those with resistant HTN.
- A clue is hypokalemia.
- Diagnosis is based on the aldosterone:renin ratio.
- Sleep apnea is now the leading secondary cause of HTN, present in 30-40% of hypertensive patients and 60-70% of those with resistant hypertension.
Renal Artery Stenosis

2-24% of cases of resistant hypertension

- Most common cause:
  - Age <30: fibromuscular disease
  - Age >30: atherosclerotic disease

- May present with accelerated or resistant HTN, flash pulmonary edema

- ACEi may cause renal insufficiency or hyperkalemia

- Diagnose with MRA of renal arteries, CT angiogram, or duplex ultrasonography

- Treat with medications and monitor renal function (stenting does not improve outcomes)
Secondary Hypertension

*Other Causes*

- Pheochromocytoma
- Hypercortisolism
- Hyperthyroidism
- Chronic kidney disease
- Alcohol
- NSAIDs
- Some antidepressants
- Sympathomimetics
- Children
  - Coarctation of aorta
  - Renal parenchymal disease
2. A 54 yo Hispanic woman has home BP of 155/95 mm Hg, confirmed by multiple similar readings and office BP of 154/94. She exercises, follows a low-salt diet, and rarely drinks alcohol. Which one of the following medications would be most appropriate for this patient?

A. Chlorthalidone
B. Clonidine (Catapres)
C. Doxazosin (Cardura)
D. Metoprolol succinate (Toprol-XL)
E. Spironolactone (Aldactone)
JNC-8 Recommendations

In the general non-black population, *including those with diabetes*, initial treatment should include:

- A thiazide-type diuretic *or* Calcium Channel Blocker (CCB) *or* Angiotensin Converting Enzyme Inhibitor (ACEI) *or* Angiotensin II Receptor Blocker (ARB)

In the general black population, *including those with diabetes*, initial treatment should include:

- A thiazide-type diuretic *or* CCB
  - Thiazide diuretics more effective than ACEI for improving heart failure and cardiovascular outcomes in African Americans (ALLHAT)
  - CCBs more effective than ACEI for reducing strokes in African Americans.
  - ACEI/ARB still recommended in CKD, heart failure

*The main objective is to add and titrate whatever medications it takes to attain and maintain goal BP.*
Thiazide Diuretics

Advocated as initial treatment since 1977 (JNC-1 through JNC-7)
JNC-8: one of several options for initial treatment

*Increase* excretion of
  - Sodium
  - Potassium
  - Magnesium (complicates correction of hypo-K)

*Reduce* excretion of
  - Calcium (reduce recurrence of kidney stones; slows bone demineralization/osteoporosis)
  - Uric acid (increases likelihood of gout)
  - Lithium (increases risk of lithium toxicity)
Thiazide Diuretics

- Average increase in glucose attributed to thiazide use: 3-5 mg/dL (Presence of diabetes is *not* a contraindication to use of thiazides)
- Can increase triglycerides
- Typically considered ineffective when GFR <30-40 mL/min
  - Exception is metolazone, which is not useful as monotherapy but improves diuresis when used in conjunction with loop diuretic
  - Loop diuretics (furosemide, torsemide, bumetanide, and ethacrynic acid) work by interfering with sodium absorption at the loop of Henle and continue to be effective in patients with renal impairment.
Thiazide Diuretics

<table>
<thead>
<tr>
<th></th>
<th>Initial Dose</th>
<th>Maximum Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrochlorothiazide</td>
<td>12.5-25 mg daily</td>
<td>25 mg</td>
</tr>
<tr>
<td>Chlorthalidone</td>
<td>12.5-25 mg daily</td>
<td>50 mg</td>
</tr>
<tr>
<td>Indapamide</td>
<td>1.25-2.5 mg daily</td>
<td>5 mg</td>
</tr>
</tbody>
</table>

- HCTZ – little difference between effectiveness of 12.5 vs. 25 mg. 50 mg more effective but with increased biochemical effects and risk of sudden death.
- Chlorthalidone – ALLHAT, SHEP, SPRINT
- Indapamide – HYVET
ACE Inhibitors and ARBs: JNC-8 recommendations

- May be used as initial treatment choice
- In the population >18 years with CKD, treatment should include an ACEI or ARB to improve kidney outcomes (regardless of race or diabetes status).
- Slows the progression of microalbuminuria in diabetic patients (screen all diabetic patients and treat with ACEI/ARB if microalbuminuria develops).
- Do not use an ACEI and an ARB together in the same patient.
ACE Inhibitors and ARBs

• ACEI: cough in 10-20% of patients, due to bradykinin accumulation
• Can increase lithium levels
• African-Americans relatively reduced BP response to monotherapy with ACEI/ARB
• ACEI-induced angioedema is 2-4 times more common in African-American patients
### ACEI (Angiotensin-Converting Enzyme inhibitors)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Starting dose</th>
<th>Maximum dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captopril</td>
<td>6.25 mg tid</td>
<td>50 mg tid</td>
</tr>
<tr>
<td>Enalapril</td>
<td>2.5 mg bid (5 mg daily)</td>
<td>40 mg daily</td>
</tr>
<tr>
<td>Fosinopril</td>
<td>5-10 mg daily</td>
<td>80 mg daily</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>5 mg daily</td>
<td>80 mg daily</td>
</tr>
<tr>
<td>Quinapril</td>
<td>5 mg bid (10 mg daily)</td>
<td>80 mg daily</td>
</tr>
<tr>
<td>Ramipril</td>
<td>1.25-2.5 mg daily</td>
<td>20 mg daily</td>
</tr>
</tbody>
</table>

### ARBs (Angiotensin Receptor Blockers)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Starting dose</th>
<th>Maximum dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Losartan</td>
<td>50 mg daily</td>
<td>100 mg daily</td>
</tr>
<tr>
<td>Valsartan</td>
<td>80 mg daily</td>
<td>320 mg daily</td>
</tr>
<tr>
<td>Candesartan</td>
<td>16 mg daily</td>
<td>32 mg daily</td>
</tr>
</tbody>
</table>
Calcium-Channel Blockers

• Dihydropyridines – vasodilators with little or no negative effect upon cardiac contractility or AV nodal conduction
  • Amlodipine
  • Nifedipine
  • Felodipine
  • Nicardipine
• Nondihydropyridines – less-effective vasodilators that slow AV nodal conduction (verapamil > diltiazem) and have negative inotropic effect
3. 54 yo man presents for follow-up of HTN. Despite adherence to his daily regimen of chlorthalidone, carvedilol, amlodipine, and lisinopril, his BP averages 152/92 mm Hg. Recent labs are normal, including CBC, BMP, UA.

Which one of the following medication adjustments would be most appropriate to bring his blood pressure to goal?

A. Change chlorthalidone to furosemide
B. Change lisinopril to losartan
C. Add isosorbide mononitrate
D. Add spironolactone
Resistant Hypertension

- Persistent HTN despite ≥3 drugs
- Most common cause: poor adherence
- Exogenous drugs
  - Caffeine (energy drinks, supplements), alcohol, nicotine, cocaine, NSAIDs, OCPs, steroids, erythropoietin, herbal agents
- Secondary HTN
- Suboptimal therapy
  - Typically inadequate diuresis
    - Consider a longer-acting diuretic such as chlorthalidone
    - Add spironolactone
  - No benefit to switching ACEI to ARB.
  - Consider vasodilating β-blocker (carvedilol, labetalol, nebivolol)
  - Consider clonidine, hydralazine, α-blocker
Aldosterone Antagonists

• Good choice for resistant HTN even when hyperaldosteronism is not present
• Provided GFR >30 mL/min and K⁺ <5 mEq/dl
• Resistant hypertension is associated with higher levels of aldosterone, leading to secondary pharyngeal edema, increasing upper airway obstruction, so good choice for patients with OSA.

<table>
<thead>
<tr>
<th></th>
<th>Starting dose</th>
<th>Maximum dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spironolactone</td>
<td>12.5 mg daily</td>
<td>50 mg daily</td>
</tr>
<tr>
<td>Eplerenone</td>
<td>25 mg daily</td>
<td>50 mg daily</td>
</tr>
</tbody>
</table>
4. A 54 yo man with type 2 diabetes has a blood pressure of 148/94 and creatinine of 1.25 mg/dL. One month after starting lisinopril 20 mg/d, his blood pressure is 128/80 and creatinine is 1.5 mg/dL. A repeat creatinine 1 week later is unchanged. What is the best approach in this situation?

A. Continue lisinopril at the same dosage
B. Reduce the lisinopril dosage to 10 mg
C. Change lisinopril to chlorthalidone
D. Change lisinopril to losartan
Treatment-Induced Decline in Renal Function

- A 20-30% increase in creatinine, which then stabilizes, represents a *hemodynamic* change, and not a structural change (if more than 30%, look for other causes and change to another class of meds).
- This is an indirect indicator that intraglomerular (IG) pressure has been reduced.
- Independent of agent used
- ACEI/ARB also dilate efferent arteriole, exaggerating decline in IG pressure.
5. A 68 yo man recently had a myocardial infarction. Which one of the following is recommended by the American Heart Association as a first-line agent for managing hypertension in patients with stable ischemic heart disease?

A. A thiazide diuretic
B. A long-acting calcium channel blocker
C. A β-blocker
D. A long-acting nitrate
Hypertension in Ischemic Heart Disease

- American Heart Association recommends β-blockers in heart disease.
- ACEI (or ARB) recommended in patients already on β-blocker (especially after MI), in diabetics, and in patients with left ventricular dysfunction.
- Long-acting nitrates are effective for angina but have little role in managing hypertension.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Starting Dose</th>
<th>Max Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoprolol succinate</td>
<td>12.5-25 mg daily</td>
<td>400 mg daily</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125 mg twice daily</td>
<td>50 mg daily</td>
</tr>
<tr>
<td>Bisoprolol</td>
<td>1.25 mg daily</td>
<td>10 mg daily</td>
</tr>
</tbody>
</table>
## Compelling Indications for Individual Drug Classes

<table>
<thead>
<tr>
<th>Compelling indication</th>
<th>Diuretic</th>
<th>Beta-blocker</th>
<th>ACEI/ARB</th>
<th>CCB</th>
<th>Aldo ANT</th>
<th>Alpha-blocker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Post-MI</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recurrent stroke prevention</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benign prostatic hypertrophy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
Hypertension in Older Adults

• Usually isolated systolic hypertension (after age 50).
• Weight loss and reduced salt intake is particularly beneficial in lowering BP

• Thiazide diuretics and CCBs preferred
• JNC-8: target SBP <150 mm Hg in patients ≥60
• Cease target SBP if DBP is reduced to <65 mm Hg
<table>
<thead>
<tr>
<th>Hypertensive Emergency</th>
<th>Severe asymptomatic HTN (formerly hypertensive urgency)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>With</em> end-organ damage</td>
<td><em>Without</em> end-organ damage</td>
</tr>
<tr>
<td>Dissecting aortic aneurysm</td>
<td>Usually chronic</td>
</tr>
<tr>
<td>Acute pulmonary edema</td>
<td></td>
</tr>
<tr>
<td>Acute coronary syndromes (MI, NSTEMI, unstable angina)</td>
<td></td>
</tr>
<tr>
<td>Renal Injury</td>
<td></td>
</tr>
<tr>
<td>Encephalopathy</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td></td>
</tr>
<tr>
<td>Eclampsia</td>
<td></td>
</tr>
<tr>
<td>Requires Hospitalization</td>
<td>Outpatient management</td>
</tr>
</tbody>
</table>
Hypertensive Emergency

• Avoid precipitous BP reductions – may provoke end-organ ischemia or infarction due to:
  − Peripheral vasodilation producing a “steal” syndrome
  − Reflexive tachycardia and excessive catecholamine release
• Antihypertensive therapy is not routinely recommended for patients with stroke and elevated BP
• In patients with intracerebral or subarachnoid hemorrhage and severely elevated BP (DBP >130), careful and gradual reduction of BP may be beneficial
• With aortic dissection, however, SBP should be decreased as rapidly as possible to 100-110 mm Hg or lower
• Agents with rapid onset and short duration of action are preferred to allow careful titration
Non-pharmacologic Treatments for Chronic HTN

- Regular aerobic exercise (>150 min per week)
- Limit alcohol to 2 drinks/day for men, 1 drink/day for women
- Dietary sodium restriction (<2400 mg/day; <1500 mg/day even better)
- DASH (Dietary Approaches to Stop Hypertension)
- Weight loss in an obese patient

**No** evidence of effectively lowering blood pressure:
- Calcium or magnesium
- Fish oil supplements or coenzyme Q_{10}
- Reduced caffeine intake
- Relaxation therapy or yoga or acupuncture

Systolic Murmurs

Right second intercostal space

**Aortic stenosis**
crescendo-decrescendo, radiates from aortic area to the shoulder and neck

**Bicuspid aortic valve**
Most common congenital heart defect in the US, prevalence of 1-2%. Autosomal dominant inheritance pattern. Screen 1st degree relatives with Echo.

Left second intercostal space

**Pulmonary stenosis**
crescendo-decrescendo and radiates from pulmonary area to the shoulder and neck

Lower left sternal border

**Tricuspid regurgitation**

Apex

**Mitral regurgitation**
Aortic Stenosis

• Most common valvular heart disease leading to intervention; typically a disease of older adults
• Physical exam findings *not* highly accurate in grading severity
• Repeat Echocardiography every 3-5 years in asymptomatic patients with mild aortic stenosis
  – per ACA/AHA 2008 guidelines on valvular heart disease
• Statin drugs do not slow progression; no medications do
• TAVR: Transcatheter Aortic Valve Replacement now common rather than open heart surgery
Diastolic Murmurs

Aortic regurgitation
Left sternal border
decrescendo; having patient sit up, lean forward and hold breath after full expiration increases the intensity of the murmur

Pulmonary regurgitation
Left sternal border
decrescendo, increases with inspiration

Mitral stenosis
Apex with the patient in left lateral decubitus position

Tricuspid stenosis
Lower left sternal border
Answers

1. B  
2. A  
3. D  
4. A  
5. C
Fever and Infectious Diseases in Children

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Program Director and Chair
New Hanover Regional Medical Center Residency in Family Medicine
Wilmington, North Carolina
Disclosure Statement

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Learning Objectives

1. Identify an approach to evaluate and manage infants/children with fever
2. Describe bacterial and viral illnesses of the respiratory tree with a focus on epidemiology, diagnosis, and treatment
3. List the characteristic features and describe the clinical courses of common exanthems
Fever

• An abnormal condition of the body characterized by an undue rise in temperature, quickening of the pulse, and disturbance of various body functions

• Fever (> 100.4°F or 38°C) – rectal most accurate
  • Usually does not indicate serious illness
  • Can cause discomfort and seizures
  • Does not cause brain damage
  • Does help fight infection
1. A 14-day-old infant is brought to your office for a routine visit. The rectal temperature is 100.8°F. The infant appears well, and parents have zero concerns. What should you do?

A. Reassure parents and schedule a follow-up appointment in 24 hours
B. Administer acetaminophen, observe and send home if fever resolves
C. Do outpatient sepsis work-up and follow up in 24 hours
D. Admit and do inpatient sepsis work-up
Fever in First 21 Days

- Admit for temperature >100.4°F
- All infants
  - CBC with differential and blood cultures
  - Chest x-ray (if resp symptoms)
  - Urinalysis and urine culture
  - Lumbar puncture for CSF studies and culture
- Stool studies/fecal WBC if diarrhea present

- Causes
  - Group B streptococcus
  - E. coli
  - Listeria

- IV antibiotics
  - Ampicillin + gentamicin or Ampicillin + cefotaxime
  - ± Acyclovir
  - No ceftriaxone less than 1 month (kernicterus risk)
Fever in Infants 21-90 Days Who Are Ill-appearing

The Abnormal Pediatric Assessment Triangle

- **Appearance**
  - Poor muscle tone, poor caregiver interaction, inconsolable, poor cry
- **Breathing**
  - Abnormal airway sounds, retractions, nasal flaring, tachypnea
- **Circulation**
  - Pallor, mottling, cyanosis, decreased capillary refill

Treat the same as infant ≤ 21 days old
Fever in Infant 21-90 Days Who Appears Well “Step-by-Step” Approach

**High Risk for Invasive Bacterial Infection**
Treat according to community standards for high-risk patients – usually hospital admission, with full septic work-up

**Low Risk for Invasive Bacterial Infection**
Treat according to community standards for low-risk patients – can range from admission and full septic workup to close outpatient observation

Febrile Seizures

- 3-4% of children (9-20 months most common age)
- 30-40% will have a recurrence
- Family history or underlying neurological condition
- Not associated with brain damage
- No evaluation other than workup of fever is indicated for first simple febrile seizure

2. A 3 yo girl presents with 4-day history of fever without other symptoms. Ears, throat, lungs and abdominal exams are normal, but she appears lethargic. What should be your next step?

A. Treat fever and reevaluate her in 24 hours
B. Order urinalysis with cultures
C. Order an abdominal ultrasound
D. Administer IV fluids
Urinary Tract Infection

- Most common serious bacterial infection in children (look for it when there are no obvious sources)
- 70-90% E. coli
- Newborns: males and premature infants more likely to have UTI
- Ages 1-5: girls 10-20 times more likely
- Urine culture needed: catheter or suprapubic tap
Treatment of Urinary Tract Infection

- UA with pyuria/bacteriuria + positive culture >50,000 CFU/mL
- Cephalosporin or trimethoprim-sulfamethoxazole 1st choice for 7-14 days (Cochrane review states 3-5 days are as good)
- Follow-up renal ultrasound
  - If first febrile UTI <2 years of age, or
  - Recurrent UTIs (more than 1)
- Follow up with Voiding CystoUrethroGram (VCUG)
  - If US reveals hydronephrosis/scarring, or
  - Recurrent febrile UTIs (more than 1)

3. A 16 yo female patient is evaluated for a 4-day history of sore throat, nonproductive cough and rhinorrhea. She is afebrile, and exam reveals enlarged erythematous tonsils without exudate, and no lymphadenopathy. What is the next step?

A. Supportive care  
B. Rapid strep test  
C. Treat with oral penicillin for 10 days  
D. Treat with azithromycin for 5 days
Modified Centor Criteria for Group A Streptococcus Pharyngitis

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
<th>Total</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature &gt; 38 degrees C</td>
<td>1</td>
<td>0-1</td>
<td>No testing or treatment (can consider test at 1)</td>
</tr>
<tr>
<td>Absence of cough</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swollen, tender anterior cervical nodes</td>
<td>1</td>
<td>1</td>
<td>Test with rapid antigen detection testing, treat if positive (culture if negative in kids)</td>
</tr>
<tr>
<td>Tonsillar swelling and/or exudate</td>
<td>1</td>
<td>2-3</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-14</td>
<td>1</td>
<td>0-1</td>
<td>No testing, treat</td>
</tr>
<tr>
<td>15-44</td>
<td>0</td>
<td>4-5</td>
<td></td>
</tr>
<tr>
<td>45+</td>
<td>-1</td>
<td></td>
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</tr>
</tbody>
</table>

Pharyngitis

Viral: most common
Group A β-hemolytic streptococcus: 15%
• Poststreptococcal illness
  • Rheumatic fever – treat with NSAIDs
  • Glomerulonephritis – gross hematuria, hypertension and edema
  • Reactive arthritis
  • PANDAS?
  • Treatment with penicillin/amoxicillin for 10 days (macrolide or clindamycin if pcn allergic) – prevents rheumatic fever but not glomerulonephritis
• 2012 guidelines from the Infectious Diseases Society of America (IDSA) indicate that GABHS infection is uncommon in children younger than three years – recommend against testing
Peritonsillar Abscess & Retropharyngeal Abscess

- **Symptoms**
  - Severe throat or neck pain
  - Painful swallowing
  - High fever
  - Poor oral intake (dehydration)
- **Physical**
  - Cervical adenopathy
  - Uvular deviation
  - Muffled voice with trismus
  - Elevated WBC with a left shift
- **Treatment**: surgical drainage, IV antibiotics
Epiglottitis

- Rare since Haemophilus influenzae vaccine
- Can visualize swollen, cherry red epiglottis
- X-ray shows “thumb print” sign
- Airway management
- Antibiotic treatment
  - Cephalosporin +/- clindamycin
- Steroids and racemic epinephrine are **not** used
Viral URIs

• OTC cough/cold medications NOT recommended, particularly under the age of 4
• Treatment
  • Buckwheat honey
  • Pelargonium sidoides (geranium) extract (Umcka Coldcare)
  • Nasal saline irrigation
  • Vapor rub (over age of 2)
  • Zinc sulfate
• Don’t use antibiotics

Lymphadenopathy

• 50% of healthy children have palpable lymphadenopathy at some point

Management

• Watchful waiting up to 4 weeks (in absence of red flags).
• Oral antibiotics can be considered if inflammation is evident.
• If lymphadenopathy persists or other red flags are present, evaluate with CBC/smear, ESR, CXR
• Best initial imaging for neck masses
  • Under age 14 - ultrasound
  • Over age 14- CT
• FNA if persists

Mouth Sores

Herpetic gingivostomatitis
Cause: HSV
Prodrome: fever, LAD
Treatment: Oral acyclovir

Herpes labialis
Cause: HSV
Prodrome: Tingling, burning, itching
Treatment: Oral/topical acyclovir
Mouth Sores

Herpangina
  Cause: Coxsackie virus
  Prodrome: fever, headache, sore throat
  Treatment: Symptomatic

Aphthous ulcers (canker sores)
  Cause: unknown, ? virus
  Prodrome: burning, itching
  Treatment: Symptomatic/topical steroids

4. A 2 yo child is brought to the emergency department with a barking cough, stridor that worsened tonight, and a temperature of 101\(^{\circ}\) F. What is the treatment?

A. Nebulized albuterol
B. Inhaled steroids
C. Nebulized epinephrine and dexamethasone
D. Humidified oxygen
Croup (Laryngotracheobronchitis)

- Viral illness causing edema of upper airways
- Etiology
  - Parainfluenza viruses 1, 2, 3, cause 75%
  - Adenovirus, rhinovirus
  - Respiratory syncytial virus (RSV)
  - Influenza A and B
- Symptoms: URI symptoms, “barky” cough, hoarseness, tachypnea, mild stridor – worse at night
- X-rays show subglottic narrowing (“steeple” sign) in 40-50%
Treatment of Croup

- Dexamethasone 0.15-0.6 mg/kg IM (or oral) reduces hospitalization rates and shortens ED stay
  - Single dose (multiple dose may lead to bacterial or fungal infections)
  - Indicated for croup of ANY severity
- Moderate to severe croup (cough with stridor and retractions)
  - Nebulized racemic epinephrine
  - Followed by admission or at least 4-hr observation
  - Still give dexamethasone
- Beta-agonist bronchodilators NOT effective

5. 9-month-old child is admitted in Jan. for cough, wheezing, feeding, and fever of 38°C. CXR shows mild peribronchial cuffing. Which treatment is indicated?

A. Amoxicillin/clavulanate (Augmentin)
B. Systemic corticosteroids
C. Supplemental oxygen and fluids
D. Nebulized ipratropium (Atrovent)
Bronchiolitis

- Most common cause of bronchiolitis and pneumonia in infants under 1 year – respiratory syncytial virus (RSV)
- Rhinorrhea, pharyngitis, cough, wheezing, rhonchi, rales, CXR often normal, fever and WBC inconsistent
- Diagnosis: antigen detection assays
- Treatment is supportive (oxygen, acetaminophen, fluids, nebulized saline) – no bronchodilators!!
- No evidence for steroids, antibiotics, or ribavirin

Pertussis

- Presentation in stages
  - Catarrhal stage
    - URI symptoms, very contagious
    - Lasts 1-2 weeks
  - Paroxysmal
    - Paroxysms of coughing, inspiratory "whoops," post tussive emesis
    - Lasts 2-6 weeks (can be up to 10 weeks)
  - Convalescent
    - Lasts 2-3 weeks
  - Apnea (50% of patients), pneumonia (20%), seizures (1%), and death (1%) are the most common complications in infants who are hospitalized with pertussis
  - Test with PCR/Culture if treating (reportable disease)
Treatment of Pertussis

- Admission for most children <6 months
- Supportive: hydration, oxygen if needed
- Antibiotics: erythromycin, clarithromycin, azithromycin, TMP-SMX (halts spread, does NOT hasten recovery)
- Close contacts – azithromycin
- Adults should get Tdap as single booster dose

Pneumonia

- Most common cause – VIRUSES!
- Most common bacterial causes
  - Preschool kids (60 days-5 years) – *Streptococcus pneumoniae* and *Haemophilus influenzae*
    - Treat with amoxicillin (second choice azithromycin or clarithromycin)
  - School age kids (5-18) – *Mycoplasma pneumoniae* and *Chlamydia pneumoniae*
    - Treat with azithromycin

Gastroenteritis

- Most common cause – VIRUSES!!!! (75-90%) • Rotavirus and norovirus • Bacterial causes • E. coli 0157 – leads to hemolytic uremic syndrome in 10-15% of cases • Bloody stools – salmonella, shigella, campylobacter enterocolitis, C. difficile

Gastroenteritis

- Signs of dehydration – abnormal respiratory pattern and skin turgor, prolonged capillary refill
- Stool studies only needed for diarrhea >14 days or bloody
- Main treatment – early Oral Rehydration Solution (ORS)
  - Probiotics
  - No anti-diarrheals!
  - Resume normal diet as soon as possible

6. A 2 yo boy has very red cheeks and a fine rash but does not appear ill. He had a fever a couple of days ago. When can he return to day care?

A. Today  
B. Tomorrow  
C. In 5 days  
D. After the rash is gone
Fifth Disease (Erythema Infectiosum)

- Common disease, rarely clinically significant – parvovirus B19
- Rash immune-mediated
  - Occurs after acute infection, so children with rash may attend school or day care
- Arthralgias uncommon in children, more common in adolescents and young adults
- Pregnant women: rare complication – fetal hydrops/fetal demise

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
</tr>
</thead>
<tbody>
<tr>
<td>facial flushing (slapped cheeks) – 2-4 days</td>
<td>macular rash in reticular pattern – 1-6 weeks</td>
<td>rash may appear with heat, stress, sun</td>
</tr>
</tbody>
</table>
Measles

- Occurs in under-vaccinated populations
- Prodrome – fever, malaise, anorexia
- **Conjunctivitis, coryza, cough, Koplik’s spots**
- Maculopapular, blanching rash beginning on the face and spreading down to the neck, upper trunk, lower trunk, and extremities
- Complications – bronchopneumonia, encephalitis, myocarditis, subacute sclerosing panencephalitis
Mumps

- Occurs in under-vaccinated populations
- Prodrome – myalgia, fatigue, loss of appetite, fever and headache
- Parotitis is the most common manifestation
- Complications – infertility, meningitis and encephalitis
Roseola Infantum (Exanthem Subitum)

- Human herpesvirus HHV-6 or HHV-7
- Usually mild – children appear well
- Children 6 months to 4 years
- Natural course
  - Days 1-4: Abrupt onset of high fever, otherwise mild symptoms
  - Day 4: Rash begins as fever abates
  - Pink almond-shaped macules begin on trunk, spreads peripherally
  - Confluent then fade in hours to 2 days
Roseola

• Pink, blanchable, discrete maculopapular rash mainly on trunk; resolves in 1-2 days

• Nearly 100% of children have antibodies to HHV-6 by 3 years of age

Henoch-Schönlein Purpura

- 90% of cases occur in children under 10
- Usually follows URI with low-grade fever, fatigue
- **Triad** of purpura, colicky abdominal pain, and arthritis
- Rash: pink maculopapules progressing to nonthrombocytopenic palpable purpura on buttocks and legs
- Renal disease most serious complication (occurs in 40-50% of patients)
  - Check for hematuria and proteinuria
- Treat for pain symptoms and/or renal involvement with oral prednisone 1-2 mg/kg for 2 weeks (reduces pain and persistent renal disease)

Henoch-Schönlein Purpura

https://commons.wikimedia.org/w/index.php?curid=9699485
Hand, Foot, and Mouth Disease

• Usually in children <5 years, late summer, early fall
• Coxsackie A16 virus (usually)
• Oral-oral, oral-fecal spread
• Incubation period 4-6 days
• Prodrome of fever, sore throat, and anorexia 1-2 days before the rash
• Small vesicles, erythematous base
• Hands (nail borders), feet (heel margins), buttocks
• Spontaneous resolution in a few days
• Sometimes magic mouthwash preparations needed

7. A 5 yo male has 7 days of spiking high fevers and a diffuse erythematous rash. His tongue and lips are red, dry and cracked, and he has large cervical lymph nodes. In addition to rehydration, what are the next treatment steps?

A. Outpatient steroids and high-dose aspirin
B. Outpatient antibiotics and high-dose aspirin
C. Inpatient IV antibiotics and high-dose aspirin
D. Inpatient immune globulin and high-dose aspirin
Kawasaki Disease

• Diffuse vasculitis of unknown etiology
• Leading cause of acquired cardiac disease in children in U.S.
• Diagnostic criteria
  • Fever >5 days duration and 4/5 of the following
    • Bilateral conjunctival injection
    • Oropharyngeal erythema, strawberry tongue, fissuring and crusting of the lips
    • Induration of hands and feet, erythema of palms and soles; desquamation of fingertips and toes
    • Erythematous rash (scarlatiniform or morbilliform)
    • Enlarged lymph node mass (>1.5 cm)
Kawasaki Disease

• Biggest risk – coronary artery aneurysms

• Treatment
  • Single dose of IV immune globulin 2g/kg over 8-12 hrs
  • High dose aspirin (80-100mg/kg/day) until inflammatory markers normalize (continue if aneurysms develop)
  • ECHO at onset and at 6-8 weeks
  • If giant coronary artery aneurysms (>8 mm) occur – aspirin plus warfarin

## Meningitis

<table>
<thead>
<tr>
<th>Ages</th>
<th>Bacterial Causes (Viruses most common!)</th>
<th>Empiric Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 month</td>
<td>Group B Strep E.coli Listeria Klebsiella</td>
<td>Ampicillin + cefotaxime OR ampicillin + gentamycin (+/-acyclovir)</td>
</tr>
<tr>
<td>1-23 months</td>
<td>Streptococcus pneumoniae Neisseria meningitidis E. coli H. influenzae type b and nontypeable Streptococcus agalactiae</td>
<td>Ceftriaxone + vancomycin OR meropenem + vancomycin (+ dexamethasone 10-20 minutes before abx)</td>
</tr>
<tr>
<td>2-18 years</td>
<td>Streptococcus pneumoniae Neisseria meningitidis</td>
<td>Ceftriaxone + vancomycin OR meropenem + vancomycin (+ dexamethasone 10-20 minutes before abx)</td>
</tr>
</tbody>
</table>

Meningococcal Meningitis

- Neisseria meningitidis: gram negative diplococcus.
- Clinical manifestations of meningococcemia or meningitis
  - Abrupt onset: fever, chills, malaise, prostration
  - Rash: maculopapular, macular, petechial
  - Waterhouse-Friderichsen syndrome: purpura, DIC, shock, coma, death
Frequent Flyers!!!

- Community-acquired pneumonia
- Croup
- Bronchiolitis (particularly RSV)
- Pharyngitis – strep vs. viral
- Kawasaki’s
- Pertussis

- Viral URI treatment
- Urinary tract infections
- Sepsis work up for newborns (remember admit for temp $\geq 100.4$
- Review neonatal resuscitation/pediatric advanced life support – basic initial steps
Answers

1. D
2. B
3. A
4. C
5. C
6. A
7. D

Thank you!
Heart Failure

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Disclosure Statement

It is the policy of the AAFP that all individuals in a position to control content disclose any relationships with commercial interests upon nomination/invitation of participation. Disclosure documents are reviewed for potential conflicts of interest. If conflicts are identified, they are resolved prior to confirmation of participation. Only participants who have no conflict of interest or who agree to an identified resolution process prior to their participation were involved in this CME activity.

All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.
Learning Objectives

1. Discuss the language and concepts in describing heart failure
2. Review diagnostic tests
3. Review the role of sympathetic neurohormonal activation in systolic heart failure
4. Differentiate the therapies that improve survival in heart failure from those that only improve symptoms
2013 ACCF/AHA Guideline for the Management of Heart Failure

• Avoid “Congestive Heart Failure”
• Dyspnea and fatigue are main symptoms
• New language based on ejection fraction (EF):
  HFrEF (previously termed systolic heart failure)
  HFpEF (previously termed diastolic heart failure)

Heart Failure with Reduced Ejection Fraction (HFrEF) 
(previously termed systolic heart failure)

• EF $\leq$ 40%
• Randomized Clinical Trials (RCTs) have mainly enrolled patients with HFrEF, and it is largely in these patients that efficacious therapies have been demonstrated
• Common cause: ischemic heart disease
Heart Failure with Preserved Ejection Fraction (HFpEF) *(previously termed diastolic heart failure)*

- EF ≥50%
- Diastolic dysfunction due to ventricular stiffness usually due to Left Ventricular (LV) hypertrophy from hypertension
- Other causes: infiltrative disorders (amyloidosis, sarcoidosis), storage disorders (hemochromatosis), pericardial constriction, primary valvular disease, atrial myxoma
- Delayed heart rate recovery and less increase in cardiac output with exercise
- Both systolic heart failure and diastolic dysfunction may be present in the same patient.
- Efficacious therapies have not been clearly identified.
Subcategories of HFpEF

HFpEF, borderline
- EF 41-49%
- Characteristics, treatment patterns, and outcomes appear similar to HFpEF.

HFpEF, improved
- EF >40%
- Subset of patients with HFpEF previously had HFrEF.
- Improvement or recovery in EF may be clinically distinct from those with persistently preserved or reduced EF.
Primary Cardiomyopathies (usually HFrEF)

**Acquired**

Myocarditis

Peripartum

Tachycardia induced

Takotsubo “broken heart” syndrome (left ventricular apical ballooning)

- Stress induced cardiomyopathy
- Chest pain, EKG changes, elevated troponin, with normal coronary arteries
- Usually postmenopausal women (mean age of 62–76 yrs)

**Genetic**

Hypertrophic cardiomyopathy (LVH without chamber dilation)

- Autosomal dominant; most common primary cardiomyopathy, prevalence 1:500 persons
- Usually asymptomatic; diagnosed by systolic murmur that increases with Valsalva, or incidentally on EKG
- β-Blockers or non-dihydropyridine CCB’s decrease exertional dyspnea & chest pain and prevent sudden death
- Should not engage in intense competitive sports
- Need risk stratification for consideration of implantable cardioverter-defibrillator (ICD)

Other: Ion channel disorders, left ventricular compaction, mitochondrial myopathies, right ventricular dysplasia
# NYHA Functional Classification

(New York Heart Association)

<table>
<thead>
<tr>
<th>I</th>
<th>No limitation of physical activity. Ordinary physical activity does not cause symptoms of HF</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in symptoms of HF</td>
</tr>
<tr>
<td>III</td>
<td>Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes symptoms of HF</td>
</tr>
<tr>
<td>IV</td>
<td>Unable to carry on any physical activity without symptoms of HF, or symptoms of HF at rest</td>
</tr>
</tbody>
</table>
1. What is the ejection fraction?
2. Is the LV structure normal?
3. Are there valvular, pericardial, or RV abnormalities?
4. Impaired diastolic relaxation/filling and more need for “atrial kick?”
1. An 86 yo woman presents with shortness of breath and a nonproductive cough. She is slightly tachypneic and tachycardic but temperature and BP are normal. Normal cardiac exam but bilateral crackles on lung exam and bilateral fluffy infiltrates on CXR. A CBC, metabolic panel, and troponin are normal. Her EKG shows sinus tachycardia. Which of the following tests would be best to determine whether she should be treated for pneumonia, heart failure, or both?

   A. A serum D-dimer level  
   B. BNP and procalcitonin levels  
   C. Serial troponin and creatine phosphokinase levels  
   D. An erythrocyte sedimentation rate and C-reactive protein level  
   E. A serum lactic acid level
BNP and Heart Failure

Level of Evidence: A  (regarding usefulness in clinical decision making)

• BNP (brain natriuretic peptide) is secreted from the ventricles in response to ventricular volume expansion and pressure overload.
• Release is directly proportional to ventricular dysfunction and correlates with end-diastolic pressure.
• BNP undergoes partial renal excretion; levels are inversely proportional to creatinine clearance.
• Increases in both HFrEF and HFpEF
BNP and Heart Failure

- BNP <100 excludes HF as cause of dyspnea*
- BNP >400 confers a 95% likelihood of HF
- BNP 100-400 requires further investigation

Other causes can elevate BNP: lung cancer, cor pulmonale, chronic hypoxia, obstructive sleep apnea, pulmonary embolus, cirrhosis with ascites, primary hyperaldosteronism, Cushing disease, anemia, renal failure

*50 pg/mL suggested as upper limit of normal if BMI >35; BNP levels are lower in obese patients, both with and without heart failure (potential mechanism: increased clearance by adipocytes)
BNP and Heart Failure

For patients at risk of developing HF, natriuretic peptide biomarker-based screening followed by team-based care, including a cardiovascular specialist optimizing guideline-directed management, can be useful to prevent the development of left ventricular dysfunction (systolic or diastolic) or new-onset HF. (Class IIa)

2017 ACC/AHA/HFSA Heart Failure Focused Update
Physiologic Basis of HF Treatment

Low cardiac output triggers sympathetic neurohormonal activation, which ultimately results in premature apoptosis of cardiac myocytes. Treatment is directed toward:

- **Preload reduction:** diuretics, nitrates
- **Afterload reduction:** ACEI, ARB, hydralazine, nitrates
- **Sympathetic blockade:** ß-blockers
- **Aldosterone-antagonist therapy:** spironolactone, eplerenone
2. A 72 yo male has a new diagnosis of hypertensive cardiomyopathy with left ventricular ejection fraction of 30%. He has dyspnea at rest and with minimal exertion. Which one of the following drugs will reduce his mortality risk?

A. Atenolol (Tenormin)
B. Lisinopril
C. Digoxin
D. Furosemide (Lasix)
E. Nifedipine (Procardia)
Renin-Angiotensin System Inhibition
Systolic heart failure triggers elevated renin, angiotensin, aldosterone

• Angiotensin-converting enzyme inhibitors (ACEI)
• Angiotensin receptor blockers (ARB)

Both are LOE A recommendation in HFrEF
ACEI in HFrEF
Level of Evidence A

• Reduce morbidity and mortality
  • Multiple RCTs: CONSENSUS, SOLVD, ATLAS, SAVE, AIRE, TRACE
• Helps in mild, moderate, severe HF
• Can cause angioedema
• Caution in patients with low BP, renal insufficiency, elevated potassium
• Increased bradykinin levels, which can cause cough

2016 ACC/AHA/HFSA Focused Update on New Pharmacological Therapy for Heart Failure. Circulation 2016:134
# ACE Inhibitors in HF

<table>
<thead>
<tr>
<th></th>
<th>Starting Dose</th>
<th>Maximum Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captopril</td>
<td>6.25 mg tid</td>
<td>50 mg tid</td>
</tr>
<tr>
<td>Enalapril</td>
<td>2.5 mg bid</td>
<td>10 mg bid</td>
</tr>
<tr>
<td>Fosinopril</td>
<td>5 to 10 mg daily</td>
<td>40 mg daily</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>2.5-5 mg daily</td>
<td>40 mg daily</td>
</tr>
<tr>
<td>Quinapril</td>
<td>5 mg bid</td>
<td>20 mg bid</td>
</tr>
<tr>
<td>Ramipril</td>
<td>1.25-2.5 mg daily</td>
<td>10 mg daily</td>
</tr>
</tbody>
</table>
ARBs in HFrEF

• Use in ACEI-intolerant patients
• Reduce morbidity and mortality (though ACEI’s have more evidence)
  • Multiple RCTs: HEAAL, CHARM
• Caution in patients with low BP, renal insufficiency, elevated potassium
• Lower incidence of cough or angioedema

<table>
<thead>
<tr>
<th></th>
<th>Starting Dose</th>
<th>Study Dose</th>
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<tbody>
<tr>
<td>Losartan</td>
<td>25-50 mg daily</td>
<td>50-150 mg daily</td>
</tr>
<tr>
<td>Valsartan</td>
<td>20-40 mg twice daily</td>
<td>160 mg twice daily</td>
</tr>
<tr>
<td>Candesartan</td>
<td>4-8 mg daily</td>
<td>32 mg daily</td>
</tr>
</tbody>
</table>
β-blockers and HFrEF

Level of Evidence A

• Mortality rates are improved with β-blockers in addition to ACEi and diuretics.
• β-blockers decrease mortality in patients with prior MI, regardless of NYHA classification.
• There is no absolute threshold ejection fraction.
• β-blockers should be started when the patient is stable and euvolemic.
β-blockers in Heart Failure

Use with caution or not at all
- Hemodynamic instability
- Heart block or bradycardia
- Severe asthma or COPD – 2nd generation β-blockers are cardioselective (β1) though this selectivity is lost at higher doses

<table>
<thead>
<tr>
<th>The proven 3</th>
<th>Starting Dose</th>
<th>Max Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metoprolol Succinate</td>
<td>12.5-25 mg daily</td>
<td>200 mg daily</td>
</tr>
<tr>
<td>Carvedilol</td>
<td>3.125 mg twice daily</td>
<td>50 mg twice daily</td>
</tr>
<tr>
<td>Bisoprolol</td>
<td>1.25 mg daily</td>
<td>10 mg daily</td>
</tr>
</tbody>
</table>
3. A 69 yo woman with hypertension, previous MI, and EF 32% is seen in your office. She is comfortable at rest but is breathless when walking upstairs. Her current medications are atorvastatin, lisinopril, metoprolol succinate, furosemide, and aspirin. Her blood pressure is 132/78. Exam: no murmur, (+) bibasilar rales, trace pretibial edema. EKG 52 beats/min, multifocal PVCs, QRS interval 0.10 sec. Adding which one of the following would help to decrease both mortality and risk of hospitalization?

A. Spironolactone (Aldactone)
B. Digoxin
C. Furosemide (Lasix)
D. Amlodipine (Norvasc)
E. Losartan (Cozaar)
Aldosterone Antagonists and HFrEF
Class I, LOE A

- Reduce mortality and improve ejection fraction
- Appropriate if GFR >30mL/min and K⁺<5 mEq/dL
- Avoid concomitant NSAIDs and COX-2 inhibitors
- Spironolactone (but not eplerenone) can cause breast tenderness and gynecomastia

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<tr>
<th></th>
<th>Starting Dose</th>
<th>Max Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spironolactone</td>
<td>12.5 mg daily</td>
<td>50 mg daily</td>
</tr>
<tr>
<td>Eplerenone</td>
<td>25 mg daily</td>
<td>50 mg daily</td>
</tr>
</tbody>
</table>
Other Drugs in HFrEF

Digoxin
- No reduction in mortality but decreases hospitalizations (LOE B)

Furosemide (Class I recommendation. LOE C)
- Improves symptoms & reduces hospitalizations for NYHA class II-IV
  - May decrease mortality

Nesiritide (B-type natriuretic peptide)
- Vasodilatory properties can trigger hypotension
  - No effect on rehospitalization or death (ASCEND-HF)
Hydralazine Plus Isosorbide Dinitrate (BiDil)

- Vasodilator in HFrEF
- Reduces mortality rates and improves quality-of-life measures and symptoms
- Use when diuretics, β-blockers, and an ACEI (or ARB) do not control symptoms or are not tolerated
- Particularly effective in African-Americans with NYHA class III or IV heart failure (Class I, LOE A)
4. 62 yo man with hypertension and heart failure reports dyspnea on exertion. Current medications are enalapril 10 mg bid, carvedilol 12.5 mg bid, spironolactone 25 mg daily, and furosemide 20 mg daily. On exam, blood pressure is 128/82 and pulse 62. An Echocardiogram shows ejection fraction of 35% and BNP level is 250 pg/mL.

Current American Heart Association guidelines recommend which of the following to further reduce morbidity and mortality?

A. Increase furosemide to 40 mg daily
B. Add ivabradine (Corlanor) 5 mg twice daily
C. Add losartan 50 mg daily
D. Stop enalapril and start sacubitril/valsartan (Entresto) 49/51 mg twice daily
ARNI = ARB + Neprilysin Inhibitor

In patients with chronic **symptomatic** HFrEF NYHA class II or III who tolerate an ACEi or ARB, *replacement by an ARNI is recommended* to further reduce morbidity and mortality. (Class I)

2017 ACC/AHA/HFSA Heart Failure Focused Update
ARNI = ARB + Neprilysin Inhibitor
(Entresto: valsartan + sacubitril)

Inhibition of neprilysin results in natriuretic, vasodilatory, and anti-proliferative effects

PARADIGM-HF trial

• Compared to enalapril
  – Reduced death from CV causes (16.5% vs. 13.3%)
  – Reduced overall death (19.8% vs. 17.0%)
  – Hospitalization reduced by 21%
• Expensive ($4,600/yr)
• Wait 36 hrs after stopping ACEI to start (angioedema concerns)
Ivabradine (Corlanor)

*Sinus node modulator*

- SHIFT trial
- Ivabradine can be beneficial to reduce HF **hospitalization** for patients with symptomatic (NYHA class II-III) stable chronic HFrEF (LVEF ≤35%) who are receiving guideline-directed management, including a beta blocker at maximum tolerated dose, and who are in sinus rhythm with a heart rate of 70 bpm or greater at rest. (Class IIa)
5. A 70 yo man has a history of a myocardial infarction and now has heart failure with an EF of 30%. EKG with sinus rhythm. Which one of the following medications that he is currently taking is potentially harmful and should be discontinued?

A. Carvedilol (Coreg)
B. Atorvastatin (Lipitor)
C. Furosemide (Lasix)
D. Diltiazem (Cardizem)
E. Candesartan (Atacand)
Drugs to Avoid in HFrEF

• Calcium channel blockers
  – Verapamil, diltiazem have potent negative inotropic effect and are associated with worsening heart failure and increased risk of adverse cardiovascular events.
  – *May* use amlodipine for BP lowering, but can cause leg edema

• Most antiarrhythmic drugs

• NSAIDs

• Thiazolidinediones (cause water retention)
  – Pioglitazone (Actos)
  – Rosiglitazone (Avandia)
HFpEF Treatment

• Priorities are symptom relief and management of related comorbidities
• Hypertension is the single most important predictor
• Atrial fibrillation, diabetes and CKD are also associated
• Renin-angiotensin-aldosterone system is an important contributor to the development of HFpEF.
• Aldosterone antagonist therapy may be beneficial.

Evidence-based therapy recommendations are limited.
HFpEF Treatment

Careful preload reduction
- Ventricular filling occurs during diastole and depends on preload so be careful with diuresis as hypotension can occur.
- Impaired ventricular relaxation limits diastolic filling ➔ decreases stroke volume ➔ decreases cardiac output (CO=HR x SV).

Careful reduction in heart rate
- Will increase diastolic filling time ➔ increase SV ➔ increase CO
  - β-blockers (or non-dihydropyridine CCB if β-blocker intolerant)
  - Digoxin only if atrial fibrillation or flutter present
HFpEF Treatment

In appropriately selected patients with HFpEF
- EF ≥45%
- elevated BNP levels or HF admission within 1 year
- estimated glomerular filtration rate >30 mL/min
- creatinine <2.5 mg/dL
- potassium <5.0 mEq/L

aldosterone receptor antagonists might be considered to decrease hospitalizations.

2017 ACC/AHA/HFSA Heart Failure Focused Update
Advanced Heart Failure Care

• Implantable cardioverter defibrillator (ICD) to reduce risk of sudden death due to ventricular tachyarrhythmias
  – For patients with LVEF ≤35%, NYHA class II or III symptoms on meds, and life expectancy > one year
• Cardiac resynchronization therapy (CRT) (Biventricular pacing)
  – For patients with LVEF ≤35%, NYHA class II, III, or IV symptoms on meds, QRS duration ≥150 ms, and life expectancy > one year

• Left ventricular assist devices (LVAD) as a “bridge” to recovery or transplant or other decisions
  – For patients with anticipated 1-year survival of <50%
• Heart transplantation
Answers

1. B
2. B
3. A
4. D
5. D
Common ENT Problems

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Disclosure Statement

It is the policy of the AAFP that all individuals in a position to control content disclose any relationships with commercial interests upon nomination/invitation of participation. Disclosure documents are reviewed for potential conflicts of interest. If conflicts are identified, they are resolved prior to confirmation of participation. Only participants who have no conflict of interest or who agree to an identified resolution process prior to their participation were involved in this CME activity.

All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.
Learning Objectives

1. Recognize the diagnosis, management and ancillary testing for the following:
   - Acute and chronic otitis media
   - Tinnitus and hearing loss
   - Acute and chronic sinusitis
   - Allergic rhinitis and chronic cough
   - Laryngitis
   - ENT Emergencies
   - Vertigo
   - Bells Palsy
1. A 12-month-old male patient is brought into your office by his mother for fever, cough and pulling on his left ear. He is afebrile in your office, playful and interactive. When you examine his ear, the tympanic membranes are slightly erythematous, but he is uncooperative for pneumatic otoscopy. Your diagnosis is?

A. URI, acute otitis media uncertain
B. Otitis media with effusion
C. Acute otitis media
D. Ramsay Hunt syndrome
Diagnosis of Acute Otitis Media

- Must use stringent criteria
  - Ensure appropriate treatment
  - Avoid overuse of antibiotics
- Three required elements to make the diagnosis
  - Acute onset of *symptoms* of otalgia
  - Presence of a middle ear *effusion*
  - Acute signs of middle ear *inflammation*

http://pediatrics.aappublications.org/content/early/2013/02/20/peds.2012-3488 SORT B
Symptoms of Acute Otitis Media

- Onset within 48 hours
- “Severe” symptoms
  - Moderate to severe pain
  - Fever $\geq 39^\circ C$ (102.2$^\circ F$)
  - Non-verbal child (<6 months old)
    - Holding, tugging, or rubbing of ear
    - Poor eating, irritability

http://pediatrics.aappublications.org/content/early/2013/02/20/peds.2012-3488 SORT B
Diagnosis of Middle Ear Effusion

• Decreased or absent mobility of TM
  - Do not diagnose without demonstrating MEE
  - Pneumatic otoscopy – standard of care
    - Better sensitivity and specificity than tympanometry and Weber Test
  - Tympanometry

http://pediatrics.aappublications.org/content/early/2013/02/20/peds.2012-3488  SORT B
Diagnosis of Middle Ear Inflammation

- Bulging and fullness of the TM
- Bullae on the TM
- Acute purulent otorrhea (not from otitis externa)
- Marked erythema, BUT...
  - An erythematous TM in the absence of bulging or immobility of the TM has only a 15% PPV for AOM
  - An erythematous TM can be caused by fever, crying, and URI
Otitis Media With Effusion (OME)

• Signs of middle ear fluid
  - Impaired TM mobility
  - Air fluid levels
  - Bubbles
  - Amber or blue color

• Absence of signs of acute inflammation

• Symptoms- slower onset, less severe, no fever
<table>
<thead>
<tr>
<th></th>
<th>Acute Otitis Media</th>
<th>Otitis Media with Effusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM position</td>
<td>Bulging</td>
<td>Retracted or Neutral</td>
</tr>
<tr>
<td>TM color</td>
<td>Red or Yellow</td>
<td>Amber or Blue</td>
</tr>
<tr>
<td>Signs/Symptoms</td>
<td>Pus, Otorrhea, or Bullae</td>
<td>Air fluid levels or Bubbles</td>
</tr>
</tbody>
</table>

![Image](https://commons.wikimedia.org/wiki/File:Otitis_media_entdifferenziert2.jpg)
Tympanometry

- Quantifies pneumatic otoscopy
- Considered if otoscopy indeterminant or OME uncertain
- Not for kids <7mo (canals too compliant)
- Measures:
  - Ear canal volume (cm$^3$)
  - Compliance (cm$^3$)
  - Pressures
Type A curve
- Normal compliance and pressures

Type B curve—always abnormal
- Decreased compliance
- MEE
- Stiff TM from
  - Scarring
  - Tympanosclerosis
  - Cholesteatoma
  - Tumor

Type C curve
Less helpful — low Sn, Sp
- Negative pressures
- Retracted TM
- Eustachian tube dysfunction
2. A 22-month-old male patient is brought to you crying and in obvious acute distress from right ear pain. He has a fever of 103.6°F and has an immobile, bulging, erythematous right TM. The best treatment option would be?

A. Do not use antibiotics because this is probably a viral illness
B. Have the parents observe for 24-48 hours and treat with antibiotics if the child does not improve
C. Treat with antihistamines/decongestants alone
D. Start antibiotics immediately
Treatment of AOM

• Pain control
  - Use ibuprofen or acetaminophen

• Decongestants/Antihistamines
  - Not proven to help
  - Increased side effects
  - May relieve nasal congestion in older children
Treatment of AOM

• Three bacterial pathogens
  - *S. pneumoniae*
  - *H. influenzae*
  - *M. catarrhalis*

• Antibiotics or Observation?
  - First studies out of Europe
  - Concerns about over usage of antibiotics
  - Several meta-analyses suggest most children do well without ATBs
    • 61% resolve symptoms within 24 hours
## Treatment of AOM
### 2013 AAP/AAFP Guideline

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt; 6 months</th>
<th>6-23 months</th>
<th>&gt;= 24 months</th>
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<tr>
<td><strong>Observation</strong></td>
<td>N/A if suspect AOM</td>
<td>Unilateral AND Symptoms are NOT severe</td>
<td>Uni-/Bilateral AND Symptoms are NOT severe</td>
</tr>
<tr>
<td><strong>Antibiotics</strong></td>
<td>Suspect AOM</td>
<td>Bilateral AND Symptoms are NOT severe</td>
<td>Uni-/Bilateral AND Symptoms are Severe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR Uni/Bilateral AND Symptoms are severe</td>
<td></td>
</tr>
</tbody>
</table>

[http://pediatrics.aappublications.org/content/early/2013/02/20/peds.2012-3488](http://pediatrics.aappublications.org/content/early/2013/02/20/peds.2012-3488)
Observation of AOM
2013 AAP/AAFP Guideline

• Observation if symptoms worsen or persist
• Based on shared decision-making with parents
• Is *only* appropriate if follow-up can be ensured in 48-72 hours
  • Reexamination
  • Phone call
  • Prescription can be filled

"Antibiotics for ear infections in children"
3. You diagnose AOM with severe symptoms in a 22-month-old male patient who weighs 20 kg (44 lb). What is the most appropriate treatment?

A. Amoxicillin 900 mg/day
B. Amoxicillin 1800 mg/day
C. Amoxicillin-clavulanate 900 mg/day
D. Amoxicillin-clavulanate 1800 mg/day
Antibiotics for AOM
2013 AAP/AAFP Guideline

• Amoxicillin 80-90 mg/kg per day
• Amoxicillin-clavulanate for those:
  - Treated with ATBs in last 30 days
  - With concurrent conjunctivitis
    \((H. \text{ influenzae})\)
  - Taking prophylactic amoxicillin for recurrent AOM (no longer recommended)
Antibiotics for AOM
2013 AAP/AAFP Guideline

• Penicillin allergy – No urticaria or anaphylaxis (Non-type 1)

• Cephalosporins
  - Cefdinir (Omnicef) 14 mg/kg per day
  - Cefpodoxime 10 mg/kg per day
  - Cefuroxime (Ceftin) 30 mg/kg per day
  - Ceftriaxone 50 mg/kg IM/IV
Antibiotics for AOM
2013 AAP/AAFP Guideline

• Penicillin allergy with urticaria or anaphylaxis (Type 1)
  - Macrolides
    • Erythromycin + sulfisoxazole
    • Azithromycin, clarithromycin
  - Clindamycin

• Not recommended due to resistance
  - Trimethoprim-sulfamethoxazole
  - Levofloxacin
Antibiotics for AOM
2013 AAP/AAFP Guideline

- Duration of treatment
- 10-day course of antibiotics
  - Reduced course of antibiotics showed less favorable outcomes
  - Neither adverse effects or emergence of drug resistance was lower with reduced length of treatment

4. You treated a child with AOM with antibiotics and see him back 4 weeks later. The child is asymptomatic, but you determine he has a middle ear effusion. Your recommendation would be?

A. Reassurance and reevaluate in 2 months
B. Oral antihistamine for 30 days
C. Re-treat with amoxicillin-clavulanate
D. Oral low-dose steroids for 30 days
E. ENT referral
Follow-up for AOM

• Monitor middle ear effusion (MEE)
• Does not mean treatment failure
  - 70% had MEE after two weeks
  - 40% after one month
  - 20% after two months
  - 10% after three months
• Follow-up recommended at 8-12 weeks
• Monitor for hearing, language and learning problems

http://www.uptodate.com/online/content/topic.do?topicKey=pedi_id/10593&selectedTitle=1~150&source=search_result SORT C
Persistent AOM

- No improvement in 48-72 hours
- Reassess to confirm diagnosis
- Switch to second-line antibiotic – assume resistant bacteria (penicillin resistant *S. pneumoniae*)
  - Amoxicillin/Clavulanate
  - Cephalosporin
  - Macrolide
  - Clindamycin
Recurrent AOM

- Antibiotic prophylaxis
  - *Specifically NOT* recommended
  - 2013 AAP/AAFP Guidelines
- Minimize risk factors
  - Exposure to cigarette smoke
  - Pacifier, bottle feeding
  - Daycare attendance
Treatment of Otitis Media With Effusion

- Watchful waiting for three months
- Test for hearing loss at three months
- Tympanostomy tubes is preferred procedure <4 years
- Tympanostomy tubes, adenoidectomy or both >4 years
- Do NOT use antibiotics, antihistamines, decongestants or steroids
- Tubes now controversial-
  AAFP POEMs 2018- 16 RCTs no hearing benefit at 12-24 months

[Links to referenced sources]

Am Fam Physician. 2016 Nov 1;94(9):747-749. SORT A/B
Tinnitus

- Perception of noise in the absence of an acoustic stimulus
- Most commonly idiopathic, then sensorineural hearing loss
- Other causes: cerumen impaction, effusion, cholesteatoma, HTN, TMJ, vascular, neoplastic, neurologic, meds
- Meds: NSAIDs, Antimicrobials, antineoplastics, loop diuretics, others.

All work up other than history and physical is SORT C

Hearing loss or vertigo: eval for Meniere’s dz with audiometry, electronystagmography, MRI

Pulsatile: neurovascular imaging

Unilateral: eval for vestibular schwannoma with audiometry, MRI

Sudden Sensorineural Hearing Loss

• 30dB loss at 3 consecutive frequencies with normal exam otherwise

• Idiopathic 85-90%

• Treatment- oral corticosteroids 1mg/kg/d- max of 60mg x 10-14 d
  − Equivocal benefit but low risk, best benefit if started right away (first 2 weeks of sx)
  − No benefit for: antivirals, vasodilators (calcium channel blockers), anti-platelets, or antibiotics unless evidence of AOM on exam

• Otolaryngol Head Neck Surg 2012;146(3 Suppl):S1-S35.
5. A 43-year-old male presents to your office with five days of nasal congestion and headache. His temperature is 100.8°F, he has purulent rhinorrhea, and minimal tenderness to palpation over the frontal and maxillary sinuses. Your next step would be?

A. Transilluminate the sinuses
B. Get sinus x-rays
C. Treat with decongestants/mucolytics
D. Treat with amoxicillin-clavulanate
Acute Rhinosinusitis

Symptoms <4 weeks
- Purulent nasal drainage
- Nasal obstruction
- Facial pain, pressure or fullness

Etiology
- Viral is most common etiology
- Bacterial rhinosinusitis – 0.5-2%
Indicators of Bacterial Rhinosinusitis

- Duration of symptoms >7 days
- Worsening of symptoms
- Moderate to severe pain and fever >101°F
- Bimodal illness – worsening of symptoms after initial improvement

Am Fam Physician. 2016 Jul 15;94(2):97-105 SORT C
Non-helpful Tests

• Trans-illumination of sinuses
• Viral or bacterial cultures (except endoscopic)
• Diagnostic imaging is not recommended unless a complication or alternative diagnosis is suspected
  • Sinus x-rays
  • Sinus CT scans
  • MRI or ultrasound

Am Fam Physician. 2016 Jul 15;94(2):97-105 SORT C
Treatment of Viral Rhinosinusitis

- Self-limited disease – treatment does not shorten the course.
- Supportive care: SORT A
  - Analgesics (NSAIDs, acetaminophen)
  - Saline nasal sprays (irrigation)
  - Intranasal corticosteroids
- Consider
  - Ipratropium- NIH data for rhinorrhea only, not pain or congestion
  - Topical decongestants: do not use longer than 72 hours, risk of rebound congestion

- Not recommended
  - Oral decongestants: no RCT evaluating effectiveness
  - Antihistamines: worsen congestion by over-drying mucosa; not recommended unless history of allergy
  - Zinc- no benefit for sinusitis (mixed data for URIs)
Antibiotic Treatment of Bacterial Rhinosinusitis

• In acute, uncomplicated watchful waiting without abx is an appropriate initial management if assurance of follow up SORT A

• Observation should include supportive treatment for seven days – 70% resolve by 1 week

• Antibiotics recommended if sx persist > 7 days without clinical improvement or if worsening SORT C

*Am Fam Physician. 2016 Jul 15;94(2):97-105*
Avoid prescribing antibiotics in ED for uncomplicated sinusitis

Do not routinely obtain radiographic imaging for pts who meet diagnostic criteria for uncomplicated acute rhinosinusitis

Do not routinely prescribe antibiotics for acute, mild to moderate sinusitis unless sx (purulent nasal secretions, maxillary pain, or facial/dental tenderness to percussion) last at least 7 days or xs worsen after initial clinical improvement
Antibiotics for Bacterial Rhinosinusitis

Start empiric antibiotics if

- Onset with severe symptoms or signs of high fever >102°F and purulent nasal discharge or facial pain lasting at least 3-4 days
- Onset with persistent symptoms lasting 10 days without improvement
- Onset with worsening symptoms, new onset of symptoms lasting 5-6 days after initially improving (“double sickening”)

IDSA Clinical Practice Guideline. Clinical Infectious Diseases 2012;54(8):1041–5
Amoxicillin-clavulanate now recommended as empiric choice due to antibiotic resistance

Duration: 7-10 days adults, 10-14 days for kids

High dose (1 g BID or 90 mg/kg/day) if:
- >10% penicillin resistant S. pneumonia
- Abx use within past month
- <2 yo or >65 yo
- Immunocompromised
- Recent hospitalization
- Daycare attendance
- Severe infections

IDSA Clinical Practice Guideline. Clinical Infectious Diseases 2012;54(8):1041–5 SORT C
Antibiotics for Bacterial Rhinosinusitis (IDSA)

- Adults: Fluoroquinolones and doxycycline
  No longer recommended due to antimicrobial resistance:
  - Macrolides
  - Trimethoprim-sulfamethoxazole
  - Cephalosporins

- Kids: cephalosporins

IDSA Clinical Practice Guideline. Clinical Infectious Diseases 2012;54(8):1041–5
Treatment of Bacterial Rhinosinusitis

• Same adjunctive therapy as for viral rhinosinusitis (NSAIDs, saline spray, topical ipratropium, mucolytics)

• What about nasal steroids?
  Reduces inflammation and swelling of nasal mucosa
  Meta-analysis showed increased symptom response, especially milder disease

http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD005149/frame.html
Bacterial Rhinosinusitis in Children

AAP guidelines in 2013 made several changes

• Added worsening of symptoms after initial improvement to diagnostic criteria
• Added observation period of three days after 10-day illness
• **Amoxicillin** (80-90 mg/kg) is the drug of choice for children
• Amoxicillin-clavulanate or ceftriaxone are alternatives
• Recommend against any imaging studies

http://pediatrics.aappublications.org/content/early/2013/06/19/peds.2013-1071.full.pdf SORT C
Chronic Rhinosinusitis

- 12 weeks of symptoms
  - Nasal obstruction
  - Facial pain
  - Mucopurulent drainage
  - Decreased sense of smell
- Most patients cannot be cured – control or reduce symptoms
- Complex inflammatory changes rather than persistent bacterial infection
Chronic Rhinosinusitis

- Saline nasal sprays/irrigations – low pressure/high volume Neti pots better than sprays (SOR B)
- Intranasal steroids – sprays and instillations
- Oral steroids
- Leukotriene antagonists
- Referral to ENT specialist
  - Topical and oral antimicrobials if endoscopic culture positive

Allergic Rhinitis

• IgE mediated rhinitis
  • Persistent: >4 d/wk for >4 weeks
    - Tx: allergen avoidance, intranasal steroids
  • Intermittent- less than 4 d per week
    - Tx: nasal saline spray

• Second Line tx
  - Antihistamines (SOR B)- increased side effects and less effectiveness

• Not Helpful for either:
  - Pillow/ mattress covers are not helpful (SOR A)
  - Imaging: Choose Wisely Campaign for ENT
Chronic Cough

• Cough >8 weeks
• Eval: exam, CXR, check for ACE
• Most common causes:
  – GERD: empiric high dose PPI for 2-3 months, consider pH probe or EGD
  – Postnasal drip: nasal steroid
  – Asthma: trial inhalers, consider spirometry

• If above treatments fail, consider CT chest or bronchoscopy

Laryngitis

• Acute- hoarseness for <3-4weeks
  − Causes: URI, vocal strain (due to vocal fold edema), allergic rhinitis
  − Tx: complete voice rest
    NOT: whispering, clearing throat, ABX, inhaled steroids, nebulized saline

• Chronic: >3-4weeks
  − Causes: GERD, smoking, allergic rhinitis, vocal fold polyps, head/neck cancer, neurologic
  − Eval: Laryngoscopy (SOR C)- if >3 months of sx
    if >2 weeks if high risk (smoker, heavy EtOH, hemoptysis)
  − Treatment: tx the underlying cause (PPI, polypectomy, etc.)
    voice therapy (SOR A)

ENT Emergencies: Ears

• Otitis media and Otitis Externa – (covered in Special Sensory)

• Foreign bodies
  – Watch out for **button batteries** – Need urgent consultation!

• Auricular hematoma
  – Needs I&D, w/o results in cauliflower ear.

“Scrum cap”
ENT Emergencies: Nose

• Epistaxis
  – Anterior: packing, silver nitrate sticks, electrocautery, topical tranexamic acid (TXA)
  – Posterior – balloon packing

• Foreign bodies
  – Watch out for button batteries

• Nasal fracture
  – No x-rays needed
  – Check for septal hematoma
    • Needs I&D, w/o results in “saddle deformity”
ENT Emergencies: Dental Trauma

• Tooth fracture
  − Ellis I – enamel only
  − Ellis II – enamel + dentin
  − Ellis III – includes pulp

• Tooth avulsion
  − Immediate replace/reinsert adult tooth
    • Gently cleansed, do not scrub
  − Do not replace/reinsert baby tooth

Courtesy of SlideShare
Author: Rea Corpuz
6. A 57-year-old female patient of yours presents with dizziness and a sensation that she is spinning. It occurs when she turns in bed or lifts her head to look in an upper cabinet. Episodes are brief but are becoming more frequent. She has no tinnitus or hearing loss. The most likely diagnosis would be?

A. Meniere’s disease
B. Benign paroxysmal positional vertigo
C. Vestibular neuronitis
D. Acoustic neuroma
Vertigo

Illusion of movement
- Spinning, tilting, swaying
- Subjective or objective (patient or environment)

Must be distinguished from presyncopal faintness and dysequilibrium

Central and peripheral causes

<table>
<thead>
<tr>
<th></th>
<th>Peripheral Vertigo</th>
<th>Central Vertigo</th>
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<tbody>
<tr>
<td>Imbalance</td>
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<td>Severe; cannot stand</td>
</tr>
<tr>
<td>Hearing Loss</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Tinnitus</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Other Neuro Symptoms</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Peripheral Vertigo

- Benign paroxysmal positional vertigo
  - Canalithiasis
  - **Torsional up-beating nystagmus** (85-95% in posterior semicircular canal)
  - Brief spinning spells (seconds) **when head moved**
  - Nausea, but rarely vomiting
  - No hearing loss, ear pain or tinnitus

- Vestibular Neuronitis
  - Viral or post-viral inflammation of labyrinth
  - Saccade, horizontal nystagmus
  - With unilateral hearing loss, it is called “labyrinthitis”
  - Lasts 1-2 days before resolution

Peripheral Vertigo

- Meniere’s Disease
  - Endolymphatic Hydrops
  - Associated with tinnitus, hearing loss and ear fullness

- Acoustic neuroma
  - Vertigo is minor, tinnitus and hearing loss are main complaints

- Herpes Zoster Oticus (Ramsay Hunt Syndrome)
  Hearing loss, vertigo, taste loss, facial paralysis

Central Vertigo

• Migrainous vertigo

• Wallenberg’s syndrome
  - Infarction of lateral medulla

• Cerebellar hemorrhage or infarction
  - Sudden intense vertigo and vomiting
  - Markedly impaired gait – falls to the side of the lesion
Evaluation of Vertigo

- Careful history
- Neurological exam
- Lab tests help <1% of the time
- MRI: if other neuro signs, hearing loss
- Dix-Hallpike Maneuver

Treatment of Vertigo

• Medications
  ‐ Most useful for vertigo that lasts hours or days – not BPPV
  ‐ Lots of sedation as well as risk of falls and urinary retention in older patients
  ‐ Anticholinergics – scopolamine
  ‐ Antihistamines – meclizine, dimenhydrinate
  ‐ Phenothiazines – promethazine, metoclopramide
  ‐ Benzodiazepines – diazepam, lorazepam
Treatment of Vertigo

- Vestibular Rehabilitation (PT)
- CNS compensation for peripheral vestibular injury – ? Central?
- When started early, balance and function are improved compared with controls
- Home exercises also effective

http://www.uptodate.com/online/content/topic.do?topicKey=genneuro/5875&selectedTitle=1~150&source=search_result SORT B
Treatment of Vertigo

• Benign Paroxysmal Positional Vertigo
  - Medications generally not helpful
  - Canalith repositioning – Epley Maneuver

http://www.aafp.org/afp/20050315/1115.html
Bells Palsy

• Idiopathic facial paralysis
• Early recognition and treatment decreases risk of chronic partial paralysis and pain.
• DDx: stroke and other central pathology of facial nerve spare the forehead
• Antivirals/corticosteroids (NNT 15) more effective than either agent alone.
• Do not use antivirals alone to treat (SORT A)

Board Frequent Fliers

- AOM dx- need all 3: sx (F>102, pain onset 48 hrs), effusion, inflammation
- AOM ABX if: <6mo, bilateral/ severe 6mo-23mo, severe 24+ mo
- AOM ABX = Amox 80-90mg/kg/d
- Tinnitus- causes: idiopathic, then sensorineural hearing loss
- Acute sinusitis ABX if: >7d, worsening sx, bimodal, F >101- use augmentin adults, augmentin or amox in kids
- Chronic sinusitis- no ABX
- Laryngitis- tx total voice rest
- BPPV- torsional up-beating nystagmus
- Bells palsy- tx antiviral and steroids
Answers

1. A
2. D
3. B
4. A
5. C
6. B
Challenging Issues in Hematology

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Disclosure Statement

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Learning Objectives

1. Recognize the evaluation and treatment of DVT and PE in medical and pregnant patients.
2. Understand classifications and work up for anemia.
3. Identify the diagnosis and clinical hallmarks of sickle cell disease, multiple myeloma, TTP, leukemia and hemophilia.
Venous Thromboembolism (VTE)

- 2/3 DVT
- 1/3 pulmonary embolus PE

- Of patients with proximal DVT, 40% have associated PE
- 70% of patients with PE also have DVT
- Mortality rate 6% (DVT) and 12% (PE)

VTE Risk Factors

• Virchow’s Triad
  – Stasis
  – Hypercoagulability
  – Endothelial injury

• Other risk factors
  – Family history of VTE (thrombophilia)
  – Obesity
  – Prior episodes of VTE
  – Malignancy
  – Stroke
  – Pregnancy/postpartum
## Pretest Probability for DVT: Wells Criteria

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Cancer: Treatment within last 6 months</td>
<td>1</td>
</tr>
<tr>
<td>Palliative treatment</td>
<td></td>
</tr>
<tr>
<td>Paralysis, paresis or immobilization of lower extremity</td>
<td>1</td>
</tr>
<tr>
<td>Bedridden for &gt;3 days or major surgery within 4 weeks</td>
<td>1</td>
</tr>
<tr>
<td>Localized tenderness along deep veins</td>
<td>1</td>
</tr>
<tr>
<td>Entire leg swollen</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling &gt;3 cm in symptomatic leg</td>
<td>1</td>
</tr>
<tr>
<td>Pitting edema greater in symptomatic leg</td>
<td>1</td>
</tr>
<tr>
<td>Collateral superficial veins</td>
<td>1</td>
</tr>
<tr>
<td>History of DVT/ PE</td>
<td>1</td>
</tr>
<tr>
<td><strong>Alternative diagnosis more likely</strong></td>
<td>-2</td>
</tr>
</tbody>
</table>
Pretest Probability for DVT: Wells Criteria

Scoring

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Intermediate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1-2</td>
<td>&gt;= 3</td>
</tr>
</tbody>
</table>
1. A 38-year-old female patient presents with pain in her R calf of 3 days duration. She had a lap cholecystectomy 8 weeks ago and a cervical conization for carcinoma-in-situ 6 years ago with no recurrence. No one in her family ever had a DVT. She has 2+ bilateral pitting ankle edema. Your choice of an initial diagnostic study would be:

A. D-dimer
B. Proteins C and S
C. Venous compression ultrasounds
D. Venogram
Diagnosing DVT

• D-dimer (ELISA)
  – Cut off <500 mcg/L
    • Consider age x 10 for >50 years old*
    • Increase in false positive with age
  – 95% sensitive, 40-60% specific
  – 95% negative predictive value
  – Excellent test to rule out, not so good to rule in!

Diagnosing DVT

- D-dimer <500 and low probability Well’s Score makes DVT unlikely
- Moderate or high probability Wells score should get noninvasive testing (D-dimer NOT helpful)
- Venous compression ultrasounds have 94% positive predictive value
  - If negative and clinical suspicion is high, repeat US at 5-7 days
  - Best sensitivity and specificity in symptomatic pts with proximal thrombosis of lower extremities

If VTE Is Diagnosed, Who Needs…

• Screening for malignancy?
• Screening for thrombophilia?
Screening for Malignancy

- Cancer risk = 1.3x expected
- Complete H&P (with rectal and pelvic exams)
- CBC, LFTs, CXR, stool guaiac
- Aggressive cancer work-up *not* necessary or cost-effective
  - Cancer usually makes its presence known prior to VTE
  - Lung, pancreas, colon, kidney, prostate
Screening for Thrombophilia

- Initial thrombosis prior to age 50
- Family history of VTE
- Recurrent venous thrombosis
- Unusual vascular beds (Non-extremity site)
- Warfarin-induced skin necrosis
- Testing
  - Protein C, protein S, fibrinogen, antithrombin III, factor V Leiden, lupus anticoagulant, anticardiolipin antibody, prothrombin 20210 gene mutation
2. A 63-year-old man presents with a history of several days of shortness of breath with exertion and pleuritic chest pain. He suffered a DVT 5 years ago. His $\text{pO}_2 = 85\%$ on RA and his HR is 110. He recently returned from vacation in Japan. What is the best test for initial evaluation of this patient’s symptoms?

A. D-dimer  
B. Compression US of the lower extremities  
C. VQ scanning  
D. CT angiography
Diagnosis of PE

• Symptoms and physical findings are very nonspecific
• Likewise, EKG and CXR findings not specific
• Arterial blood gases/pulse oximetry also lack sensitivity
  • Normal SpO2 does not rule out PE
Modified Well’s Criteria for PE

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms of DVT</td>
<td>3</td>
</tr>
<tr>
<td>Other Dx less likely</td>
<td>3</td>
</tr>
<tr>
<td>HR &gt; 100</td>
<td>1.5</td>
</tr>
<tr>
<td>Immobilization or surgery in past 4 wks</td>
<td>1.5</td>
</tr>
<tr>
<td>Previous DVT or PE</td>
<td>1.5</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>1</td>
</tr>
<tr>
<td>Malignancy with tx within 6 mos or palliative</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Intermediate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2</td>
<td>2-6</td>
<td>&gt;6</td>
</tr>
</tbody>
</table>
Diagnosis of PE

• D-dimer (ELISA)
  – D-dimer <500 combined with low pretest probability (<2) rules out PE
Diagnostic Imaging

- **Computed Tomography Angiography**
  - High sensitivity and specificity (99% NPV)
  - Test of choice if
    - Low pretest probability and positive D-Dimer
    - Moderate pretest probability
    - High pretest probability
  - Preferred over pulmonary angiogram due to
    - 2% mortality
    - 5% morbidity

Diagnostic Imaging: V/Q Scanning

- All other combinations require angiography or other imaging
- Imaging of choice in patients with contraindications to CT
  - Contrast allergy
  - Renal disease
  - Pregnancy (VQ test of choice if only full dose CT scan available)

<table>
<thead>
<tr>
<th>VQ Scan Result</th>
<th>Pretest Probability</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>ANY</td>
<td>PE excluded</td>
</tr>
<tr>
<td>LOW probability</td>
<td>LOW</td>
<td>PE excluded</td>
</tr>
<tr>
<td>HIGH probability</td>
<td>HIGH</td>
<td>PE confirmed</td>
</tr>
</tbody>
</table>
3. A 48-year-old female presents with 3 days of left lower extremity swelling. Venous Dopplers reveal a proximal DVT. She is stable and has no other medical problems. What would be the best initial treatment for this patient?

A. Rivaroxaban (Xarelto) only as an outpatient
B. Low-molecular-weight heparin and concurrent warfarin as an outpatient
C. Hospitalization for unfractionated heparin and concurrent warfarin therapy
D. Hospitalization for thrombolytic therapy
Treatment of VTE
2016 ACCP Guidelines

• **DOAC are the preferred** anticoagulation choice for proximal DVT or PE when cancer not present.
  - Dabigatran (Pradaxa), Rivaroxaban (Xarelto), Apixaban (Eliquis), or Edoxaban (Savaysa)
  - Increased time in the therapeutic window, less major bleeding, patient convenience

• **Dose adjust DOACs for renal disease**

• LMWH with concurrent warfarin is still acceptable, just not preferred.

Treatment of VTE
2016 ACCP Guidelines

- Reversal of DOACs
  - Antidotes now available for some
  - Charcoal
  - Hemodialysis
- Cancer-associated thrombosis
  - LMWH recommended over warfarin and DOACs

Acute Isolated Distal DVT
2016 ACCP Guidelines

• If no severe symptoms and low risk for extension, then serial imaging x 2 weeks rather than anticoagulation

• Risk factors for extension
  - Strongly positive D-dimer
  - >5 cm thrombus
  - Thrombus close to proximal veins
  - No reversible provoking factors
  - Active cancer
  - History of VTE
  - Inpatient status

Treatment of VTE
2016 ACCP Guidelines

• Outpatient treatment with DOACs is safe and cost effective in selected patients
  – Ambulatory and stable- no O2, IV ABX, or IV pain control
  – Low risk of bleeding
  – No renal insufficiency
  – Reliable patient and system to monitor complications

• Criteria for inpatient treatment
  – Massive DVT
  – Symptomatic PE
  – High risk for bleeding
  – Comorbid conditions

Duration of Treatment of VTE
2016 ACCP Guidelines

• The first three months is high-risk period
• Treatment duration
  3 months for provoked DVT/PE (surgical or non-surgical)
  3 or more months if unprovoked DVT/PE
  Indefinite if recurrent DVT/PE

Treatment of VTE
2016 ACCP Guidelines

• Early ambulation is suggested instead of prolonged bedrest
• Compression stockings are *no longer* recommended because there is no evidence of benefit

Treatment of PE
2016 ACCP Guidelines

- Consider systemic thrombolysis if hypotensive (SBP <90)
- Start anticoagulation before diagnosis is confirmed
- Early discharge and outpatient treatment is an option
  - If patient is stable and doesn’t require O₂
  - Low risk of bleeding
  - No renal insufficiency
  - Reliable patient and system to monitor blood work and complications
- Consider IVC filter if anticoagulants contraindicated
  - Remove after treatment window to decrease recurrent DVT
Treatment of PE
2016 ACCP Guidelines

- **Subsegmental PE** - New Recommendation
  - No proximal pulmonary artery involvement
  - No proximal DVT in the legs
  - Low risk for recurrent VTE
  - Clinical surveillance recommended over anticoagulation

4. A 28-year-old pregnant female, G3P2, is diagnosed with a DVT in her right lower extremity. The treatment of choice for this patient would be:

A. Apixaban (Eliquis)
B. Unfractionated heparin and warfarin
C. Low-molecular-weight heparin alone
D. Vena cava filter
VTE in Pregnancy

- VTE risk increases 5-fold during pregnancy
- Risk 1/1,600 pregnancies
- PE is a leading cause of pregnancy-associated mortality and morbidity
- 20-50% have an underlying thrombophilia
- Women with a history of thromboembolic events have a 3- to 4-fold increase in risk for recurrence during pregnancy
VTE in Pregnancy

- Risk of VTE overall, antepartum = postpartum and occurs with equal frequency throughout all trimesters
- PE is more common in the postpartum period, especially the first week.
- D-dimer less useful in pregnancy (almost always positive)
- Lower dose chest CTPA safe in pregnancy
  - If not available, do CXR
  - If CXR is normal, do V/Q scan
  - If CXR is abnormal, do full dose CT scan

*Am J Respir Crit Care Med.* 2011 Nov 15;184(10):1200-8
Anticoagulation in Pregnancy

- Heparin and LMWH do not cross placenta and are safe in pregnancy  SORT B
- Unfractionated Heparin (UH)
  - Dosage requirements increase due to increases in heparin binding proteins, plasma volume, renal clearance and degradation by the placenta
- Low-Molecular-Weight Heparin (LMWH)
  - Reduced risk for bleeding, osteoporosis and HIT in nonpregnant patients compared to UH
  - Longer half-life – longer dosage intervals, but increased risk if epidural/spinal
  - Epidural anesthesia 12 hours after last dose of LMWH  SORT C

Anticoagulation in Pregnancy

- Warfarin – not for use in pregnancy
  - Crosses the placenta
  - Associated with harmful fetal effects
  - Use is generally only in the postpartum period or in selected patients with mechanical heart valves
- DOACS not adequately studied in pregnancy.
- All anticoagulants are safe for breastfeeding mothers
  - LMWH and coumadin with good data
  - DOACs – limited data
Anticoagulation in Pregnancy

- Convert from LMWH to UH for last month of pregnancy.
- Compression stockings until anticoagulation resumed postpartum.
- Restart anticoagulation after delivery
  - 4-6 hours post vaginal delivery
  - 6-12 hours post C-section
- May be bridged to warfarin (or potentially DOACs) postpartum
- Avoid paradoxical thrombosis and skin necrosis from early anti-protein C effect of warfarin by bridging with LMWH or UFH until INR 2-3 x 2 days

Contraception if History of VTE

• Avoid Estrogen

• Use of progesterone is controversial
  – NIH: ok with first DVT, but not if recurrent
  – Depo Provera may have the highest risk but not well studied
5. A 48-year-old female with rheumatoid arthritis presents to your office complaining of two months of fatigue, and more recently dyspnea on exertion. Her Hgb=9.2 with normocytic, normochromic indices. You order iron studies, which show low iron, low TIBC and high ferritin. The best treatment for this patient would be:

A. Oral B₁₂ for fatigue
B. Oral ferrous sulfate for anemia
C. Home oxygen for dyspnea
D. DMARDs for rheumatoid arthritis
Kinetic Approach to Anemia

• Two reasons for anemia
  – Decreased RBC production (reticulocyte < 2)
    • Lack of substrate
    • Marrow disorders/suppression
    • Decreased trophic hormones
    • Chronic illness/inflammation
  – Increased RBC loss
    • Hemolysis – inherited or acquired (reticulocyte >2)
    • Blood loss – occult or obvious
Morphologic Approach to Anemia

- RBC indices – reflect cell size
  - Mean Corpuscular Volume (MCV)
  - Mean Corpuscular Hemoglobin (MCH)
  - Mean Corpuscular Hemoglobin Concentration (MCHC)
  - Red cell Distribution Width (RDW)

- Use the RBC indices to direct your work-up of anemia

http://www.uptodate.com/online/content/topic.do?topicKey=red_cell/2950&selectedTitle=1~150&source=search_result
Morphologic Approach to Anemia

- Macrocytic (MCV >100)
  - Reticulocytosis (high RDW)
  - $B_{12}$ and folate deficiencies
    * PPIs can cause B12 deficiency
  - Myelodysplasia
  - Alcohol abuse, liver disease, hypothyroidism

Courtesy: Wikimedia Commons
Morphologic Approach to Anemia

- Microcytic Anemia (MCV <80)
  - Iron deficiency
  - Decreased heme synthesis
    - lead, sideroblastic anemia
  - Decreased globin synthesis
    (thalassemia states, hemoglobinopathies)
  - Chronic illness/inflammation (uncommon)
Morphologic Approach to Anemia

- Normocytic, normochromic anemia
  - Acute blood loss
  - Acute hemolysis
  - Hypersplenism
  - Anemia of chronic disease (most common)
Iron Deficiency Anemia

• Confirmed by low iron, high iron-binding capacity and low ferritin (<10)

• Identify **WHY** the patient is iron deficient!
  – Menstrual blood loss
  – GI malignancy/blood loss

• Response to iron therapy
  • Retic count 5-7 days
  • Hct 4-6 weeks
  • Iron stores 4-6 months
6. A 3-year-old patient is brought to see you after moving to your community. He has Hgb SS disease. The parents ask you whether he needs to continue taking the penicillin he was prescribed by another physician. You should recommend:

A. Stop the penicillin to avoid antibiotic resistance  
B. Take penicillin V 125 mg daily for the rest of his life  
C. Take penicillin V 250 mg BID until age 5 at least  
D. Take penicillin V 250 mg daily until age 12
Sickle Cell Disease

- Most common single gene disorder in African-Americans
- Diagnosed by hemoglobin electrophoresis
- Due to homozygous abnormal hemoglobin S (SS disease)
  - Sickle SC disease (less severe disease, more retinal disease)
  - Sickle-Thal (variable)
- Hemoglobin S is poorly soluble when deoxygenated and forms polymers that deforms the cells
Sickle Cell Disease

• Clinical Manifestations
  – Moderate anemia (7.9/22.9) with high retic count and normal or high MCV
  – Vaso-occlusive crises – muscular, CVA, renal, priapism, retinopathy
  – Infections – pneumococcus, hemophilus, salmonella
  – Aplastic crisis – parvovirus B19 marrow suppression
  – Acute chest syndrome – pneumonia + infarct
  – Splenic sequestration crisis – acute anemia
Sickle Cell Disease

- Infection Prophylaxis
  - Immunizations
    - Strep pneumonia (PCV13 and 23)
    - Neisseria meningitides (Menactra and Men-B)
    - H. influenza, Type B
    - Hepatitis B
    - Influenza
  - Penicillin prophylaxis (for all types of SSD)
    - Pen V p.o. 125 mg BID from age 3 month to 3 years
    - Pen V p.o. 250 mg BID from age 3 to 5 years
    - After age 5 is controversial
Sickle Cell Disease

Annual Screening with Transcranial Doppler Ultrasound to evaluate risk of stroke age 2-16 years (SORT A)

Hydroxyurea therapy age 9-42 months or adults who have 3 or more crises in 12 months to decrease vasocclusive effects and decrease risk of acute chest syndrome (SORT B)

- Disease modifying therapy
- Increases levels of HbF
- Initiation requires contraceptive counseling, CBC and reticulocyte q4w

Am Fam Phys 2015 Dec 15; 92(12): 1069-1076
Multiple Myeloma

• Incidence: 1.6% of all cancer, 10% of hematologic cancer in U.S.
• Risk factors: age >65, African Americans
• Signs/ sx
  – anemia (73%)
  – bone pain (58%)
  – elevated creatinine (48%)
  – hypercalcemia (28%)
  – N/V, weakness, recurrent infections, weight loss
Multiple Myeloma

• Dx: abnormal plasma cells in marrow
  monoclonal protein in serum/ urine
  bone lesions

• Work Up: CBC w/ diff, Cr, LDH, beta-2 macroglobulin, immunoglobulin studies, skeletal survey, BM biopsy

• Treatment
  – Primary care: bisphosphonate tx when first diagnosed, DVT prevention, prophylactic ABX
  – Referral to oncology: chemo, stem cell transplant

Hemophilia

- Inherited bleeding disorders
  - Hemophilia A – Factor VIII deficiency
  - Hemophilia B – Factor IX deficiency (Christmas Disease)
- X-linked recessive – predominantly males affected
- Become symptomatic within first two years of life
  - Only 50% have bleeding with circumcision
  - 3-5% have bleeding in perinatal period
Hemophilia

• Bleeding sites
  – Muscles
  – Hematuria
  – Gastrointestinal
  – Epistaxis and oral cavity
  – Joints
    • Late joint destruction
    • Joints preserved by early initiation of factor concentrate treatments
Thrombotic Thrombocytopenic Purpura

“Pentad”

- Microangiopathic hemolytic anemia
- Thrombocytopenia usually with purpura
- Acute renal insufficiency (HUS)
- Neurological symptoms (TTP)
- Fever
- Actually rare for all five to be present
Thrombotic Thrombocytopenic Purpura

• Causes
  – Usually idiopathic
  – ADAMTS13 deficiency
    • Protease of VWF – inhibitory auto-antibody
    • Long polymers of VWF attract platelets
  – Shiga-toxin from E. coli 0157:H7
  – Collagen vascular diseases, cancer and transplants
  – Medications
    • Ticlopidine, clopidogrel, quinine, mitomycin, tacrolimus
• Treatment – plasma exchange therapy curative
Leukemias

- Acute Leukemias
  - Acute Lymphoblastic – Children
    - Fever, bleeding, musculoskeletal symptoms,
    - Hepatosplenomegaly (75%), lymphadenopathy (60%)
  - Acute Myelogenous – Adults
    - Fever, fatigue, weight-loss, bleeding problems
    - Anemia, thrombocytopenia
Leukemias

- Chronic Leukemias – Adults
  - Most **asymptomatic** at time of diagnosis
  - Discovered with **leukocytosis** on blood count
    - Work Up: **repeat CBC, smear, flow cytometry, onc referral**

- Chronic lymphocytic leukemia – 50%
  - Hepatosplenomegaly and lymphadenopathy
- Chronic myelogenous leukemia – 20%
  - Splenomegaly
• D Dimer only helpful for low pretest probability
  – If not CTPA for PE and doppler for DVT
• DOAC preferred over coumadin (LMWH if cancer)
  – Dose adjust DOACs with renal disease
• No coumadin in pregnancy (DOACs with insufficient data)
• Anemia of Chronic DZ: treat underlying DZ
• Macrocytic anemia – from PPIs due to B12 deficiency
• Sickle Cell: transcranial U/S screening
• Multiple Myeloma: start bisphosphonate tx
• TTP pentad: fever, anemia, thrombocytopenia, AKI, neuro sx
• Acute Leukemia: fever, bleeding
• Chronic Leukemia: asymptomatic, elevated WBC- work up: repeat WBC, smear, flow cytometry, onc referral
Answers

1. A
2. D
3. A
4. C
5. D
6. C
Managing Dysrhythmias

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Learning Objectives

1. Differentiate the diagnosis and management of types of heart block.
2. Discuss the diagnosis and management of supraventricular arrhythmias including afib.
3. Assess the diagnosis and management of sinus node disease.
1. A 52 yo male has a blood pressure of 154/86 mm Hg. He is an avid tennis player. PMH is benign. Given this rhythm strip, which of the following drugs would be inappropriate to use in this patient?

A. Dihydropyridine calcium channel blocker
B. Non-dihydropyridine calcium channel blocker
C. β-blocker
D. Cyanide
Sinus Bradycardia, First Degree AV Block
(Rate <60 bpm, PR interval >0.20 secs)

- Associated with higher degrees of physical conditioning.
- Neither is a contraindication to the use of β-blockers, CCBs, or any other antihypertensives.

EKG = Each 1 mm (small) horizontal box corresponds to 0.04 second (40 ms), with heavier lines forming larger boxes (five small boxes) representing 0.20 sec (200 ms) intervals
2. A 52 yo man with COPD and hypertension has worsening fatigue. He denies chest pain or shortness of breath. Exam is notable for a slow, irregular pulse; his lungs are clear. His medications are lisinopril, chlorthalidone, tiotropium, and ASA. Based on history and this rhythm strip, what is the diagnosis?

A. Blocked premature atrial contraction
B. Mobitz type I second degree AV block
C. Mobitz type II second degree AV block
D. Third degree AV block
Mobitz type I Second Degree AV block (Wenckebach)

The PR interval progressively lengthens until a P wave fails to conduct and a beat is “dropped.”

- Usually disease of the AV node.
  - Normal in some athletes, especially during sleep.
- If acute, inferior wall ischemia is likely.
  - Inferior wall supplied by RCA, which also supplies the AV node.
- The rhythm itself does not require treatment; the underlying cause may.
Mobitz Type II Second Degree Block

- Intermittently non-conducted P waves *not* preceded by PR prolongation and *not* followed by PR shortening
- Usually disease of the distal conduction system, below the AV node (His-Purkinje system)
- May progress to third-degree AV block
- Treatment: permanent pacemaker.
Third Degree AV Block
(complete heart block)

- Impulses from SA node do not propagate to the ventricles creating two regular but completely dissociated and independent rhythms.
- Can cause syncope
- If the cause is inferior MI, AV node may recover
  - Escape rhythm originates at or near the AV junction, and is narrow-complex
- If the cause is anterior MI, distal conduction system is typically permanently damaged
  - Escape rhythm originates in the ventricles, and is wide-complex
- Treatment: permanent pacemaker
Inferior MI (RCA) may affect AV node
Anterior MI (LAD) may affect distal conducting system
Supraventricular Tachycardia (SVT)

Atrial flutter, Atrial fibrillation and Multifocal atrial tachycardia also arise from atrial or atrioventricular tissue, but in practice “SVT” usually refers to:

- Atrioventricular nodal reentrant tachycardia (AVNRT)
  - More common in women
- Atrioventricular reciprocating tachycardia (AVRT)
  - Most common type in children
- Atrial tachycardia
  - Focal area of automaticity in the atrium
SVT: Narrow Complex, Fast

- Originate above ventricles (atrium or AV node)
- Usually structurally normal hearts
- Paroxysmal = sudden onset, sudden resolution
- Palpitations, light-headedness, anxiety, SOB
3. A 24 yo woman who has been treated for panic attacks presents to the ED with heart rate of 180 beats/min without clear atrial activity. Her blood pressure is 130/80 and she reports feeling anxious but does not have dizziness or chest pain. You diagnose SVT based on her EKG. You try vagal (Valsalva) maneuvers without successful change in the rhythm or rate. Which of the following is the next best step in treatment?

A. Intravenous adenosine (Adenocard)
B. Intravenous amiodarone (Cordarone)
C. Intravenous diltiazem
D. Intravenous verapamil
E. Electrical cardioversion
Vagal maneuvers: Valsalva, unilateral carotid massage

If unsuccessful, next step is Adenosine: 6 mg IV bolus; repeat with 12 mg prn

If still not successful, several next options to slow AV conduction:

- β-blocker: metoprolol 5 mg IV; repeat twice if needed
- Diltiazem: 5-20 mg IV; repeat in 15 min if needed
- Verapamil: 2.5-5 mg IV; repeat q 15 min up to 20-30 mg
- Digoxin requires loading over hours so is not quickly effective.

Will see abrupt conversion to sinus rhythm
SVT: Long-term Therapy

*If merited by frequency and severity of episodes*

“Pill in the pocket” for prn use
Diltiazem 120 mg + propranolol 80 mg or flecainide 3 mg per kg

Typically use the medication that converted the rhythm
- Diltiazem 240-360 mg daily
- Verapamil 240-480 mg daily
- Metoprolol 25-200 mg daily
- Flecainide 50-300 mg daily

Catheter Ablation (radiofrequency or cryoablation)
- 95% effective, expensive
- Inadvertent heart block risk <5%
Multifocal Atrial Tachycardia

- Irregular narrow-complex rhythm with three or more P waves of variable morphology.
- Differences from wandering atrial pacemaker: significantly increased rate and almost invariably associated with severe pulmonary disease.
- Treatment: verapamil, diltiazem, metoprolol.
Atrial Fibrillation

- Irregularly irregular narrow-complex rhythm
- Atrial rate >300 bpm with erratic activation of ventricles.
- No discrete P waves are noted.
- Paroxysmal or permanent
- If persistent, atrial remodeling occurs, increasing chance of permanent atrial fibrillation
- Alcohol consumption > one drink/day associated with atrial fibrillation
- Check TSH to rule out hyperthyroidism
4. A 76 yo man is in your office with new atrial fibrillation with a rate of 130 bpm with BP 130/80 mm Hg. He also has COPD from smoking and uses an albuterol inhaler and inhaled corticosteroids. Lung exam reveals scattered wheezes and rhonchi. Which one of the following would be the best choice to control his heart rate?

A. Digoxin (Lanoxin)
B. Diltiazem (Cardizem)
C. Amiodarone
D. Propranolol
E. Cardioversion
Atrial Fibrillation: Rate Control

• Outcomes equivalent to rhythm control – AFFIRM study (2002)

• Non-dihydropyridine CCBs, particularly diltiazem, do not affect the β2 receptors in the lung so can be used in COPD.

• β-blockers provide the most effective control of heart rate in AF, both at rest and during exercise so generally are tried first. 2nd generation β-blockers (metoprolol, carvedilol, bisoprolol) are β1 selective so can be considered in patient with COPD, though the selectivity is lost at higher doses. Propranolol is a nonselective β-blocker.

• Digoxin is no longer recommended for monotherapy but can be added to β-blocker or CCB
Atrial Fibrillation: Anticoagulation

• To reduce risk of embolic stroke
• Risk quantification is critical
  - Risk of stroke vs. risk of bleeding
  - CHA$_2$DS$_2$-VASc score (superior to old CHADS$_2$ score)
  - HAS-BLED score predicts risk of bleeding (≥3 is high risk)
    • Hypertension, Abnormal renal or liver function, Stroke, Bleeding, Labile INR, Elderly, Drugs or alcohol
**CHA$_2$DS$_2$-VASc**

- Congestive heart failure (HFrEF) = 1 point
- Hypertension = 1 point
- Age $\geq$ 75 = 2 points
- Diabetes = 1 point
- Stroke or TIA = 2 points
- Vascular disease = 1 point
- Age = 65-74 = 1 point
- Sex (Female) = 1 point

<table>
<thead>
<tr>
<th>Score</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (stroke risk 0%)</td>
<td>ASA 81 mg</td>
</tr>
<tr>
<td>1 (stroke risk 1.3% per year)</td>
<td>ASA or oral anticoagulation (OAC); favor OAC</td>
</tr>
<tr>
<td>$\geq$2 (stroke risk 2.2% per year and higher)</td>
<td>Anticoagulation</td>
</tr>
</tbody>
</table>

ACC/AHA Guidelines on Atrial Fibrillation 2014
Atrial Fibrillation: Anticoagulation

- **Warfarin** (*VKORC1* and *CYP2C9* genotype variations can affect metabolism)
- **Direct oral anticoagulants** ("DOACs" or "NOACs")
  - Direct thrombin inhibitor
    - Dabigatran (Pradaxa)
  - Factor Xa inhibitor
    - Apixaban (Eliquis)
    - Rivaroxaban (Xarelto)
    - *Equal efficacy to warfarin*
    - *Similar bleeding risk*
    - *More expensive*
    - *Fixed dosing (no INR checks)*
    - *Adjust dose in renal disease*
    - *IV Antidotes now available*
      - idarucizumab is antidote to dabigatran
      - andexanet is antidote to Xa inhibitors
Atrial Fibrillation: Rhythm Control

Cardioversion – limited long-term effectiveness

- Electrical cardioversion
  - Emergently if unstable and present <48 hours
  - If non-emergent, need 4 weeks anticoagulation before and after procedure (unless transesophageal ECHO shows no clot in left atrium)

- Pharmacologic cardioversion
  - IV dofetilide, flecainide, propafenone, amiodarone, ibutilide
  - Amiodarone can cause bronchiolitis obliterans organizing pneumonia (BOOP), interstitial pneumonitis, and hypothyroidism
Atrial Fibrillation: Rhythm Control

Catheter ablation

- For patients with refractory fibrillation who are symptomatic
- Younger patients
- Targeted destruction of foci near pulmonary vein ostia in left atrium
- Best predictor of long-term success is size of left atrium
- Needs to be repeated in ~20% of patients
Atrial Fibrillation: Other Options

• Maze procedure and left atrial appendage obliteration (only if undergoing heart surgery for other reasons)

• Occlusion of the left atrial appendage, for patients for whom anticoagulation is contraindicated
  – Watchman device
Atrial Flutter

- Regular or regularly irregular narrow-complex rhythm that is typically rapid. The atrial rate is ~300. Conduction is expressed as atrial beats: ventricular beats (e.g., 3:1, 2:1).
- Vagal maneuver (arrow) slows AV conduction and makes the flutter waves more apparent (arrowheads).
- Management is similar to atrial fibrillation.
Wolff-Parkinson-White Syndrome

- Patients with Delta Waves (pre-excitation of QRS complex) due to bypass track on their resting EKG, who then have a tachyarrhythmia (Up to 80% with tachyarrhythmia have atrioventricular reentrant tachycardia (AVRT), 15-30% have atrial fibrillation, and 5% have atrial flutter)
- Short PR interval, delta wave with widened QRS complex (not >0.1 second)
5. A 32 yo woman presents with dyspnea, palpitations and near-syncope. Her EKG shows rapid atrial fibrillation (150 bpm) with delta waves. Which of the following treatments is a Class I recommendation for acute treatment?

A. Intravenous Metoprolol  
B. Intravenous Diltiazem  
C. Intravenous Digoxin  
D. Intravenous Procainamide  
E. Intravenous Amiodarone
Wolff-Parkinson-White syndrome (pre-excitation)

- Accessory pathway bypasses the AV node
- Caution with AV nodal blocking agents, which may force conduction down accessory pathway, predisposing to tachyarrhythmias, including ventricular fibrillation (sudden death)
Wolff-Parkinson-White Syndrome

Treatments

Acute treatment when the tachyarrhythmia is…

• AVRT: follow usual approach for SVT, with cardioversion available if needed
• Atrial fibrillation/flutter: Ibutilide or procainamide – do NOT use AV nodal blockers such as Amiodarone, Digoxin, Beta blockers, Adenosine, Verapamil, diltiazem

Long term treatment: catheter ablation vs watchful waiting – EP study can risk stratify. Patient preference or patient occupation may influence treatment decision. The incidence of sudden cardiac death (SCD) is low.
Sinus Node Disease ("Sick Sinus Syndrome")

• Sinus node disease can cause tachy-brady syndrome, bradycardia, episodic sinus arrest
• Junctional escape beats may be seen (AV nodal origin; narrow complex; no preceding P wave).
• Causes: Aging, superimposed drug effect, right or circumflex coronary artery disease, severe hypothyroidism
• Pacemaker therapy is indicated in **symptomatic** patients.
Ventricular Tachycardia (VT)

- ≥3 beats in a row originating from ventricle at rate >100 bpm
  - Non-sustained: Self-termination within 30 seconds
  - Sustained: Duration >30 seconds, even if ultimately self-terminates
- Causes: ischemia, heart failure, hypoxemia, prolonged QT interval, electrolyte abnormalities, drug toxicity
- If pulseless → defibrillation
- If hemodynamically stable → Lidocaine, Amiodarone
Torsades de Pointes
“Twisting of the Points”

- Polymorphic VT with cyclical progressive change in cardiac axis.
- Usually non-sustained; may evolve into ventricular fibrillation.
- Associated with hypomagnesemia, hypokalemia and medications or conditions that prolong the QT interval.
- Treatment = IV magnesium
Long QT syndrome

Genetic (~1 in 7000 people)
• If resting QTc is greater than 470 msec, a beta blocker is advised
• QTc >500 msec is high-risk for torsades de pointes and sudden death, may need Implantable Cardioverter Defibrillator (ICD)
• Avoid QT-prolonging medications

Acquired
• Due to low potassium, magnesium, or calcium, or QT-prolonging medications

QTC is prolonged if
Women= >460 msec
Men= >440 msec
## Commonly Used QT-Prolonging Drugs

<table>
<thead>
<tr>
<th>Antiarrhythmics</th>
<th>Psychotropics</th>
<th>Antibiotics</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disopyramide</td>
<td>Haloperidol</td>
<td>Erythromycin</td>
<td>Methadone</td>
</tr>
<tr>
<td>Procainamide</td>
<td>Phenothiazines</td>
<td>Pentamidine</td>
<td>Probucol</td>
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<tr>
<td>Quinidine</td>
<td>Citalopram</td>
<td>Azithromycin</td>
<td>Droperidol</td>
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<tr>
<td>Dofetilide</td>
<td>Tricyclic antidepressants</td>
<td>Chloroquine</td>
<td>Ondansetron</td>
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<tr>
<td>Dronedarone</td>
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<td>Ciprofloxacin</td>
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<tr>
<td>Ibutilide</td>
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<td>Fluconazole</td>
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<td>Sotalol</td>
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<td>Levofloxacin</td>
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<tr>
<td>Amiodarone</td>
<td></td>
<td>Moxifloxacin</td>
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<tr>
<td></td>
<td></td>
<td>Clarithromycin</td>
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<td></td>
<td></td>
<td>Itraconazole</td>
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<tr>
<td></td>
<td></td>
<td>Ketoconazole</td>
<td></td>
</tr>
</tbody>
</table>

**Antibiotics**
- Erythromycin
- Pentamidine
- Azithromycin
- Chloroquine
- Ciprofloxacin
- Fluconazole
- Levofloxacin
- Moxifloxacin
- Clarithromycin
- Itraconazole
- Ketoconazole

**Others**
- Methadone
- Probucol
- Droperidol
- Ondansetron
Answers

1. D
2. B
3. A
4. B
5. D
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Common Problems in Neurology

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Learning Objectives

1. **Seizure Disorders** – Describe the classification, diagnostic tests used in the evaluation, use of and common side effects of antiepileptic medications, management in the pregnant patient.

2. Diagnosis and treatment of **vascular headaches and chronic tension headaches** and recognize the indications for neuroimaging in the evaluation of headaches.

3. List the clinical presentations and management options for **multiple sclerosis**.
A 65-year-old male patient of yours presents to the ED having had a seizure in his bedroom witnessed by his wife. She heard a cry and the fall, saw him stiffen and shake all over, and then become incontinent of urine. He was not arousable until he had been in the ED for several minutes. His seizure would be classified as:

A. Complex Partial
B. Generalized Tonic-Clonic
C. Grand Mal
D. Myoclonic
• A seizure is a transient occurrence of signs or symptoms due to abnormal excessive or synchronous neuronal activity in the brain, and can be either focal (partial) or generalized
Classification of Seizures

• Focal seizures (formerly partial)
  – Local
  – Ipsilateral propagation
  – Contralateral propagation
  – Secondarily generalized
  – Consciousness may or may not be impaired (formerly complex vs simple)
Classification of Seizures

- Generalized seizures
  - Nonconvulsivse (absence)
    • Typical (3/sec spike and slow waves on EEG)
    • Atypical (<3/sec spike and slow waves on EEG)
  - Convulsive
    • Myoclonic (very short muscle contractions)
    • Clonic (repeated jerking)
    • Tonic (stiffening)
    • Tonic-clonic (stiffening followed by jerking)
      - Grand Mal term is now outdated and no longer used
    • Atonic (“drop attacks” – loss of muscle tone)
2. The most likely cause of a new seizure in a patient >65 years old would be:

A. Cerebrovascular disease/stroke
B. Idiopathic
C. Metabolic derangement
D. Brain tumor
Etiology of Seizures

- Idiopathic – 62% overall ages
- Stroke – 15% overall, 49% >age 60
- Brain tumor – 6% overall, 11% >age 60
- Head trauma
- Intracranial infection
- Cerebral degeneration
- Congenital brain malformations
- Inborn errors of metabolism
“Provoked” Seizures

• Seizures that occur within a medical setting, that, if removed, presumably the seizures would not occur

• Metabolic derangements
  – Hypo- and hyperglycemia
  – Hyponatremia
  – Hypocalcemia (usually neonates)
  – Renal failure and uremia
“Provoked” Seizures

• More rare metabolic causes
  – Hyperthyroidism
  – Acute intermittent porphyria

• Cerebral anoxia
  – Arrest, anesthesia, drowning, CO
  – Syncope with brief hypoventilation (adolescents)

• Drug toxicities/withdrawal
  – Alcohol
  – Benzodiazepines
Epilepsy

- Epilepsy is a chronic condition characterized by at least two unprovoked seizures at least 24 hours apart.
3. A patient with a new onset seizure has a complete workup that is unremarkable for any provoked causes, signs of infection, drug toxicities, or neurological disease. The next step in the workup for this patient would be:

A. Event monitor  
B. Prolactin level  
C. Neuroimaging (CT/MRI)  
D. Lumbar puncture
Diagnostic Evaluation

• Must start with a complete H&P
  – Witnessed description of the event
  – Substance abuse
  – Head trauma
  – Cerebrovascular events
  – Cardiac history
  – Sleep disorders
  – Medication history
    • Diphenhydramine, tramadol, buproprion
Diagnostic Evaluation

• Blood studies
  – CBC
  – Electrolytes
  – Calcium, magnesium, phosphorus
  – Glucose
  – BUN/creatinine
  – ?ESR, LFTs, RPR
  – Prolactin has limited utility – low sensitivity
Diagnostic Evaluation

• Lumbar puncture – only if signs of infection
• EEG – essential to diagnosis and classification
• Neuroimaging
  – MRI preferred over CT
  – Better for identifying structural lesions
  – Is the lesion the cause of the seizures?
4. A patient presents to you having had a single new unprovoked seizure with negative workup. Your first step in treatment would be:

A. Start no medications at this time  
B. Start oral valproic acid  
C. Start oral phenytoin  
D. Start IV phenytoin
Starting Antiepileptic Drugs (AEDs)

- Not necessary in individuals with a single new onset seizure or infrequent seizures
- Immediate AED therapy compared to delay of treatment pending a 2nd seizure is likely to reduce recurrence risk within the first 2 years (SORT B) but not improve quality of life (SORT C)
- Immediate AED unlikely to improve prognosis over a longer term (>3 years) (SORT B)
- Treat only if there is a high risk of recurrence
- Most will respond to 1st or 2nd monotherapy AED

Neurology. 2015; 84(16): 1705
JAMA Neurol. 2018 75(3): 279-286
High Risk of Seizure Recurrence

- Status epilepticus
- Hx of brain injury
- Brain lesion on neuroimaging
- Focal neurological abnormalities
- Intellectual disability
- Abnormal EEG with epileptiform discharges
- High-risk seizure types
  - Focal, absence, myoclonic or atonic seizure
Antiepileptic Drugs

- Start with AED monotherapy
- Selection is individualized based on
  - Relative efficacy
  - Other medications (enzyme induction)
  - Comorbid conditions
  - Potential adverse effects, tolerability, serious toxicity
  - Patient preferences and cost
- Do not consider combination therapy until patient has failed two monotherapy trials
- Monitor patients closely for effectiveness, side effects, and compliance
Classification of AEDs

- Broad Spectrum
  - All seizure types
- Narrow Spectrum
  - Focal or secondarily generalized seizures
- First Generation
  - Less expensive
  - More side effects and drug interactions
  - Require monitoring of drug levels
- Second Generation
  - More expensive
  - Fewer side effects and interactions
  - Monitoring often unavailable
Toxicities of AEDs

• Common toxicities with AEDs
  – *Suicidality* – twice the risk with AEDs compared to placebos
  – *Neurotoxicities* – ataxia, dizziness, somnolence, fatigue, headache
  – *Rash* – wide spectrum from simple maculopapular rashes to Stevens-Johnson Syndrome
  – *Liver enzyme* – induction or inhibition
5. A 46-year-old male patient of your practice presents with fever, arthralgias, and erythroderma. He has no respiratory symptoms. His medications include lisinopril, valproic acid, and atenolol. His fever is 102.2° and his skin reveals a very erythematous maculopapular rash and some tenderness. There are no oral lesions. You order bloodwork that reveals a WBC = 16,000 with 17% eosinophils, and AST and ALT about 2x normal. The most likely diagnosis is:

A. Toxic shock syndrome
B. DRESS syndrome
C. Stevens-Johnson syndrome
D. Neurocutaneous phakomatosis syndrome
DRESS Syndrome

- **Drug Reaction with Eosinophilia and Systemic Symptoms**
- Maculopapular rash, fever, arthralgias and lymphadenopathy
- Persists weeks to months with 10-25% mortality
- Common offenders
  - *Carbamazepine*, phenytoin, lamotrigine, valproate
  - Allopurinol and sulfonamides

Status Epilepticus

A single unremitting seizure lasting longer than 5 minutes or recurrent seizures without interictal return to baseline

- Convulsive: rhythmic jerking of extremities (Generalized Convulsive SE)
- Non-convulsive: seizure activity on EEG without clinical findings of GCSE
- Refractory: do not respond to standard treatment regimens for SE

Non-Convulsive Status Epilepticus

- “Wandering confused”
- Acutely ill patient with severely impaired mental status
  +/- subtle motor movements (rhythmic eye twitches or tonic eye deviation)
  “subtle status”
  Frequently follows uncontrolled GCSE
  Often in ICU setting

## Mortality Rates

<table>
<thead>
<tr>
<th>Status Epilepticus Type</th>
<th>Mortality Rate at Hospital Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convulsive</td>
<td>9-21%</td>
</tr>
<tr>
<td>Non-Convulsive</td>
<td>18-52%</td>
</tr>
<tr>
<td>Refractory</td>
<td>23-61%</td>
</tr>
</tbody>
</table>

Status Epilepticus Initial Therapy

- Evaluate causes while you treat
- Drug of choice is lorazepam 0.1 mg/kg IV up to 4 mg/dose
- Drug of choice via other routes: Midazolam IM, Diazepam rectally
- Urgent Control Therapy with AED in all SE patients unless immediate cause is known and corrected (e.g., hypoglycemia) with phenytoin/fosphenytoin, phenobarbital, valproate sodium

Neurocritical Care. Aug 2012; 17 (1): 3-33. SORT A
Seizures and Driving

- 0.01-0.1% of MVAs are attributable to seizures
- Fatal MVAs 8x greater from alcohol than seizures
- Seizure-free interval is best indicator of driving safety
  - The longer the seizure-free interval, the less likely an MVA
  - The longer the patient is restricted from driving, the lower the compliance

- 1994 consensus statement of the American Academy of Neurology, American Epilepsy Society, and the Epilepsy Foundation of America recommends a 3-month seizure-free interval before driving resumed.

Seizures and Driving

- States authorities make the ultimate decision about driving, not physicians.
- State laws vary regarding seizure-free intervals.
- Only a few states require physicians to report patients with seizures.
- KNOW YOUR OWN STATE’S LAWS!

www.epilepsy.com/driving-laws/2008721
Epilepsy and Contraception

• Hormonal contraception failure on AEDs that stimulate cytochrome P450 system:
  – Carbamazepine
  – Phenytoin
  – Phenobarbital/primidone
  – Topiramate
  – Oxcarbazepine
Epilepsy and Contraception

- AEDs also interfere with progesterone-only pills, contraceptive rings, and progesterone implants.
- AEDs do NOT interfere with Depo Provera or IUDs (hormonal or copper)
- Combined OCs can decrease lamotrigine blood levels by as much as 50%
Epilepsy and Pregnancy

- Consider withdrawing AEDs 6 months prior to conception if patient has been seizure-free >2 years
- Do not change AEDs in pregnancy if patient well-controlled
- Supplement folic acid 4 mg per day if patient on carbamazepine or valproic acid
Epilepsy and Pregnancy

• Monitor both total and free drug levels of AEDs at 6 weeks, 10 weeks, then once a trimester, then first or second postpartum week.

• Vitamin K supplementation 10-20 mg/day in last month of pregnancy if on phenobarbital, carbamazepine, phenytoin, topiramate, oxcarbazepine.

• May breastfeed on AEDs except lamotrigine
6. A 46-year-old male smoker comes to you for a complaint of unilateral, cyclical, nocturnal headaches that last 30 minutes each. He has taken OTC meds, but they have not been helpful. The best prophylactic medication for his headaches would be:
A. Oxygen
B. Sumatriptan
C. Propranolol
D. Verapamil
Primary Headaches

- Tension-type
- Trigeminal Autonomic Cephalgias
  - Primary, unilateral headache syndromes in the trigeminal nerve distribution
  - Associated with ipsilateral autonomic symptoms
  - Cluster headaches are the most common
- Migraines
- Others: cough, exercise, sexual activity, others
Chronic Tension Headaches

• Bilateral, band like
• Tx: OTC analgesics
  − if >2x/week, increased risk of chronic daily HA
  − TCAs for prophylaxis (SOR B)
  − Butalbital and opioids should be avoided- increase risk of chronic daily HA

• Chronic Daily Headaches: 15 or more HA per month x 3 months
  − Can be due to chronic tension headaches or chronic migraines
  − Treatment: stop all abortive treatments, begin prophylactic treatments:
  − Non-pharmacologic: biofeedback/relaxation, cognitive behavioral therapy (SOR B)
  − Pharmacologic: SOR A: topiramate, valproate
    SOR B: amitriptyline, gabapentin, tizanidine
  − no effect: SSRIs, propranolol, botox

Cluster Headaches

- Prevalence <1%
- Males > females
- Orbital or temporal unilateral pain
- Associated ptosis, miosis, rhinorrhea, lacrimation or conjunctival injection
- Last 15 minutes to 3 hours
- Acute treatment – oxygen and sumatriptan SQ
- Preventive treatment
  - Verapamil – drug of choice (240-320 mg per day or more)
  - Steroids, lithium, topiramate
Migraine Headache

- Affects 18-26% women, 6-9% men in US
- Pathophysiology – unclear
  - Cellular and blood-brain permeability changes → inflammation of meninges and vasodilation
  - Genetic factors play a major role.
- Recurrent attacks in four phases
  - Prodrome: euphoria, depression, irritability, yawning
  - Aura: Visual – flickering lights, spots or lines
    - Sensory – pins and needles, numbness
    - Dysphasic speech
  - Headache
  - Postdrome – sudden head movement causes head pain
ICHD-3 Criteria: Migraine Without Aura

A. At least five attacks fulfilling criteria B–D
B. Lasting 4-72 hours
C. Has at least two characteristics
   1. Unilaterial location
   2. Pulsating quality
   3. Moderate or severe pain intensity
   4. *Aggravation by or causing avoidance of routine physical activity (e.g., walking or climbing stairs)
D. At least one of the following
   1. Nausea and/or vomiting
   2. *Photophobia and phonophobia
E. Not better accounted for by another ICHD-3 diagnosis

* denotes a secondary criterion.
ICHD-3 Criteria: Migraine WITH Aura

A. At least two attacks fulfilling criteria B and C
B. One or more fully reversible aura symptoms
C. At least three of the following:
   1. At least one aura symptom *spreads* gradually over ≥5 minutes
   2. Two or more aura symptoms occur *in succession*
   3. Each individual aura symptom lasts 5-60 minutes
   4. At least one aura symptom is *unilateral*
   5. At least one aura symptom is *positive*
   6. The aura is accompanied, or followed within 60 minutes, by headache
D. Not better accounted for by another ICHD-3 diagnosis.
 Diagnosis of Migraine Headache

• Clinical diagnosis – primarily history
• Negative neurological examination
• Neuroimaging unnecessary, except with
  – Unexplained abnormal neuro findings
  – Headaches that do not fit the strict definition
  – Choose Wisely Campaign (Radiology)
• No benefit for EEG
  – Choose Wisely Campaign (Neurology)
“Red Flags” for Neuroimaging

- Rapidly increasing headache frequency
- Lack of coordination, abnl neuro exam, papilledema
- Headaches that awaken from sleep
- Worse headache of life
- Patients with cancer, HIV, Lyme disease
- New onset over age 50
- Rapid onset with strenuous exercise

CT or MRI w/o contrast – test of choice

(need contrast if immunocompromised or concern for temporal arteritis, dissection, or aneurysm)

Am Fam Physician 2013 May 15;87(10): 682-687
Acute Treatment of Migraine: First Line

- Acetaminophen, NSAIDs
- Triptans – serotonin 1b/1d agonists
  - All triptans have been found to be effective and well-tolerated
  - Avoid triptans (due to increased BP risk) in
    - Familial hemiplegic migraine
    - Basilar migraine
    - Ischemic stroke
    - Ischemic heart disease, Prinzmetal’s angina, uncontrolled hypertension
    - Pregnancy (relative contraindication)
- Acetaminophen/aspirin/caffeine
- Sumatriptan/naproxen
Acute Treatment of Migraine: Second Line

- Intranasal Dihydroergotamine (DHE)
  - Side effects: leg cramps, HTN, tinging in extremities
  - Contraindicated in pregnant
- Antiemetics: dopamine antagonists
  - Prochlorperazine, Metoclopramide, promethazine
  - Risk extrapyramidal adverse effects
- Opioids: tramadol, codeine, meperidine, butorphanol
  - Moderate effectiveness but high abuse potential
  - Routine use not recommended
Refractory Migraine

• Parenteral dihydroergotamine (DHE45)
  – Avoid for 24 hours after triptan
• Magnesium sulfate IV: alternate treatment migraine with aura
• Dexamethasone IV: consider to decrease recurrence-prednisone taper

• Valproate IV: contradictory evidence
• Diphenhydramine: not recommended
• Opioids: use sparingly and infrequently

Preventive Treatment of Migraine

• Indications
  – Headaches significantly interfere with usual activities
  – Overuse of acute therapies
  – Adverse events with acute therapies
  – Patient preference
  – Certain migraine variants that mimic CVAs
    • Hemiplegic migraines
    • Basilar migraines
    • Prolonged aura
Preventive Treatment of Migraine

• **First line agents** (if no contraindications): SORT A
  - Valproic acid
  - Frovatriptan
  - Propranolol, timolol, metoprolol
  - Topiramate
    - If not effective after 2-3 months, adjust dose.
    - If max dose or adverse effects, change med
    - If no single first line agent effective/tolerable, consider combination

• **Second line agents**: amitriptyline, atenolol, nadolol, naratriptan, zolmitriptan, venlafaxine, supplements (butterbur, riboflavin, feverfew, magnesium

Am Fam Physician 2019 Jan 1;99(1)17-24
Estrogen-Containing Contraceptives and Migraines

- Increased risk of CVA if
  - Migraines with aura at any age
  - Migraines over age 35

(Lack of good quality data but was still on 2018 ITE)
Multiple Sclerosis

- Auto-immune inflammatory demyelinating disease
- Affects adults 20-40 years old, 2:1 female to male ratio
- Most common neurologic disability in young adults
- Prevalence 1 per 800 persons; incidence 2-10 per 100,000
- Must diagnose discrete lesions in various parts of the CNS at least 3 months apart
- Pathogenesis unclear
  - Immune system stimuli
  - Viral infections
  - Geographic and environmental factors
  - Genetic factors

Am Fam Physician. 2013 May 15; 87 (10): 712-714
Multiple Sclerosis

• Clinical Manifestations
  – Insidious or sudden onset
  – Optic neuritis – pain with eye movement and visual loss
  – Paresthesias, weakness, loss of coordination
  – Bladder urgency/retention
  – Constipation, sexual dysfunction
  – Fatigue and depression
  – *Lhermitte’s sign* – neck flexion results in an electric shock sensation down limbs and spine
  – *Uhthoff’s phenomenon* – worsening of symptoms with increased body temperature
  – No single specific diagnostic test
Multiple Sclerosis

• Acute exacerbations treated with corticosteroids
  – Methylprednisolone 500-1000 mg daily x 3-7 days
  – Short prednisone taper
Multiple Sclerosis

- No treatment has been shown to affect long-term outcome
- Disease-modifying agents should be started *EARLY*
  - Decreased relapse rate, decreased brain lesions on MRI
- SE Immunomodulators
  - Interferons – flu-like syndrome, leukopenia, depression/suicidality
  - Glatiramer – injection site reactions, flushing, chest tightness/palpitations
- SE Immunosuppressives
  - Dimethyl fumarate – progressive multifocal leukoencephalopathy
  - Fingolimod – zoster infections
  - Teriflunomide – hepatotoxicity
  - Mitoxantrone – cardiac toxicity

*Am Fam Physician. 2013 May 15; 87 (10): 712-714*
Board Frequent Fliers

• SZ cause – most common idiopathic overall, if >60 CVA
• SZ meds – lots of side effects, not needed after first SZ with neg eval, in preg- stop 6 mo prior to conception if no SZ >2yrs
• Chronic tension HA – TCAs for prevention
• Chronic daily HA – stop abortive, start topiramate or valproate, consider biofeedback, CBT
• Migraine prevention – TCAs no longer first line
• HA neuroimaging – for red flags only- usually CT or MRI w/o contrast
• MS- start immunomodulators early, meds have lots of side effects
Answers

1. B
2. A
3. C
4. A
5. B
6. D
## Antiepileptic Drugs

<table>
<thead>
<tr>
<th>First Generation</th>
<th>Second Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>More complicated pharmacokinetics</td>
<td>Fewer serious adverse effects</td>
</tr>
<tr>
<td>Narrower therapeutic ranges</td>
<td>Wider therapeutic Ranges</td>
</tr>
<tr>
<td></td>
<td>Lower Risk teratogenesis</td>
</tr>
<tr>
<td></td>
<td>More expensive</td>
</tr>
<tr>
<td><strong>Examples:</strong></td>
<td><strong>Examples:</strong></td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>Levetiracitam</td>
</tr>
<tr>
<td>Ethosuxamide</td>
<td>Lamotrigine</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>Oxcarbazepine</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>Gabapentin</td>
</tr>
<tr>
<td>Primidone</td>
<td>Pregabalin</td>
</tr>
<tr>
<td>Valproic Acid</td>
<td>Topiramate</td>
</tr>
</tbody>
</table>


# Antiepileptic Drugs: First-Line Monotherapy

<table>
<thead>
<tr>
<th>Seizure type</th>
<th>&lt; 16 years old</th>
<th>16-59 years old</th>
<th>&gt; 60 years old</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal</td>
<td>Oxcarbazepine</td>
<td>Carbamazepine</td>
<td>Gabapentin</td>
<td>SORT A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Levetiracetam</td>
<td>Lamotrigine</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phenytoin</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zonisamide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generalized:</td>
<td>Ethosuxamide</td>
<td>No SORT A</td>
<td>No SORT A</td>
<td>Choose a Broad</td>
</tr>
</tbody>
</table>
| Absence           | Valproic Acid  |                 |                | spectrum 2\textsuperscript{nd} generation |}
| Generalized:      | No SORT A      | No SORT A       | No SORT A      | Recommendations          |
| Others            |                |                 |                | are SORT C/D             |

*Am Fam Phys 2017 July 15; 96 (2): 87-96*
Emergency Medicine, Part 1

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Ellis Hospital Family Medicine Residency Program
Albany Medical College, Albany, New York
Disclosure Statement

It is the policy of the AAFP that all individuals in a position to control content disclose any relationships with commercial interests upon nomination/invitation of participation. Disclosure documents are reviewed for potential conflicts of interest. If conflicts are identified, they are resolved prior to confirmation of participation. Only participants who have no conflict of interest or who agree to an identified resolution process prior to their participation were involved in this CME activity.

All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.
Learning Objectives

1. Be familiar with current BLS and ACLS algorithms.
2. Understand new principles of sepsis recognition and management.
3. Recognize common injuries associated with child abuse.
4. Evaluate and triage complicated extremity trauma.
5. Develop wound care strategies for common lacerations.
6. Be familiar with Good Samaritan Laws.
Part 1

• Resuscitation
  - BLS
  - ACLS
    • Cardiac arrest
    • Arrhythmias
  - Good Samaritan Laws
• Shock
• Trauma – Prevention Strategies

• Specific injuries and emergencies
  - Head injury
  - Eye and ENT emergencies
  - Chest and Abdominal trauma
  - Muscle and extremity injury
  - Acute laceration and burn care

• Child Abuse
1. You are on a plane ride when a passenger suddenly becomes unresponsive. Which statement below is true?

A. You should immediately start chest compressions
B. You should check a pulse, if none present, open the airway, give 2 rescue breaths and start chest compressions
C. You should check a pulse; if none present, immediately start chest compressions
D. You are aware that Good Samaritan laws protect you in all 50 states, but do not get involved because such laws do not exist during airflight
A. Nontraumatic Cardiac Arrest: BLS and ACLS: Basics

Step 1: Initiate emergency response

Step 2: Start BLS

Step 3: Monitor

Notes
1) No pulse check – public
   *Pulse check <10sec – healthcare provider
2) Think “CAB”

“Shockable” (VF/VT) vs. “nonshockable” (asystole/PEA)
Nontraumatic Cardiac Arrest: “Nonshockable” Rhythm: Asystole & PEA

Step 1: Continue CPR for 2 minutes

Step 2: Epinephrine 1mg IV/IO q3-5 minutes

Asystole Note
Atropine is out

PEA: The 5T’s and 6H’s

1. Toxins
2. Tamponade
3. Tension pneumo
4. Thrombosis (cardiac)
5. Thrombosis (PE)

1. H+ (acidosis)
2. Hypothermia
3. Hypokalemia
4. Hyperkalemia
5. Hypovolemia
6. Hypoxia
**Nontraumatic Cardiac Arrest:**

“Shockable” Rhythm: V fib/V tach

1. **Defibrillate (200J) x 1**
2. 5 cycles of CPR, if shockable rhythm
   - 1. Defibrillate again (x1) and
   - 2. Give vasopressors (epinephrine 1 mg q3-5min)
3. 5 cycles of CPR, if shockable rhythm
   - 1. Defibrillate again (x1) and
   - 2. Give antiarrhythmic (amiodarone 300mg IV/IO)
Electrical Cardioversion

Narrow regular: 50-100 J
SVT and atrial flutter

Narrow irregular: 120-200 J
atrial fibrillation

Wide regular: 100 J;
monomorphic VT

Wide irregular: defibrillation dose
polymorphic VT (not synchronized)

All cases courtesy of ecgweekly.com
Good Samaritan Laws

• Present in all 50 states
  - And on airlines (Aviation Medical Assistance Act, 1998)

• General principles
  - No legal obligation to provide aid*
  - Immunity from malpractice suit if aid were provided, except for
gross, willful or wanton negligence or lack of “good faith”
  - Restriction to application outside of hospitals*
  - Withdrawal of legal immunity if the doctor accepted payment for aid
  - Recipient of aid must not object to aid rendered.
Shock

- Cardiogenic
- Septic
- Hypovolemic
- Neurogenic
Sepsis: CMS Definitions

• **Sepsis** = ➔
  - SIRS + source of infection

• **Severe Sepsis** = ➔
  - Sepsis + a) lactate > 2  \textbf{or}
    - b) organ dysfunction

• **Septic Shock** = ➔
  Severe sepsis + a) lactate > 4  \textbf{or}
    - b) Hypotension despite fluid resuscitation

\textbf{SIRS:} ≥2 or more
- T <36° or >38°
- RR>20
- P>90
- WBC <4,000 or >12,000 \textbf{or} >10% immature cells
Septic Shock Management

To be completed within three hours of time of presentation:

- Measure lactate level
- Obtain blood cultures prior to administration of antibiotics
- Administer broad spectrum or approved combination of antibiotics within 1 hour of sepsis recognition
- **Administer 30 mL/kg crystalloid for hypotension or lactate ≥4 mmol/L**

* If hypotensive (MAP <65) after fluid challenge, start norepinephrine
Trauma Prevention

- 27.6 million people were treated in an ED for injuries in 2015
- 2.8 million people were hospitalized due to injuries in 2015
- Each year 214,000 people die from injury – 1 person every 3 min
  - #1: MVA – 33,804/yr (2013)
Trauma Prevention

• 27.6 million people were treated in an ED for injuries in 2015
• 2.8 million people were hospitalized due to injuries in 2015
• Each year 214,000 people die from injury – 1 person every 3 min
Trauma Prevention

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Trauma Prevention

• 27.6 million people were treated in an ED for injuries in 2015
• 2.8 million people were hospitalized due to injuries in 2015
• Each year 214,000 people die from injury – 1 person every 3 min
  - #1: Firearms 39,773 (2017)
Trauma Prevention Children (age 1-19)

2016 statistics

<table>
<thead>
<tr>
<th>Cause</th>
<th># of deaths</th>
<th>% of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>All causes</td>
<td>20,360</td>
<td></td>
</tr>
<tr>
<td>Injury-related</td>
<td>12,336</td>
<td>60.6%</td>
</tr>
<tr>
<td>#1: Motor vehicle crash</td>
<td>4,074</td>
<td>20.0%</td>
</tr>
<tr>
<td>#2: Firearm</td>
<td>3,143</td>
<td>15.4%</td>
</tr>
<tr>
<td>(#3 Malignant neoplasm)</td>
<td>1,853</td>
<td>9.1%</td>
</tr>
</tbody>
</table>

(suffocation, drowning, burns make up the rest of trauma deaths)

Cunningham RM, et al. NEJM, December 20, 2018
Trauma Prevention Children (age 1-19)

- **2016 statistics**
  - All causes: 20,360 deaths
  - Injury-related: 12,336 deaths (60.6%)
- **#1: Motor vehicle crash**
  - 4,074 deaths (20.0%)

- **Seat belts** reduce serious crash-related injuries and deaths by 50%
- **Seat belts** saved almost 14,000 lives in 2015
- **Air bags** provide added protection but are not a substitute for seat belts.
- **Air bags** plus seat belts provide the greatest protection for adults.
Child Safety Seat Recommendation

Note: NHTSA and AAP (August 2018): revised recommendation from age-based to Weight-height recommendations of manufacturer

Make sure your child is always buckled in an age- and size-appropriate car seat, booster seat, or seat belt.

Courtesy of CDC, accessed @cdc.gov (motor vehicle safety page)
Trauma Prevention: Drowning

• 4,000 deaths/yr in U.S.
  - >6 minutes submersion is associated with poor outcome
  - Water temperature has no correlation with outcome
  - No difference in fresh vs. saltwater aspiration

• #1 cause of death children ages 1-4 yrs of age

Fencing: Odds ratio for drowning in a fenced vs. unfenced pool = 0.27 (95%CI, 0.16-0.47)
4-sided fencing completely surrounding pool (not attached to house on one side)

Thompson, DC et al. Cochrane Review 1998
accessed June 22, 2018
Trauma Prevention: Suffocation

• Most common cause of unintentional deaths in infants

• Counsel parents to
  - Remove soft bedding and toys from sleeping area
  - Use the crib’s original mattress size
  - Position newborns **on their backs** for sleeping

https://www1.nichd.nih.gov/sts/about/risk/Pages/reduce.aspx
Head Injury-Prevention: Helmets

- **Motorcycle helmets**: decrease head injury (69%) and death (42%)
  
  Cochrane Library 2008, Issue 3

- **Bicycle helmets** decrease head injury (63%), brain injury (88%) and facial injuries (65%)
  
  Cochrane Library 2008, Issue 3

- **Skiing helmets** decrease head injury (60%)
  
Head Trauma

A. Intracerebral hemorrhage
   Often not seen on initial CT (delayed presentation)

B. Epidural hematoma
   80% due to rupture middle meningeal artery
   Rare in the elderly, associated with skull fx
   Lucid interval ("talk and deteriorate")

C. Subdural hematoma
   Tear of bridging veins between dura and arachnoid
   Common in elderly, alcoholics

D. Concussion – see sports medicine lecture
Epidural Hematoma
Convex

Subdural Hematoma
Concave, crescent shape
2. 65 y/o with a fib on warfarin with acute intracerebral hemorrhage after a fall. The ACCP and AHA/ASA recommends:

A. Start FFP and Vitamin K 10mg IV
B. Start FFP and Vitamin K 10mg IM
C. Start Activated Factor VII  
   + Vitamin K 10mg IV
D. Start a 4-factor Prothrombin Complex Concentrate (KCentra)  
   + Vitamin K 10mg IV
Question #2: 65 y/o with a fib on warfarin with acute intracerebral hemorrhage after a fall. The ACCP and AHA/ASA recommends:

A. Start FFP and Vitamin K 10mg IV
B. Start FFP and Vitamin K 10mg IM
C. Start Activated Factor VII + Vitamin K 10mg IV
D. Start a 4-factor Prothrombin Complex Concentrate (KCentra) + Vitamin K 10mg IV
FFP and Vitamin K

**FFP** - normalize INR 13-48 hours
- Need ABO testing
- 30-60 minutes to thaw
- 15ml/kg - approx 1L (4units) for 70kg
  - May need 30ml/kg

**Vit K** - normalize INR 12-24 hours
- 10mg IV (over 30min)
- 3/100,000 anaphylaxis

---

**Prothrombin Complex Concentrate (PCC)**

- Pooled human plasma
- Stored as a powder
- ABO testing not required
- Volume <100ml
- Contains II, IX, X, varying amounts VII and Protein C and S
- Rapidly reverse INR: 3-15 minutes
Suggested Protocol

• A. In *life-threatening* bleeding, on warfarin...

  Vitamin K 10mg IV + 4 factor PCC (Kcentra)
  INR 2-4, give 25U/kg
  INR 4-6, give 35U/kg
  INR > 6, give 50U/kg

• B. If hx of HIT: Profilnine 50IU/kg
• C. If blood product contraindicated..
  Consider rFVIIA 1-2mg (off-label)
### Eye Emergencies: Trauma-related

**Corneal abrasion**

- Topical NSAIDs offer effective pain relief from and may result in earlier return to work. **Level of evidence B**
- Topical cycloplegics and mydriatics do not relieve pain and are not recommended. **Level of evidence B**
- Eye patch does not improve pain and can delay healing. **Level of evidence A**
- Topical antibiotics may be prescribed to prevent bacterial superinfection in corneal abrasions. **Level of evidence C**

**If associated with contact lens** –
- a) Do NOT reinsert lens
- b) Use antipseudomonal antibiotic

---

**AMERICAN ACADEMY OF FAMILY PHYSICIANS**
Eye Emergencies: Burns

• Chemical Burns
  – Alkali worse than acid
  – Irrigate, irrigate, irrigate (2L)

• Radiation keratitis
  – Fluorescein demonstrates multiple punctate lesions
  – Pain relief!!
  – Encourage prevention!
Eye Emergencies: “I got punched in the eye”

• **Orbital fracture**
  - Check EOM
    - Most common = restricted upward gaze
    - Anesthesia distribution infraorbital nerve

• **Traumatic iritis**
  - Inflammation of iris and ciliary muscle
  - Provide Analgesia
    - Mydriatics alleviate the pain associated with ciliary spasm (light sensitivity)

• **Hyphema**: blood in anterior chamber
  - Elevate head of bed 30 degrees at rest
  - Avoid ASA/NSAID’s, ophtho consult
Eye Emergencies: Subconjunctival hemorrhage

*It’s not an emergency!!*

- DO NOTHING!!!!!! (Reassure)
- Avoid straining
The Eye Emergencies

**Trauma**
- Direct blow
- Foreign body
- Chemical
- U/V keratitis

**Non-trauma**

**Painful**
- Does proparacaine relieve pain?
  - Yes: Conunctivitis, Keratitis, Corneal ulcer
  - No: Iritis/Uveitis, Acute glaucoma
The Eye Emergencies

**Trauma**
- Direct blow
- Foreign body
- Chemical
- U/V keratitis

**Non-trauma**

- **Painful**
- **Painless**

**Visual change**
- Posterior vitreous detachment
- Retinal detachment
- Retinal artery/vein occlusion
- Ischemic optic neuropathy (includes temporal arteritis)
ENT Emergencies

- See ENT and Pediatrics lecture
- See Supplemental Slides (end of slide set)
(Blunt) Chest Trauma

• Chest wall
  Rib fracture: #4-9 most common – *painful*
  Flail chest: 3 ribs with >2 fractures each

• Lungs/pleura
  Hemo/pneumothorax
  Pulmonary contusion

• Heart/great vessels

(Blunt) Chest Trauma

- **Chest wall**
  - Rib fracture: #4-9 most common – *painful!*
  - Flail chest: 3 ribs with >2 fractures each
- **Lungs/pleura**
  - Hemo/pneumothorax
  - Pulmonary contusion
- **Heart/great vessels**
  - Aortic tear
  - Cardiac tamponade
(Blunt) Chest Trauma: Commotio Cordis

- 216 cases in registry
- Blunt trauma (e.g., ball)
- Strikes before peak of T wave → V Fib
(Blunt) Abdominal Trauma

• #1: Spleen
  • At risk: splenomegaly
    • Mononucleosis, malaria, hematologic disease
  • Kehr’s sign: blood irritates diaphragm => L shoulder pain
  • Post- splenectomy vaccines
    • Pneumococcal
    • HIB
    • Meningococcal

• #2: Liver

>14 days before/after splenectomy
<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Before Elective Splenectomy</th>
<th>After Splenectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumococcal vaccines</td>
<td>Administer PCV13 if patient has not previously been vaccinated with an age-appropriate regimen. Administer PPSV23 8 wk later and at least 2 wk before splenectomy. Administer a second PPSV23 dose 5 yr later.</td>
<td>Administer PCV13 if patient has not previously been vaccinated with an age-appropriate regimen. Administer PPSV23 8 wk after PCV13. If patient has previously received an age-appropriate PCV13 regimen, administer PPSV23 at least 2 wk after splenectomy. However, if patient follow-up is uncertain, administer PPSV23 before hospital discharge. Administer a second PPSV23 dose 5 yr later.</td>
</tr>
<tr>
<td>Hib conjugate vaccine</td>
<td>Administer a single dose of Hib conjugate vaccine if patient has not previously been vaccinated with an age-appropriate regimen.</td>
<td>Recommendation is the same as that before elective splenectomy.</td>
</tr>
<tr>
<td>Meningococcal vaccines</td>
<td>Administer a two-dose series of MenACWY with an interval of 8–12 wk between doses for persons 2 yr of age or older if a dose has not been administered previously. For infants 2 through 23 mo of age, primary series of MenACWY-CRM (Menveo) or Hib-MenCY-TT (MenHibrix) is recommended.</td>
<td>Recommendation for booster dose is the same as that before elective splenectomy.</td>
</tr>
<tr>
<td>Influenza vaccines</td>
<td>Administer influenza vaccine annually. Otherwise healthy asplenic patients 2 through 49 yr of age may be vaccinated with live attenuated influenza vaccine, except patients with sickle cell disease, who should receive inactivated influenza vaccine.</td>
<td>Recommendation is the same as that before elective splenectomy.</td>
</tr>
</tbody>
</table>

3. A 31 yo male is brought to the ED after a steel scaffold struck and pinned his left lower extremity for 2 hrs before extrication. On arrival in ED: VS: stable, ABCs are normal. Left leg: hip to ankle is swollen, ecchymotic and tender. Sensation intact. 2+ DP, PT present. Labs: H/H=13/37, Urine dipstick: (+) blood. Urinalysis: 0-2 RBCs, 0-2 WBCs/hpf

This patient should be admitted for the management of:

A. Rhabdomyolysis
B. Compartment syndrome
C. Renal contusion
D. Hemorrhagic shock
Rhabdomyolysis

- First described in WWII London bombings
- Seen in: Trauma, seizures, burns, drug overdose, exertion, toxin/drug induced
- Urine dipstick positive 50% (myoglobinuria)
- Elevated CPK (>2-3x reference)
- Complication: Acute renal failure 30-40%
- Treatment:
  
  Crystalloid 500 cc/hr => Urine output 200-300 cc/hr
Compartment Syndrome

- Can occur in anywhere perfusion pressure falls below tissue pressure in any anatomic space
- >30 mm Hg***
- Classic: extremities, but any compartment susceptible
- Classic: trauma to extremity – but can occur with exercise
- Clues: severe pain, decreased sensation, pain on passive stretch, tense extremities
- 4-6 hours before irreversible damage
- Do NOT wait for pallor, pulselessness
- Caution: open fractures are NOT immune from developing compartment syndromes
Wound Care

4. A 37 y/o male in good health presents with a laceration of the 5th finger due to broken glass.

Which one of the following statements is true?

A. Sterile gloves during wound repair reduce the rate of subsequent wound infection compared to the use of clean, non-sterile gloves.

B. Local anesthetic containing epinephrine is not to be used in fingers, toes, tip of the nose and penis in healthy patients.

C. Wound irrigation with tap water has been shown to have comparable (if not lower) rates of wound infection than sterile saline.

D. X-rays are only indicated if the glass is known to contain lead.
Wound Care: Tetanus

A. Tetanus
Clostridium tetani – anaerobic Gr. (+), ubiquitous, soil
233 cases in US from 2001-2008 (approx. 30 cases/yr)
Elderly, immigrants

A. Tetanus Prophylaxis
Clean wound >10 years since last dose
Dirty wound >5 years since last dose
Safe in pregnancy

Substitute Tdap for Td **once**, then Td booster every 10 years
Can I Irrigate With Tap Water?  
Cochrane Review: 2012

• Meta analysis of 5 studies tap water vs. normal saline

***No difference in rate of wound infection with tap water vs. saline
Adults: RR 0.66, 95% CI, 0.42 – 1.04
Trauma: Wound Care Principles

- Irrigate, irrigate, irrigate
  - Pearl: *Tap water appears better than saline*
- Clean nonsterile gloves do not increase infection rate
- Non-infected wounds caused by clean objects can be repaired up to 18 hrs, face/scalp up to 24 hours
- If no concern for vascular compromise, epinephrine is safe in digits
- X-ray if you think any glass is possible
  - Will identify any glass 2 mm or greater

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>A</th>
<th>A</th>
<th>B</th>
<th>B</th>
</tr>
</thead>
</table>

**Whom do you place on prophylactic antibiotics?**
- High-risk site – (hand, foot), High-risk mechanism – (bites)
- High-risk patients (immunocompromised, prosthetic valve)
...and Know the Neurologic Innervation to the Hand!!!

• Radial nerve
• Median nerve
• Ulnar nerve

See Supplemental Slides for description of each
Burns

See Dermatology lecture and Supplemental Slides

1\textsuperscript{st} degree burn arm
Superficial 2\textsuperscript{nd} degree burn of abdomen
Deep partial 2\textsuperscript{nd} degree of thorax and arm

All photos courtesy of American Family Physician, 85: Jan 1, 2012
5. Child abuse should be suspected in all of the following EXCEPT:

A. 7-month-old with diffuse cerebral and retinal hemorrhages
B. 2-year-old with 3 rib fractures after a fall
C. 6-month-old with multiple lower ext bruises from falls
D. 20-month-old with spiral fracture of distal tibia
Child Abuse: Wide spectrum of injuries
- Includes: Burns, contusions, fractures, head injury

Shaken Baby syndrome: Diffuse cerebral injury with edema, +/- intracerebral bleed, retinal hemorrhages

3 Pearls
1. “If they don’t cruise, they don’t bruise”
2. Rib fractures – < age 3, 82% are abuse
3. Undiagnosed ==> > 25% mortality in 2 yrs
Toddler’s Fracture – Is Not “Abuse”

- Most common fx in age 9 mos – 3 yrs that present with a limp (29 of 100)
- Spiral fracture of distal tibia
- Best seen on oblique view
- May be occult
- Below knee walking cast x 3 weeks
Thank you!
Answers

1. C
2. D
3. A
4. C
5. D
Supplementary Slides
B. Arrhythmias: Bradycardia:

- Definition: Heart rate < 50

Evaluate potential causes
(MI, heart block, drug overdoses…)

Stable: Monitor

Unstable: Atropine
- Transcutaneous pacing
- Dopamine
B. Arrhythmias: Tachycardia:

Stable:

Narrow QRS
<0.12 sec

Regular rhythm
(PSVT)

- Vagal maneuver
- Adenosine
- B-Blocker
- Ca+ Channel blocker

Irregular rhythm
(rapid atrial fibrillation)

- B-Blocker
- Ca+ Channel blocker

Wide QRS
> 0.12 sec

Monomorphic

A fib with BBB

- B-Blocker
- Ca+ Channel blocker

Stable Vent tachycardia

- Antiarrhythmic agent
- Expert Consultation

Unstable
Cardioversion
(see next slide)
“Shockable” rhythm: V fib/V tach: Amiodarone vs. lidocaine vs. placebo

**Methods:** Randomized, double-blind trial of adults with out-of-hospital refractory V fib/V tach

**Results:**

- **Amiodarone 300mg (n= 970):** 24.4% survive to hospital discharge
- **Lidocaine 120mg (n=993):** 23.7% survive to hospital discharge
- **Placebo (n=1056):** 21.0% survive to hospital discharge

(95% CI, -0.4 – 7.0,; p=0.08)

Secondary outcome: Neurologic outcome in survivors: **No difference**

*Kudenchuk PJ, et al. NEJM May 5, 2016*
Sepsis: New Definition (SCCM 2016)

• “life-threatening organ dysfunction caused by” … infection

SOFA score: ≥ 2

Clinical suspicion

• Severe Sepsis

• Septic Shock: Sepsis + a) lactate > 2 AND
  b) vasopressor needed to maintain MAP > 65

JAMA Feb 23, 2016
Sepsis: New Definition (SCCM 2016)

• “life-threatening organ dysfunction caused by” … infection

Early Recognition: qSOFA score ≥ 2 or more
• RR > 22
• Altered mental status
• BPsys < 100
## 10 Leading Causes of Death by Age Group, United States – 2016

<table>
<thead>
<tr>
<th>Rank</th>
<th>&lt;1</th>
<th>1-4</th>
<th>5-9</th>
<th>10-14</th>
<th>15-24</th>
<th>25-34</th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
<th>65+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Short Gestation 3,927</td>
<td>Congenital Anomalies 433</td>
<td>Malignant Neoplasms 449</td>
<td>Sudden Infant Death Syndrome 456</td>
<td>Sudden Infant Death Syndrome 5,723</td>
<td>Sudden Infant Death Syndrome 7,569</td>
<td>Sudden Infant Death Syndrome 10,903</td>
<td>Heart Disease 34,027</td>
<td>Heart Disease 76,610</td>
<td>Malignant Neoplasms 422,927</td>
<td>Malignant Neoplasms 598,038</td>
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<tr>
<td>3</td>
<td>SIDS 1,500</td>
<td>Congenital Anomalies 377</td>
<td>Malignant Neoplasms 341</td>
<td>Unintentional Injury 5,172</td>
<td>Unintentional Injury 5,378</td>
<td>Heart Disease 10,477</td>
<td>Unintentional Injury 21,860</td>
<td>Chronic Low Respiratory Disease 131,002</td>
<td>Unintentional Injury 151,914</td>
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<td></td>
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<td>4</td>
<td>Maternal Pregnancy Complications 1,402</td>
<td>Homicide 339</td>
<td>Homicide 139</td>
<td>Homicide 147</td>
<td>Malignant Neoplasms 1,431</td>
<td>Malignant Neoplasms 3,791</td>
<td>Suicide 7,030</td>
<td>Suicide 8,437</td>
<td>Chronic Low Respiratory Disease 17,810</td>
<td>Chronic Low Respiratory Disease 121,630</td>
<td>Chronic Low Respiratory Disease 154,596</td>
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<tr>
<td>5</td>
<td>Unintentional Injury 1,259</td>
<td>Heart Disease 118</td>
<td>Heart Disease 77</td>
<td>Congenital Anomalies 146</td>
<td>Heart Disease 949</td>
<td>Heart Disease 3,445</td>
<td>Heart Disease 3,164</td>
<td>Diabetes Mellitus 14,251</td>
<td>Alzheimer’s Disease 114,883</td>
<td>Cerebrovascular Disease 142,142</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Placenta Cord Membranes 841</td>
<td>Influenza &amp; Pneumonia 103</td>
<td>Chronic Low Respiratory Disease 68</td>
<td>Heart Disease 111</td>
<td>Congenital Anomalies 388</td>
<td>Liver Disease 925</td>
<td>Liver Disease 2,851</td>
<td>Diabetes Mellitus 6,267</td>
<td>Liver Disease 13,448</td>
<td>Diabetes Mellitus 56,452</td>
<td>Alzheimer’s Disease 116,103</td>
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<tr>
<td>7</td>
<td>Bacterial Septicemia 583</td>
<td>Septicemia 70</td>
<td>Influenza &amp; Pneumonia 48</td>
<td>Chronic Low Respiratory Disease 211</td>
<td>Diabetes Mellitus 792</td>
<td>Diabetes Mellitus 2,049</td>
<td>Cerebrovascular Disease 5,353</td>
<td>Cerebrovascular Disease 12,310</td>
<td>Unintentional Injury 53,141</td>
<td>Diabetes Mellitus 80,058</td>
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<tr>
<td>8</td>
<td>Respiratory Distress 488</td>
<td>Perinatal Period 60</td>
<td>Septicemia 40</td>
<td>Cerebrovascular Disease 50</td>
<td>Chronic Low Respiratory Disease 206</td>
<td>Cerebrovascular Disease 575</td>
<td>Cerebrovascular Disease 1,851</td>
<td>Chronic Low Respiratory Disease 4,307</td>
<td>Suicide 7,759</td>
<td>Influenza &amp; Pneumonia 42,479</td>
<td>Influenza &amp; Pneumonia 51,537</td>
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<tr>
<td>9</td>
<td>Circulatory System Disease 460</td>
<td>Cerebrovascular Disease 55</td>
<td>Septicemia 38</td>
<td>Influenza &amp; Pneumonia 39</td>
<td>Influenza &amp; Pneumonia 189</td>
<td>HIV 548</td>
<td>HIV 971</td>
<td>Septicemia 2,727</td>
<td>Septicemia 5,941</td>
<td>Septicemia 41,095</td>
<td>Septicemia 50,046</td>
</tr>
<tr>
<td>10</td>
<td>Neonatal Hemorrhage 398</td>
<td>Chronic Low Respiratory Disease 51</td>
<td>Septicemia 31</td>
<td>Septicemia 31</td>
<td>Septicemia 31</td>
<td>Septicemia 184</td>
<td>Septicemia 472</td>
<td>Septicemia 897</td>
<td>Septicemia 2,152</td>
<td>Septicemia 5,650</td>
<td>Septicemia 30,405</td>
</tr>
</tbody>
</table>

Data Source: National Vital Statistics System, National Center for Health Statistics, CDC.
Produced by: National Center for Injury Prevention and Control, CDC Using WISQARS™.
Trauma Prevention

- 27.6 million people were treated in an ED for injuries in 2015
- 2.8 million people were hospitalized due to injuries in 2015
- Each year 214,000 people die from injury—1 person every 3 min

Statistics from CDC, December 2018
ENT Emergencies: Ears

• Otitis media and Otitis Externa – (covered in Special Sensory)

• Foreign bodies
  – Watch out for button batteries – Need urgent consultation!

• Auricular hematoma
  – Needs I&D, w/o results in cauliflower ear.

“Scrum cap”
ENT Emergencies: Nose

- **Epistaxis:**
  - Anterior: packing, silver nitrate sticks, electrocautery, topical tranexamic acid (TXA)
  - Posterior – balloon packing

- **Foreign bodies**
  - Watch out for **button batteries**

- **Nasal fracture**
  - No x-rays needed
  - Check for **septal hematoma**
    - Needs I&D, w/o results in “saddle deformity”
ENT Emergencies: Dental Trauma

- **Tooth fracture**
  - Ellis I – enamel only
  - Ellis II – enamel + dentin
  - Ellis III – includes pulp

- **Tooth avulsion**
  - Immediate replace/reinsert adult tooth
    - Gently cleansed, **do not scrub**
  - Do not replace/reinsert baby tooth

Courtesy of SlideShare
Author: Rea Corpuz

www.wikipedia.org
PECARN-2009

- 42,412 children eval for head injury (10,718 age < 2 years)
- 14,969 got CT: 376 (0.9%) with TBI, 60 (0.1%) underwent neurosurgery
- Derived rule (33,785 pts) and validated (8,627 pts)

**Age < 2 yrs:**
- Normal mental status
- No scalp hematoma except frontal
- No LOC or < 5 sec
- Non-severe mechanism of injury
- No palpable skull fracture
- Acting normal per parents

**Age > 2 yrs:**
- Normal mental status
- No LOC
- No vomiting
- Non-severe injury mechanism
- No signs of skull fracture
- No severe headache

**Derived:** 98.6% sensitive (95%CI,92-99%)
**Validated:** 100% sensitive (95%CI,86-100%)

96.7% sens (95%CI,93-98%)
96.8% sens (95%CI,89-99%)

Refer to mdcalc.com
ENT Emergencies: Throat

• Parapharyngeal infection (Lemierre’s Disease)
  – Septic thrombophelbitis of the Internal jugular vein
  – Typical age group 15-30
  – *Fusobacterium necrophorum*: Gram Neg(-) anaerobe

• Peritonsillar abscess
  – Most common 20-40 yrs of age

• Retropharyngeal abscess
  – Most common 2-4 yrs of age

• Epiglottitis
  – More common in adults than children
Adult Head Injury: Is There Any Clinical Decision Rule You Can Rely On?

• **Answer: No!!**

• Many have tried… none are reliable enough!!!!

• Canadian rules (*Lancet*, 2001)

• Scandinavian rules (*J Trauma*, 2000)

• New Orleans rules (*JAMA*, 2005)

• NICE (2004)

• NEXUS II (*J Trauma-Injury Inf & Crit Care*, 2005)
Can I Irrigate with Tap Water?

**Methods:** double-blind, randomized 625 subjects to:

**Results:**

<table>
<thead>
<tr>
<th></th>
<th>500ml sterile saline</th>
<th>vs.</th>
<th>500ml tap water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of infection</td>
<td>6.4%</td>
<td></td>
<td>3.5%</td>
</tr>
<tr>
<td>no difference</td>
<td></td>
<td></td>
<td>(95%CI, -0.4 – 5.5%)</td>
</tr>
</tbody>
</table>
Nerve Function: Hand
Radial Nerve

• Sensory: Posterior hand – thumb to radial 1/2 of ring finger

• Motor: Wrist and finger extension
  Test against resistance
Nerve Function: Hand Median Nerve

- Sensory: Palmer surface, thumb to radial 1/2 of ring finger
- Motor: Flexion of wrist and fingers
- Best test: Make “OK” sign
Nerve Function: Hand  Ulnar Nerve

• Sensory: little finger and ulnar 1/2 of ring finger
• Motor: innervates interosseous muscles (intrinsics)
  Test: *Ab*duction of fingers
Trauma Prevention: Burns

- 500,000+ cases/yr in US ED’s
- Scalding accounts for 80% of burns in young children
  - Flame related injuries are more common in older children
- Maintain a *functional* smoke alarm
  - 2/3 of homes in which children are injured or killed by fire have no functional smoke detectors
Burn Identification

• **1\textsuperscript{st} degree** – involve only epidermis – a bad sunburn

• **2\textsuperscript{nd} degree**
  - Superficial partial thickness: epidermis plus upper layers of papillary dermis
  - Deep partial thickness: involves deeper layers of dermis (reticular dermis)

• **3\textsuperscript{rd} degree (full-thickness)** – down to and including subcutaneous fat (requires skin grafting)

• **4\textsuperscript{th} degree** – includes muscle, tendon, bone
Burn: Care

• Minor thermal burns should be treated immediately with cool running water  
  (Level of evidence: C)

• The blisters… in general, leave alone

• Superficial burns can be treated with topical application of lotion, honey, aloe vera or antibiotic ointment.  
  (Level of evidence: B)

Silver sulfadiazine:
- “the largest volume of evidence suggests that topical silver sulfasdiazine is associated with a significant increase in rates of burn wound infection and increased hospital LOS…”  
  (Cochrane Library, 2013)

- Compared to honey (4 trials, low quality) – wounds healed quicker with honey  
  (Cochrane Library, 2015)

- Compared to biosynthetic dressings – wounds healed quicker with dressings (DuoDerm, OpSite, etc)  
  (Cochrane Library, 2013)
Emergency Medicine, Part 2

Robert Dachs, MD, FAAFP
Clinical Associate Professor
Ellis Hospital Family Medicine Residency Program
Albany Medical College, Albany, New York
Disclosure Statement

It is the policy of the AAFP that all individuals in a position to control content disclose any relationships with commercial interests upon nomination/invitation of participation. Disclosure documents are reviewed for potential conflicts of interest. If conflicts are identified, they are resolved prior to confirmation of participation. Only participants who have no conflict of interest or who agree to an identified resolution process prior to their participation were involved in this CME activity.

All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.
Learning Objectives

1. Appropriately manage a variety of soft tissue infections, including animal bites.
2. Appropriately manage tick-borne illness.
3. Recognize and manage acute allergic reactions.
4. Recognize and determine which toxicology emergencies require specific antidotes.
Part 2

- Soft tissue infection
  - Cellulitis vs. CA-MRSA
- Animal Bites
  - Cat
  - Dog
  - Human
  - Other
- Tick-related illness
  - Lyme disease
  - Other tick-related

- Acute allergic reactions
  - Acute management
  - ACE-induced angioedema
- Environmental injuries
  - Cold-related
  - Heat-related
- Toxicology
  - Gastric decontamination
  - Antidotes
  - Common toxidromes
Cellulitis

Non-purulent

• Strep pyogenes
• MSSA

(+) purulent

• CA-MRSA
Staph. aureus

MSSA

MRSA

HA- MRSA
USA 100, 200, 500, 600, 700, 800

CA- MRSA
USA 300, 400

How do they present?
Panton-Valentine Leukocidin exotoxin
CA- MRSA: Presentation

“I think I got a spider bite”
Cellulitis Treatment

Non-purulent

- Strep pyogenes
- MSSA

(+ ) purulent

- CA-MRSA

### Incision and Drainage

<table>
<thead>
<tr>
<th>Drug</th>
<th>Adult Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dicloxacillin [Nafcillin]</td>
<td>500mg QID 1-2g q4h</td>
</tr>
<tr>
<td>Cephalexin [Cefazolin]</td>
<td>500mg QID 1g q8hrs</td>
</tr>
<tr>
<td>Doxycycline*</td>
<td>100mg BID 300-450mgTID</td>
</tr>
<tr>
<td>Clindamycin*</td>
<td>600mg BID</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drug</th>
<th>Adult Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMP-SMX</td>
<td>1-2 tab BID*</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>100mg BID</td>
</tr>
<tr>
<td>Clindamycin*</td>
<td>300-450mgTID</td>
</tr>
<tr>
<td>Linezolid</td>
<td>600mg BID</td>
</tr>
</tbody>
</table>
Animal Bites

1. Which of the following bites has the highest risk of infection?

A. Cat bite to the hand
B. Human bite to the face
C. Dog bite to the thigh
D. Spider bite to the arm
A. Cat Bite

- 5-18% of all reported bites
- Puncture wounds
- 80% of bites become infected
  - 53-80% with *Pasteurella multocida*
  - Watch for bone and joint infection

**RX: Amoxicillin-clavulanate**
B. Human Bite

• Watch for *closed fist* injury
• High rate of infection, 26-83% polymicrobial

<table>
<thead>
<tr>
<th>Bacteroides species, 82%</th>
<th>Peptostreptococcus, 26%</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. epidermidis, 53%</td>
<td>Eikenella species, 15%</td>
</tr>
<tr>
<td>Corynebacterium species, 41%</td>
<td></td>
</tr>
</tbody>
</table>

• Copious irrigation, avoid closure

**RX:** Amoxicillin-clavulanate x 5 days
C. Dog Bite

• 80-90% of all reported bites (#1)
• Most common on extremities
• Only 5% of bites develop infection
  - Higher rate in hands, deep puncture, older pts.

<table>
<thead>
<tr>
<th>Pasteurella multocida</th>
<th>S. aureus, 29%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteroides species - Fusobacterium species</td>
<td>Fusobacterium</td>
</tr>
<tr>
<td>EF-4 bacteria</td>
<td>Eikenella species, 15%</td>
</tr>
<tr>
<td>DF-2 bacteria (Capnocytophaga sp)</td>
<td></td>
</tr>
</tbody>
</table>

• Primary closure - OK
  • +/- Amoxicillin-clavulanate
# The Long List of Infections

<table>
<thead>
<tr>
<th>Type of Exposure</th>
<th>Pathogens and Bacteria</th>
<th>Antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat bite</td>
<td><em>Pasteurella multocida</em></td>
<td>Amoxicillin-clavulanate</td>
</tr>
<tr>
<td>Dog bite</td>
<td><em>Pasteurella multocida, Capnocytophaga sp, Fusobacterium, EF-4, S. aureus, Eikenella</em></td>
<td>Amoxicillin-clavulanate</td>
</tr>
<tr>
<td>Human bite</td>
<td><em>Viridans Streptococci, Bacteroides sp,</em></td>
<td>Amoxicillin-clavulanate</td>
</tr>
<tr>
<td>Animal hides, carcasses</td>
<td>Anthrax (<em>Bacillus anthracis</em>) infection</td>
<td>ciprofloxacin, doxycycline, PCN</td>
</tr>
<tr>
<td>Fresh water injury</td>
<td><em>Aeromonas sp.</em></td>
<td>TMP-SMX, FQ</td>
</tr>
<tr>
<td>Saltwater injury</td>
<td><em>Vibrio fulnificus</em> (skin and GI infection)</td>
<td>3rd generation cephalosporin + mino/doxycycline or FQ</td>
</tr>
<tr>
<td>Fish tank exposure</td>
<td><em>Mycobacterium marinum</em></td>
<td>Hot compresses, minocycline, clarithromycin</td>
</tr>
<tr>
<td>Hot tub exposure</td>
<td><em>Pseudomonas aeruginosa</em></td>
<td>Self-limiting, acetic acid compresses, ciprofloxacin</td>
</tr>
</tbody>
</table>
Cat Scratch Disease

- 22,000 cases/year, 2,000 hospitalizations/year
- Regional lymphadenopathy, 10% suppurative
  - Axillary/epitrochlear nodes 46%
  - Cervical 26%, inguinal 17%
- **Bartonella (Rochalimaeae) henselae** - small Gr (-) rod
- Diagnosis: Cat scratch and serologic testing (IFA)
- **Self-limiting disease**, 1 to 2 months
  
  Do **NOT** I & D!!!
Cat Scratch Disease

• Treating with antibiotics
  • Immunocompromised patients: YES
  • Immunocompetent patients ??????
    • Some say “No”
    • Some say “Yes” (including Up-to-date) – azithromycin 500mg qd x 5 days
      *Earlier resolution seen, based on a 1998 study of 29 patients
2. A 24 yo male presents with a 3-day history of a rash that is increasing in size.
- It is not (-) painful or tender.
- It is flat, oval, 14 cm x 7 cm in size, has central clearing and has no fluctuance.
- No associated fever/chills or systemic symptoms.
- No new medications. No recall of any insect bite.
- He recently vacationed on Martha’s Vineyard, MA.

See photo - next page
2. A 24 yo male presents with a 3-day history of a rash that is continuing to increase in size. The rash is not painful or tender. It is flat, oval, 14 cm x 7 cm in size, has central clearing and has no fluctuance. No associated fever/chills or systemic symptoms. No new medications. No recall of any insect bite. He recently vacationed on Martha’s Vineyard, Mass.

In this case, you would:
A. Prescribe azithromycin 500 mg qd x 5 days
B. Prescribe doxycycline 100 mg BID x 10 days
C. Obtain a Lyme titer; if positive treat with ceftriaxone.
D. Obtain a Lyme titer; if positive, confirm with a Western blot study and if positive treat with ceftriaxone.
Lyme Disease

• Due to spirochete: *Borrelia burgdorferi*
• Transmitted by: Deer tick
  – *Ixodes scapularis* and *Ixodes pacificus*

From left to right, an *Ixodes scapularis* larva, nymph, adult male tick, and adult female tick.

FIGURE 2. Average annual number of confirmed Lyme disease cases, by county of residence* — United States, 2008–2015†
Lyme Disease: Stages

- **Early Lyme Disease**
  - *Erythema migrans*: present 50-70% of cases

  Courtesy of Wikipedia

  Courtesy of the CDC/James Gathany
Lyme Disease: Stages

• Early Lyme Disease
  – *Erythema migrans*: present 50-70% of cases

  – Neurologic disease
    Cranial neuropathy (7th nerve), radiculopathy, lymphocytic meningitis

  – Cardiac disease: think A-V block
Lyme Disease: Stages

• Late Lyme disease
  – Lyme arthritis
    • Large joints, typically knees
  – Neurologic disease
    • Encephalopathy
    • Peripheral neuropathy

• Post-Lyme disease syndromes
  – “…unexplained chronic subjective symptoms following treatment…”

IDSA guideline, 2006
Lyme Disease: Treatment

Stage 1: **Do not test, just treat**

**Adults**

- Doxycycline 100 mg BID x 10 days
- Amoxicillin 500 mg TID x 14 days
- Cefuroxime 500 mg BID x 14 days
- Azithromycine 500 mg qd x 7-10 days

*Medical Letter, May 9, 2016*
Lyme Disease: Treatment

Stage 1: Do not test, just treat

Children

- Doxycycline: ≥ age 8, 2 mg/kg BID
- Amoxicillin: 50 mg/kg/d divided TID
- Cefuroxime 30 mg/kg/d divided BID
- Azithromycin 10 mg/kg/d qd

Medical Letter, May 9, 2016
Lyme Disease: Testing

• Stage 1: Do not test, just treat

So whom do you test?????
For unexplained symptoms...
Two-Tiered Testing for Lyme Disease

**First Test**
- Enzyme Immunoassay (EIA)
  - OR
  - Immunofluorescence Assay (IFA)

> Positive or Equivocal Result

> Negative Result

**Second Test**
- Signs or symptoms ≤ 30 days
  - IgM and IgG Western Blot
- Signs or symptoms > 30 days
  - IgG Western Blot ONLY

Consider alternative diagnosis

OR

If patient with signs/symptoms consistent with Lyme disease for ≤ 30 days, consider obtaining a convalescent serum
Lyme Disease: Treatment

• **Stage 1: Erythema migrans**
  • Doxycycline, Amoxicillin, Cefuroxime, Azithromycin

• **Early Neurologic Disease**
  – 7th cranial nerve palsy ————> oral regimen (14-21 days)
  – Meningitis/radiculopathy ————> parenteral (10-28 days)

• **Lyme carditis** ————> oral or parenteral (21-28 days)

• **Lyme arthritis** ————> oral 28 days
Lyme Disease Treatment

• Watch for **Jarisch-Herxheimer reaction**
  – Fever, chills, myalgias, headache

  *Remember syphilis…*
  – Treat symptomatically, do not d/c or switch antibiotic
Lyme Disease Prophylaxis???

- Routine Abx prophylaxis or serologic testing is **NOT** recommended (E-III).
- A single dose of doxycycline *may be offered* to adult patients (200 mg) and children ≥8 years (B-I) if all of the following
  - attached tick can be reliably identified as an adult or nymphal I. scapularis tick *and*
  - that is estimated to have been attached for ≥36 h *and*
  - prophylaxis can be started within 72 h of the time that the tick was removed *and*
  - local rate of infection of these ticks with B. burgdorferi is ≥20% *and*
  - doxycycline treatment is not contraindicated.

*IDSA guideline, 2006*
Other Deer Tick-Borne Illnesses

• **HGA:** Human granulocytic *anaplasmosis*
  – Previously known as *ehrlichiosis*
  • Due to *Anaplasma phagocytophilum*
  – Within 3 weeks of tick bite…
    • Fever, chills, and headache, with
    • Thrombocytopenia, leukopenia, elevated LFTs

• **Babesiosis**
  – Malaria-like illness with intracellular protozoa
  – Hemolytic anemia, thrombocytopenia, elevated LFTs

**All 3 associated with deer tick**
Other Tick-Borne Illnesses

• Rocky Mountain Spotted Fever
  – Organism: *Rickettsia rickettsii*, transmitted by
    • The American dog tick and the Rocky Mountain wood tick.
  – 90% of cases are April to September.
  – >50% of cases involve children <15 years old
  – Symptoms: 5-10 days after tick bite:
    • Flu-like illness
    • Rash
    • Later … multisystem involvement

Photo courtesy of CDC
3. A 64 yo male presents to the ED with diffuse pruritus and erythema along with facial and oral swelling. This occurred 15 minutes after eating peanuts. His blood pressure is 65/35 mm Hg, pulse is 120 bpm.
Allergic Reactions

3. A 64 yo male presents to the ED with diffuse pruritus and erythema along with facial and oral swelling. This occurred 15 minutes after eating peanuts. His blood pressure is 65/35 mm Hg, pulse is 120 bpm.

The first medication this patient should receive is:

A. Epinephrine
B. Diphenhydramine
C. Methylprednisolone
D. Ranitidine
Allergy: Reactions

• **Urticaria** (hives) - IgE mediated

• **Angioedema** - may be
  1. IgE-mediated or
  2. Idiopathic (ACE-induced), not true allergy

    *Result: Swelling of face, neck, and tongue*

• **Anaphylaxis** - may occur within seconds to 1 hour
  – Skin rash, respiratory symptoms, hypotension, GI distress

• **Anaphylactoid reactions**: Non-immunologic (non-IgE)
  - Direct release of granules from mast cells and basophils
  - Not true allergy (Example: radiocontrast)
Allergic Reactions: Etiologic Agents

**Anaphylactic IgE-dependent**
- Food (35%)
- Medication (20%)
- Insect venom (20%)
- Latex
- Exercise

**Anaphylactoid Non-IgE/nonimmunologic**
- Opioids
- ASA and NSAIDs
- Radiocontrast media
Allergic Reactions: Etiologic Agents

Anaphylactic

IgE-dependent

- Food
- Medication
- Insect venom
- Latex
- Exercise

Anaphylactoid

Non-IgE/nonimmunologic

- Opioids
- ASA and NSAIDs
- Radiocontrast media
Allergic Reaction: Treatment

• Vasoconstrictors: Epinephrine
  A. Mild-moderate:
  0.3-0.5 cc 1:1000 solution, SQ
  B. Severe:
  1-5 cc of 1:10,000 solution, IV

1 ug/min (1:10,000)
1 mg in 1L NS at 1 cc/min
Allergic Reaction: Treatment

• Vasoconstrictors: Epinephrine

If Epi-Pen is used, refer to ED for follow up

Reason: chance of biphasic reaction

“second wave”

Note: this is exceedingly rare (5/2,323; 0.18%)

Allergic Reactions: Treatment

- **Vasoconstrictors**: Epinephrine
  - *Mild-moderate*: 0.3-0.5 cc 1:1000 solution, SQ or IM
  - **Severe**: 1-5 cc of 1:10,000 solution, IV
  - ***If pt. on B-Blocker, give glucagon 1-5 mg IV***

- **H1 antagonist**: 1st or 2nd generation antihistamines

- **H2 antagonist**: H2-blocker du jour, decreases itch

- **Steroids**
  - Do nothing for acute episode
  - May prevent recurrence
This is **NOT** an allergic reaction...
ACE-Induced Angioedema

- **NOT** an allergic reaction
- Due to accumulation of bradykinin (?)
- Up to 5x more common in African-Americans
- Women > Men
- Can occur months to years after ACE use
- **Treatment:** supportive
Scombroid Poisoning: “Pseudo” Fish Allergy

- Mimics allergic reaction – facial flushing, diaphoresis, hives, edema, diarrhea, peppery taste
- Occurs minutes to 1-2 hours after eating contaminated fish
- Classically tuna and mackerel (Scombroidae family), can occur in others
- Histidine in muscle converted by bacteria to histamine.
- Rx: H1 and H2 blockers
- Self-limiting: 4-6 hours
Ciguatera Poisoning

• Ingestion of reef fish that have accumulated sufficient amounts of the dinoflagellate
  – Most common: barracuda, amberjack, grouper, snapper, sturgeon, king mackerel

• GI or neurologic symptoms (or a mixed)
  – Onset 1-6 hrs after eating, lasts weeks-months
  – Cold sensation reversal: perceives cold temperatures as hot sensations (and vice versa)
  – Occurs in 80% of patients and pathognomonic
Environmental Injuries:  
A. Cold-Related Injuries

- **Chilblains (or pernio):** is an abnormal vascular response to cold resulting in inflammatory skin condition with pruritus and/or painful erythematous to violaceous acral lesions

- **Frostenp:** superficial freeze injury characterized by lack of extracellular ice crystal formation => pale, painful tissue  
  Resolves with rewarming; **no tissue loss**

- **Frostbite:** ice crystal formation, **(+ ) tissue loss**

**Treatment:** Rapid rewarming in circulating water, 104-108°C (40-42°C)
Environmental Injuries: Heat-Related Illness

- **Heat exhaustion**: nonspecific symptoms
  - Dizziness, weakness, N/V, HA, *diaphoresis*
  - Temp: normal - 104 °F (40 °C), *normal neuro exam*

- **Heat stroke**: $T > 105° +$ CNS dysfunction
  - A. Classic: elderly, develops gradually
    - Delirium/seizures (*looks like sepsis*)
    - Typically anhidrosis
  - B. Exertional

---

**Risk factors**
1) Exogenous heat gain
2) Increased heat production
3) Decreased heat dispersion
   - a. Dehydration
   - b. CV disease
   - c. Extreme of age
   - d. Obesity
   - e. Improper clothing
   - f. Skin disease
   - g. Drugs
Environmental Injuries: Heat-Related Illness

- **Heat exhaustion**: nonspecific symptoms
  - Dizziness, weakness, N/V, HA, diaphoresis
  - Temp: normal - 104°F (40°C), normal neuro exam

- **Heat stroke**: (+) CNS dysfunction
  
  A. Classic: elderly, develops gradually
     - Delirium/seizures (looks like sepsis)
     - Typically anhidrosis
  
  B. Exertional: younger, rapid onset, high temp
     - Will continue to sweat

**Risk factors:**
1) Exogenous heat gain
2) Increased heat production
3) Decreased heat dispersion
   - Dehydration
   - CV disease
   - Extreme of age
   - Obesity
   - Improper clothing
   - Skin disease
   - Drugs
Environmental Injuries: Heat-Related Illness

• **Heat exhaustion**: nonspecific symptoms
  - Dizziness, weakness, malaise, N/V, HA, *diaphoresis*
  - Temp: normal - 104 °F (40 °C), *normal neuro exam*

• **Heat stroke**: (+) *CNS dysfunction*
  - Classic
  - Exertional

Treatment for heat stroke:
“evaporate cooling” or “immersion cooling”
Note: antipyretics don’t work
4. A 21 yo college student presents to the ED with friends who report the student swallowed “a whole bottle” of acetaminophen 45 minutes before arrival. They also note the patient has been drinking alcohol. The patient is awake but appears intoxicated.

Which of the following would be the best course of action:

A. Administer syrup of ipecac
B. Perform a gastric lavage
C. Administer activated charcoal
D. Administer N-acetylcysteine
Toxicology: Gastric Decontamination

• **Syrup of ipecac** – No, No, No!!!!!!!
  - AAP says do not keep in home *(Pediatrics, Nov 2003)*

• **Gastric emptying** – 36-40 Fr tube
  - Possibly helpful if used within 60 min
  - Risk for iatrogenic injury (aspiration, esophagus)

• **Charcoal (best option)**
  - If given <30 min, decreases absorption by 70%
  - If given 30-60 min, decreases absorption by 30%
  - Dose: 1-2 g/kg (max 100 g)
Acetaminophen Toxicity

- Max daily dosing: 4 g per day, toxic dose = 150 mg/kg
- 2nd most common cause of liver transplantation in U.S., however, only 4% of those with hepatoxicity develop liver failure
- 4 clinical phases
  - Phase 1 (0-24 hrs): asymptomatic, nausea/vomiting
  - Phase 2 (18-72 hrs): RUQ abd pain, N/V, rising LFTs
  - Phase 3 (72-96 hrs): Abd pain, N/V, jaundice, encephalopathy, renal failure, death
  - Phase 4 (4-14 days): resolution
- Acetaminophen levels: drawn at 4 hours after ingestion, treatment based on Rumack-Matthew nomogram
- Treatment: N-acetylcysteine (NAC)
<table>
<thead>
<tr>
<th>Agent</th>
<th>Antidote</th>
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<tr>
<td>Acetaminophen</td>
<td>N-Acetylcysteine</td>
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<tr>
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<td>Alkaline diuresis</td>
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<tr>
<td>B-blocker</td>
<td>Glucagon</td>
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<tr>
<td>Ca-channel blocker</td>
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<td>Digitalis</td>
<td>Fab antibodies</td>
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<td>Heparin</td>
<td>Protamine Sulfate</td>
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<tr>
<td>Isoniazid (INH)</td>
<td>Pyridoxine (Vit B6)</td>
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<tr>
<td>Opiates</td>
<td>Naloxone (Narcan)</td>
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<tr>
<td>Organophosphates</td>
<td>Atropine</td>
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<tr>
<td>TCA</td>
<td>NaHCO3</td>
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</table>
Common Toxidromes
#1. Anticholinergic

• Presentation
  – Hot as Hades ……Hyperthermia
  – Blind as a Bat ……Mydriasis
  – Dry as a Bone ……Thirst, decreased salivation
  – Red as a Beet ……Flushing, vasodilation
  – Mad as a Hatter…..Delirium, agitation, confusion

• Etiology: Antihistamines, Antiparkinson, Antipsychotics, Antiemetics (phenothiazines), Antidepressants (TCA), Antispasmodics
Common Toxidromes
#2. Serotonin Syndrome

• Presentation
  – Cognitive-behavior: agitation, anxiety, drowsy, delirium, headache, seizures
  – Autonomic dysfunction: tachycardia, arrhythmias, hyperthermia, HTN, diaphoresis, diarrhea, nausea
  – Neuromuscular: restlessness, tremor, hyperreflexia, dysarthria, ataxia, myoclonic jerks/twitching

• Etiology
  – Most common: SSRIs, MAOs
  – Especially if combined with: meperidine, cocaine, dextromethorphan, venlafaxine, amphetamine
    **Watch out for: linezolid (Zyvox)**
Serotonin Syndrome: Presentation

# Differences Between Serotonin and Anticholinergic Syndromes

<table>
<thead>
<tr>
<th></th>
<th>Skin</th>
<th>Muscular Tone</th>
<th>Reflexes</th>
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<tr>
<td>Serotonin syndrome</td>
<td><strong>Diaphoretic</strong></td>
<td>Increased</td>
<td>Hyperreflexia</td>
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<tr>
<td>Anticholinergic</td>
<td><strong>Dry</strong></td>
<td>Normal</td>
<td>Normal</td>
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<tr>
<td>Neuroleptic malignant</td>
<td><strong>Diaphoretic, pallor</strong></td>
<td>“Lead pipe” rigid</td>
<td>Bradyreflexia</td>
</tr>
<tr>
<td>syndrome</td>
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</table>
Toxicology

Treatment for the **serotonin syndrome** is:

Cyproheptadine
- Has antiserotonergic properties
- Only available orally
Thank you!
Answers

1. A
2. B
3. A
4. C
Supplemental slides
Lyme Disease: Other types of testing
Just say “No”

• Examples of unvalidated tests include:
  • Capture assays for antigens in urine
  • Culture, immunofluorescence staining, or cell sorting of cell wall-deficient or cystic forms of B. burgdorferi
  • Lymphocyte transformation tests
  • Quantitative CD57 lymphocyte assays
  • Reverse Western blots
  • In-house criteria for interpretation of immunoblots
  • Measurements of antibodies in joint fluid (synovial fluid)
  • IgM or IgG tests without a previous ELISA/EIA/IFA

MMWR, 2014;63:333
MMWR, CDC Surveillance Summary, 2005;54:125.
Other Tick-Borne Illnesses

- Tularemia
- Bartonella
- Q fever
- Relapsing fever
- STARI-Masters’ disease
- Colorado tick fever
- Tick paralysis
- *Borrelia mayonii*
- African tick bite fever
- Ehrlichiosis
Allergic Reactions: Treatment

H2 blockers help decrease urticaria

Methods: 91 ED pts. with acute allergic symptoms, randomized to:

Results:                  Diphenhydramine 50 mg IV + ranitidine 50 mg IV     Diphenhydramine 50 mg IV + placebo
                      Urticaria at 2 hrs 8%                                      26%
                      Need for additional antihistamines 4%                       23%

Can You Give an ARB to a Patient with ACE-Induced Angioedema?

In theory….YES

Data: Very limited… (on pts. switched to ARB)
1. 3/39 pts. (7.7%) developed AE (CHARM trial)¹
2. 2/26 pts. (8%) developed AE²

¹ Lancet 2003  ² Arch Intern Med 2004
Allergic Reactions:  
**Back to Medical School**

- **Type I (immediate hypersensitivity):** antigen attaches to IgE and IgG4 on mast cells and basophils ==> degranulation release mediators (increased vascular permeability, smooth muscle constriction, etc…)

- **Type II:** IgG and IgM Ab’s react to Ag on cell surfaces 
  eg, blood transfusion rxn, ITP, hemolytic anemias

- **Type III - (immune complex):** Ag-Ab complex triggers complement system 
  ==> eg, post-strep GN, serum sickness

- **Type IV (delayed hypersensitivity):** T cell-mediated 
  eg, PPD, poison ivy
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Sexually Transmitted Infections, Vaginitis, and Vaginosis

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University of Nevada, Las Vegas School of Medicine
Disclosure Statement

It is the policy of the AAFP that all individuals in a position to control content disclose any relationships with commercial interests upon nomination/invitation of participation. Disclosure documents are reviewed for potential conflicts of interest. If conflicts are identified, they are resolved prior to confirmation of participation. Only participants who have no conflict of interest or who agree to an identified resolution process prior to their participation were involved in this CME activity.

All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.
Learning Objectives

1. Discuss the common clinical presentations for patients experiencing STIs.
2. Demonstrate the contemporary use of testing to diagnose STIs and treat STIs.
3. Review major infections with identification of appropriate therapy.
Sexually Transmitted Infections: Behavioral Counseling

USPSTF 2014 (Update in progress)

• Recommends intensive behavioral counseling for all sexually active adolescents and for adults who are at increased risk for sexually transmitted infections (B Recommendation)
  – All sexually active adolescents are at increased risk for STIs
  – Other risk groups – adults: with current STIs or other infections within the past year, who have multiple sex partners, and who do not consistently use condoms
• High-intensity counseling on sexual risk reduction can reduce STIs in primary care and related settings
  – Interventions ranging in intensity from 30 min to ≥2 h of contact time are beneficial; evidence of benefit increases with intervention intensity
  – Interventions can be delivered by primary care clinicians or through referral to trained behavioral counselors
  – Most successful approaches provide basic information about STIs and STI transmission; assess risk for transmission; and provide training in pertinent skills, such as condom use, communication about safe sex, problem solving, and goal setting
Case

22 yo G0 woman presents for an annual well-woman evaluation; c/o vaginal discharge for two days. Pelvic: No lesions on the vulva or vagina; cervix appears reddened, almost strawberry texture. There is a generous amount of yellowish, malodorous leukorrhea, but no notable pus at the cervical os. Bimanual exam: Questionable cervical tenderness and fullness in both adnexa; exam is limited due to the patient’s obesity.
1. Of the following, which is the most likely diagnosis?

A. Herpes simplex virus (HSV) infection
B. Trichomonas vaginalis infection
C. Candida albicans infection
D. Bacterial vaginosis
Vaginal Discharge

- Herpes simplex virus (HSV) infection
  - Painful vesicles that ulcerate
- **Trichomonas vaginalis infection**
  - Malodorous discharge, occasional vulvar and vaginal irritation
  - Cervix can be somewhat tender to touch; patients often c/o non-specific pelvic pain
- Candida albicans infection
  - Very itchy with thick white discharge, typically
- Bacterial vaginosis (mixed vaginal flora)
  - Shift/overgrowth in bacterial flora
  - Malodorous discharge, vulvar itching; NO cervicitis or pelvic pain
Trichomoniasis

- Pap cytology and *T. vaginalis*
  - Conventional
  - Liquid-based cytology
    - Warrants treatment without further testing *(Torre. AJOG. 2003;188)*
2. Trichomonas vaginal infection is best treated with which of the following agents?

A. Metrogel – Vaginal (topical vaginal metronidazole) 5 g applied nightly for 5 days
B. Azithromycin (Zithromax) 1 g orally in a single dose
C. Metronidazole (Flagyl) 2 g orally in a single dose
D. Levofloxacin (Levaquin) 250 mg orally in a single dose
• **Recommended regimens**
  - Metronidazole (resistance is rare)
    • 2 g single oral dose
    • Allergy: Use clindamycin 300 mg BID for seven days.
  - Tinidazole
    • 2 g single dose
    • **Appropriate treatment option for metronidazole-resistant trichomoniasis**
• **Alternative regimen**
  - Metronidazole 500 mg po BID for 7 days
• Metronidazole gel considerably less efficacious (< 50%) compared to oral preparations
• **Treatment failure**
  - Repeat oral dose.
• **Treat the sexual partner**
Is There Necessary Follow-up?

• High rates of reinfection – (17% in one series)
  – CDC 2015 – retesting for *T. vaginalis* (*test for reinfection*) is recommended for ALL sexually active women within three months following initial treatment REGARDLESS of whether they believe their sex partners were treated
  – Data are *insufficient* to support retesting men

• Most recurrent infections thought to result from having sex with an untreated partner
  – Limited number due to low-level metronidazole resistance (2-5%)
  – Use higher dose metronidazole or tinidazole
Treatment Failure … and Reinfection Is Excluded?

• First choice
  – Metronidazole 500 mg po BID for 7 days
• IF that fails…
  – Tinidazole or metronidazole 2 g po q day for 5 days
Trichomoniasis: Pregnancy

CDC 2015

• Women can be treated with 2 g metronidazole in a single dose at any stage of pregnancy.

• Multiple studies and meta-analyses have not demonstrated an association between metronidazole use during pregnancy and teratogenic or mutagenic effects in infants.
Bacterial Vaginosis

• Current clinical criteria *(Amsel Criteria, 3 of 4)*
  - Discharge – homogeneous grayish-white
  - pH > 4.5
    - Greatest sensitivity; lowest specificity
    - Need vaginal pH paper
  - **Clue cells**
    - > 20% on HPF microscopy
    - MOST SPECIFIC AND SENSITIVE SIGN OF BV
  - Whiff test – (+) amine
    - Volatilized amines released after 10% KOH (semen does the same thing)
BV Is Not an “Annoyance Ailment”

- Premature rupture of membranes
- Preterm delivery
- Postpartum endometritis
- Salpingitis and PID
- Postoperative infections
- Vaginitis
- Acquisition of HIV
Bacterial Vaginosis: Treatment

CDC 2015

• **Primary Treatment**
  - Metronidazole 500 mg po BID times 7 days
    - Avoid alcohol during treatment and 24 hours after.
  - Metronidazole vag gel (0.75%) 5 g in vagina q day times 5 days
  - Clindamycin vag cream (2%) 5 g in vagina q day times 5 days

• **Alternative treatment**
  - Tinidazole 2 g po q day for times 2 days
  - Tinidazole 1 g po q day times 5 days
  - Clindamycin 300 mg po BID times 7 days
  - Clindamycin ovules 100 g in vagina q HS times 3 days

• **Recurrent (typically \( \geq 3 \) episodes in 12 months)**
  - Metronidazole vag gel (0.75%) 5 g in vagina 2x/week for 4-6 months
Probiotics Preventing Recurrent Vaginitis?

• **Lactobacillus**
  - Eating yogurt
    • Daily for two months
  - Vaginal suppositories
    • Daily for a week, stop for week, then daily for second week

• So…
  - Bacterial vaginosis – YES [SOR B]
  - Candidiasis – NO [SOR B]
  - No adverse effects [SOR A]

3. A 39 yo diabetic female (HgbA1c 11.4) presents to the office with an 8-day history of thick white vaginal discharge and vulvar itching. She tried a 7-day over-the-counter treatment for a yeast infection but admits to only completing 5 days of the therapy. On examination, you find extensive vulvar erythema, excoriations, and edema. There is a thick curd-like white discharge at the introitus with the vagina being erythematous. A KOH preparation of vaginal secretions shows budding yeast and hyphae. Which of the following medications would be the most appropriate treatment for this condition?

A. Terconazole intravaginal daily for 21 days
B. Fluconazole 150 mg orally in two doses 72 hours apart
C. Miconazole intravaginal daily for 7 days followed by once weekly application for 3 weeks
D. Clotrimazole intravaginal daily for three days
VVC *CDC 2015*

**Uncomplicated**
- Infrequent
- Mild to moderate symptoms
- *Candida albicans*
- Immunocompetent, nonpregnant

**Complicated**
- Recurrent
- Severe symptoms
- Nonalbicans species
- Women with uncontrolled diabetes, debilitation, immunosuppression, pregnancy
Predisposing Factors Associated With VVC

- OCP use
- Sponge and IUD
- Tight clothing
- Antibiotic use
- Pregnancy
- Diabetes
  - Poorly controlled*
- Immunosuppression*
- HIV*

* Best Evidence
Nonalbicans Species

• Prevalence of 17%
  – *C. glabrata, C. tropicalis, C. krusei*

• ? Increased OTC use or incomplete courses of therapy
  – Elimination of more sensitive albicans and selection for more azole-resistant nonalbicans species

• No hyphae on wet prep
  – Buds present, but can be missed
Uncomplicated VVC

• **Cochrane Systematic Review: 2002**
• Clinical and mycological cures are the same – oral OR topical treatment.
• All topical agents are highly effective.
  – No evidence that one formulation is superior to others
• Oral fluconazole present in vagina for at least 72 hours
  – More side effects, but preferred by women
Severe VVC

• Extensive vulvar erythema, edema, excoriation, fissure formation

• Treatment
  o 7-14 days of topical azole
  o 150 mg fluconazole in two sequential oral doses (second dose 72 hours after initial dose)
Recurrent VVC

• Defined
  • Four specific episodes occurring in 12 months or
  • At least 3 episodes unrelated to antibiotic therapy within 12 months
Recurrent VVC

CDC 2015

• Induction therapy
  – Fluconazole – 150 mg q 72 hours x 3 initially or 7-14 days of topical treatment

• Maintenance therapy
  – Fluconazole 150 mg once weekly for 6 months

• Long-term cure remains elusive
Genital Herpes Simplex Virus (HSV)

• Most infections are subclinical or mild.
• HSV is a potent facilitator of HIV.
• Screening – *USPSTF 2016*
  – **Routine serologic screening** of asymptomatic persons is not recommended
• **Latex condoms are effective in preventing transmission.**
  – 37% of couples do not use condoms as advised
Primary HSV

- No antibodies to HSV 1 or 2
- 75% asymptomatic
- Lesions appear 2-14 days following exposure
  - Tender vesicles, ulcers
- Fever, HA, myalgias
- Viral shedding for 12 days

First Clinical Episode of Genital Herpes*

- Most patients should receive antiviral therapy.

<table>
<thead>
<tr>
<th>Agent</th>
<th>Dose</th>
<th>Duration</th>
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<tbody>
<tr>
<td>Acyclovir</td>
<td>400 mg po TID</td>
<td>7-10 days</td>
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<tr>
<td>Acyclovir*</td>
<td>200 mg po 5x/d</td>
<td>7-10 days</td>
</tr>
<tr>
<td>Famciclovir</td>
<td>250 mg po TID</td>
<td>7-10 days</td>
</tr>
<tr>
<td>Valacyclovir</td>
<td>1 g po BID</td>
<td>7-10 days</td>
</tr>
</tbody>
</table>

- *Treatment can be extended if healing is incomplete after 10 days of therapy.*

* CDC 2015
Recurrent HSV

- 50% of patients will develop prodromal symptoms such as tingling or shooting pains into the hips or buttocks.
  - Usually unilateral and much smaller than primary consistent area of outbreak
- 90% of persons with primary HSV-2 will have at least one recurrence in the next 12 months.
Episodic Therapy for Recurrent Genital Herpes – *CDC 2015*

- Initiate therapy within 1 day of lesion onset or during prodrome that precedes some outbreaks

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<tr>
<td>Famciclovir</td>
<td>500 mg times 1, then 250 mg BID for 2 days</td>
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<td>Valacyclovir</td>
<td>500 mg po BID</td>
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<tr>
<td>Valacyclovir</td>
<td>1 g q day</td>
<td>5 days</td>
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</table>
HSV: Suppressive Therapy

**CDC 2015**

- Reduces frequency of recurrences by 70-80% (with frequent recurrences > 6/year)
- Reduces but does not eliminate subclinical viral shedding – therefore ? prevention of transmission

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<tr>
<td>Valacyclovir*</td>
<td>500 mg po q day</td>
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<tr>
<td>Valacyclovir</td>
<td>1 g q day</td>
</tr>
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</table>

*Valacyclovir 500 mg q day might be less effective in patients who have very frequent recurrences (ie, > 10 episodes per year).*
4. A 22 yo sexually active female comes to your office for a Pap test and STI screening. Her Pap test is normal but she tests positive for gonorrhea. Chlamydia testing is negative. Which one of the following is the recommended treatment?

A. Doxycycline  
B. Ceftriaxone  
C. Ceftriaxone plus azithromycin  
D. Ofloxacin
Figure 17. Gonorrhea — Rates of Reported Cases by County, United States, 2018

* Per 100,000.

Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention
Uncomplicated Neisseria Gonorrhea
(any Anatomic Site)*

- Ceftriaxone 250 IM plus azithromycin 1 g po (preferred) or doxycycline 100 mg BID
  - Note: 8/12 regimen is in response to an increase in multidrug-resistant gonorrhea; fluoroquinolone-resistant gonorrhea is continuing to spread and is now widespread in the U.S. This class of antibiotics is no longer recommended for the treatment of gonorrhea in the United States.

- * This regimen is recommended for all adult and adolescent patients, regardless of travel history OR sexual behavior.

CDC 2015
Treatment of Gonorrhea at ANY Anatomic Site

• **Alternatives**
  – If ceftriaxone is unavailable, single oral dose of cefixime 400 mg *and either:*
    • A single dose of azithromycin or
    • Doxycycline 100 mg orally twice per day for 7 days
  – If the patient is allergic to cephalosporins, a single dose of azithromycin 2 g can be used.

• Patients with **pharyngeal gonorrhea** who receive either of the alternatives to ceftriaxone for treatment should return for a **test of cure in 14 days**.

• CDC advises that clinicians should perform susceptibility testing in patients who fail to respond to treatment and notify their local public health STI program.
Additional Guidance

* CDC 2015 *

- Patients who have persistent symptoms after treatment should be retested by culture.
  - If culture is (+) for gonococcus, isolates should be submitted for resistance testing.
- Test of cure **14 days** after RETREATMENT.
- Ensure that sex partners from the preceding 60 days are promptly evaluated and treated.
Test of Reinfection?

CDC-2015

- A high prevalence of *gonorrhea* infection is observed in men and women who were treated for *N. gonorrhea* infection in the preceding several months.

- **Men and women** who have been treated for gonorrhea should be retested approximately 3 months after treatment, regardless of whether they believe that their sex partners were treated.
Neisseria Gonorrhea

*Treatment in Pregnancy*

- Cephalosporin regimen
- No tetracycline regimen
- Azithromycin or amoxicillin for presumptive or diagnosed chlamydial infection
Gonorrhea

USPSTF 2014

• All high-risk sexually active adolescent girls and women should be screened (Grade B)
  - Age < 25
  - Multiple sex partners
  - No barrier contraception
  - Incarcerated
  - Illicit drug use

• Insufficient evidence for or against routine screening in high-risk men
• Recommend AGAINST routine screening of low-risk men and women
5. A 21 yo ♀ had a pelvic examination and a normal Pap test 1 week ago. Her screening test for Chlamydia returned positive. She is now being treated for chlamydia cervicitis with azithromycin, 1 g in a single dose. When should she have a test of cure for Chlamydia?

A. 1-2 weeks
B. 3-4 months
C. 12 months (at her next routine examination)
D. No test of cure is required.
Figure 4. Chlamydia — Rates of Reported Cases by County, United States, 2018

* Per 100,000.

Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention
Test of Cure?

- **Except in pregnant women**, test of cure (repeat testing 3-4 weeks after completing therapy) is **not** recommended when treated with the recommended or alternative regimens.

  Exceptions:
  - Therapeutic compliance is in question
  - Symptoms persist
  - Reinfection is suspected

- Pregnant women diagnosed with a chlamydial infection during the first trimester should not only receive a test to document chlamydial eradication but be retested 3 months after treatment.
Test of Reinfection?

*CDC-2015*

- A high prevalence of *C. trachomatis* infection is observed in men and women who were treated for chlamydial infection in the preceding several months.

- **Men and women** who have been treated for chlamydia should be retested approximately 3 months after treatment, regardless of whether they believe that their sex partners were treated.
Chlamydia Trachomatis

USPSTF 2014

• All high-risk sexually active adolescent girls and women should be screened (Grade B)
  − Age < 25
  − Multiple sex partners
  − No barrier contraception
  − Incarcerated
  − Illicit drug use

• Insufficient evidence for or against routine screening in high-risk men
• Recommend AGAINST routine screening of low-risk men and women
Nonculture Tests for Chlamydia and GC

- DNA-amplification tests (gold standard now)
  - More sensitive than culture (detects 20% more) and 100% specific for GC and chlamydia (CDC 2007)
- Appropriate specimens
  - Endocervical secretions or urine samples in females
  - Urethral swab or urine in males
    - Gram stain of a male urethral sample for intracellular gram (−) diplococci is highly sensitive and specific; diagnostic in symptomatic men.
Chlamydia Treatment

CDC 2015

- Recommended – equally effective, no test of cure required
  - Doxycycline 100 mg po BID x 7 d
  - Azithromycin 1 g po single dose
- Alternative regimens
  - Ofloxacin 300 mg po BID x 7 d
  - Levofloxacin 500 mg q D X 7 d
  - Erythromycin base 500 mg QID for 7 d*
  - Erythromycin ethylsuccinate 800 mg QID for 7 *

*Less effective; consider TOC 3 weeks after treatment.
Chlamydia in Pregnancy

**CDC 2015**

- **Recommended**
  - Azithromycin 1 g po times 1

- **Alternative**
  - Amoxicillin 500 mg po TID for 7 days
  - Erythromycin base 500 mg po QID for 7 days
  - Erythromycin base 250 mg po QID for 14 days
  - Erythromycin ethylsuccinate 800 mg po QID for 7 days
  - Erythromycin ethylsuccinate 400 mg po QID for 14 days
Males With Urethritis

**CDC**

- Mucopurulent or purulent discharge or dysuria or urethral pruritus
  - “Test now, treat now, diagnose later.”
- Empiric treatment recommended if
  - Gram stain of urethral secretions > 5 WBC per oil immersion field
  - Positive leukocyte esterase on first void urine or > 10 WBC per high-power field
  - High risk who are unlikely to return
Very high rates of reinfection

- Men and women with gonorrhea and/or chlamydia should return in 3 months for test of reinfection regardless of treatment status of partner.
- Women with trichomoniasis should return in 3 months for test of reinfection regardless of treatment status of partner.
Expedited Partner Therapy (EPT)

• Clinical practice of treating the sex partners of patients diagnosed with chlamydia or gonorrhea by providing prescriptions or medications to the patient to take to his/her partner without the health care provider first examining the partner.

• Provision of expedited partner treatment lessens the risk of reinfection for patients treated for *N. gonorrhoeae* or *C. trachomatis* infection.
  
  − Studies have shown that patients whose partners received EPT were 29% less likely to be reinfected than those who simply told their partners to visit the doctor.

• CDC has concluded that EPT is a useful option to facilitate partner management, particularly for treatment of male partners of women with chlamydial infection or gonorrhea.

https://www.cdc.gov/std/ept/default.htm
Pelvic Inflammatory Disease

- Clinical diagnosis, *not* laboratory-based
- Untreated PID has significant morbidity and mortality – empiric treatment is recommended if the patient meets the following minimal diagnostic criteria
  - Uterine/adnexal tenderness *or*
  - Cervical motion tenderness, *and*
  - No other cause for illness identified
- Empiric therapy unlikely to impair diagnosis and management of other important causes of lower abdominal pain – do not delay treatment while pursuing additional evaluation if history and physical are suggestive of PID.
Other Helpful (but Not Necessary) Criteria

- Mucopurulent discharge
- Temperature > 38.3°C (101°F)
- WBC on wet prep
- ↑ ESR
- ↑ C-reactive protein
- Laboratory evidence of GC or chlamydia
Management of PID

- Start empiric therapy if minimal criteria present.
- Increased risk of ectopic and infertility
  - Delay > 3 days = 3x risk (observational data)
- Polymicrobial infection is likely present if the patient has symptoms.
  - Broad-spectrum regimen necessary
- Treat sexual partner if had sex with patient during 60 days preceding onset of symptoms.
PID: Oral Treatment
Mild to Moderate Disease

*CDC 2015*

**Regimen A**
- Ceftriaxone 250 mg IM in a single dose PLUS
- Doxycycline 100 mg orally BID x 14 days
- WITH OR WITHOUT metronidazole 500 mg po BID x 14 days

**Regimen B**
- Cefoxitin 2 g IM in a single dose and probenecid 1 g po administered concurrently in a single dose PLUS
- Doxy and metronidazole as above
Criteria for Admission for the Treatment of PID

- Uncertain diagnosis
- Surgical emergencies like appendicitis cannot be excluded
- Suspected pelvic abscesses
- Concurrent pregnancy (due to high risk of maternal mortality, fetal wastage, and preterm delivery)
- Adolescent patient with uncertain compliance with therapy
- Severe illness
- Patient cannot tolerate outpatient regimen (e.g., severe vomiting)
- Lack of response to 72 hours of treatment
- Concurrent HIV infection
- Clinical follow-up cannot be arranged within 72 hours
PID: Parenteral Treatment

**CDC 2015**

- **Regimen A**
  - Cefotetan 2 g IV q 12 hours OR cefoxitin 2 g IV q 6 hours PLUS
  - Doxycycline 100 mg po or IV q 12 hours

- **Regimen B**
  - Clindamycin 900 mg IV q 8 hours PLUS
  - Gentamicin load IV/IM (2 mg/kg) followed by maintenance dose (1.5 mg/kg) q 8 h. (Single dosing [3-5 mg/kg] may be substituted.)
HIV Screening

USPSTF 2019

• Screen all patients aged 15-65 for HIV, regardless of risk level (Level A). Younger adolescents and older adults who are at increased risk of infection should also be screened.
  – Substantially decrease the HIV disease burden across the country.
  – Dramatically reduce transmission of the virus.
  – Markedly curtail infected patients’ progression to AIDS and death.

• Clinical guidelines have moved away from risk-based to routine voluntary screening

• Convincing evidence shows "with high certainty" that identifying and treating HIV infection in asymptomatic people will substantially benefit public health as well as the health of those individual patients.

• Insufficient evidence to establish optimal interval for screening
  – Reasonable to rescreen “at-risk” people at 1-year intervals
    • Engage in high-risk behaviors.
    • Live in or receive medical care in high-prevalence settings, eg, correctional facilities, homeless shelters, TB clinics, STI clinics, and clinics that serve men who have sex with men.
Update 2013

Three Key Research Findings

• 20% of people infected with HIV are not aware they are infected.
  - 236,400 people in US do not know that they should take precautions against transmitting the virus and begin treatment to limit HIV-related illness and end-organ damage.

• Proven that initiation of antiretroviral therapy before carriers become symptomatic (CD4 counts are between 0.200 and 0.500 x 10^9 cells/L) markedly reduces progression to AIDS and death

• Overall harms of screening the general population and treating those who are found to be HIV-positive are now considered “small.”
  - Both conventional and rapid screening tests are highly accurate, with sensitivities and specificities topping 99.5% – so the potential harms of false-negative and false-positive results are minimal.
  - Treatment is highly effective, with benefits clearly outweighing adverse effects.
Aging and HIV

• In 2013, an estimated 42% of Americans living with diagnosed HIV were aged 50 and older, 25% were aged 55 and older, and 6% were aged 65 and older.
• Additionally, the largest percentage increase in HIV prevalence (26%) from 2008-2010 was in those aged 65 years and older.

HIV Among People Aged 50 and Over. https://www.cdc.gov/hiv/group/age/olderamericans/
Rationale for Routine HIV Screening

• Effective treatment is widely available
• Many infected persons access health care but are not tested until symptomatic (lower CD4 at diagnosis)
• Awareness of HIV infection leads to reductions in high-risk sexual behavior
• Inconclusive evidence re: prevention benefits from “typical” counseling for persons who test negative
• Substantial experience with HIV tests, including rapid assays
HIV Testing Options

• Rapid assay \((\text{Sensitivity & Specificity} > 99.5\%)\)
  – Initial positive = “preliminary positive” \(\rightarrow\) requires confirmation with conventional assay
  – OTC availability (OraQuick)

• Conventional/“standard” assay: serum immunoassay with confirmatory WB or indirect immunofluorescent assay \((\text{Sensitivity & Specificity} > 99.5\%)\)

• Today: 4th generation screen and “cascade” testing
Role for Rapid HIV Tests

- Increase receipt of test results
- Increase identification of HIV-infected pregnant women so they can receive effective prophylaxis
- Increase feasibility of testing in acute-care settings with same-day results
- Increase number of venues where testing can be offered to high-risk persons
# Four FDA-approved Rapid HIV Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity (95% C.I.)</th>
<th>Specificity (95% C.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OraQuick Advance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- whole blood</td>
<td>99.6 (98.5 - 99.9)</td>
<td>100 (99.7 - 100)</td>
</tr>
<tr>
<td>- oral fluid</td>
<td>99.3 (98.4 - 99.7)</td>
<td>99.8 (99.6 - 99.9)</td>
</tr>
<tr>
<td>- plasma</td>
<td>99.6 (98.5 - 99.9)</td>
<td>99.9 (99.6 - 99.9)</td>
</tr>
<tr>
<td><strong>Uni-Gold Recombigen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- whole blood</td>
<td>100 (99.5 - 100)</td>
<td>99.7 (99.0 - 100)</td>
</tr>
<tr>
<td>- serum/plasma</td>
<td>100 (99.5 - 100)</td>
<td>99.8 (99.3 - 100)</td>
</tr>
</tbody>
</table>
Conventional Assays: Updates

• 4th generation assays
  – Combined antigen and antibody immunoassay
• Second step differentiates between HIV-1 and 2
• Includes NAAT to detect HIV RNA → allows for identification of acute HIV-1 infection*
  – Window period is as early as 15-17 days**

* Rare false positives  
** Qualitative HIV-1 NAAT & HIV-1 VL assays positive ~ day 10-12 [not used for screening]
Advantages and Drawbacks of 4th generation testing

+ • Shorter turnaround for Dx (no more WB)
  • Detects infection earlier
  • No “indeterminate” WB

? Higher cost
  o Preliminary cost-effectiveness studies in high-incidence areas found benefits:
    increased case identification, reduced transmission, and increased QALY
Giving Results: HIV positive

• Must give results confidentially in person!
• Psychosocial support services
• Partner notification (screen for DV)
• Linkage to care; confirm contact information & insurance status!
• Brief HIV disease education
• Communicable disease reporting: all new diagnoses must be reported to local/state health authorities
Advancing HIV Prevention: New Strategies for a Changing Epidemic

- Early HIV “treatment as prevention” → reduces community viral load and new infections: Grade A evidence

- PrEP (approved 7/2012): Grade A evidence
  - Daily oral therapy = 200 mg emtricitabine/300 mg tenofovir = Truvada (1 tablet daily)
  - Counseling on behavioral risk reduction, condom use
  - Monitoring of pregnancy and STI status

Prevention of HIV Infection: Preexposure Prophylaxis

*USPSTF – June 2019*

- Recommends that clinicians offer preexposure prophylaxis (PrEP) with effective antiretroviral therapy to persons who are at high risk of HIV acquisition. (Grade A)
Persons Considered for PrEP – USPSTF June 2019

• Men who have sex with men, are sexually active, and have one of the following characteristics:
  − Serodiscordant sex partner (i.e., in a sexual relationship with a partner living with HIV)
  − Inconsistent use of condoms during receptive or insertive anal sex
  − STI with syphilis, gonorrhea, or chlamydia within the past 6 months

• Heterosexually active women and men who have one of the following characteristics:
  − Serodiscordant sex partner (i.e., in a sexual relationship with a partner living with HIV)
  − Inconsistent use of condoms during sex with a partner whose HIV status is unknown and who is at high risk (e.g., a person who injects drugs or a man who has sex with men and women)
  − STI with syphilis or gonorrhea within the past 6 months

• Persons who inject drugs and have one of the following characteristics:
  − Shared use of drug injection equipment
  − Risk of sexual acquisition of HIV (see above)
Minimum Baseline Testing

• **HIV antibody**
  — Exclude HIV, because use of PrEP in the setting of undiagnosed HIV could lead to antiretroviral resistance

• **Hepatitis B Surface Antigen**
  — Assess for chronic hepatitis B infection, because the medication used for PrEP is active also against hepatitis B;

• **Creatinine**
  — Ensure that the creatinine clearance is greater than 60 mL/min, because one of the components in PrEP (tenofovir) should not be used in the setting of renal failure
Monitoring

- HIV testing q 3 months (minimum)
- Pregnancy testing q 3 months for women of childbearing age
- Serum creatinine after 3 months, and if stable, q 6 months
- Screening for STIs (syphilis; gonorrhea and chlamydia in the urine, rectum, or vagina as indicated based on the patient’s sexual practices; gonorrhea in the pharynx as indicated based on the patient’s sexual practices) q 6 months (minimum)
Effectiveness in Prevention

• Daily PrEP reduces the risk of getting HIV from sex by more than 90%
  – Combine with condoms to reduce risk AND to prevent other STIs
• Among people who inject drugs, it reduces the risk by > 70%
Nonoccupational Postexposure Prophylaxis (nPEP) – CDC 2016

• HIV testing (rapid if possible) of patient +/- source*
• Should be initiated within 72 hours of exposure
• 28-day course of 3-drug antiretroviral regimen
  – Preferred: Tenofovir disoproxil fumarate (300 mg) once daily with emtricitabine (200 mg) [Truvada] q day plus raltegravir (400 mg) BID or dolutegravir 50 mg daily

* Can D/C nPEP if source found to be HIV negative
# Estimated Per-act Risk for HIV Acquisition

<table>
<thead>
<tr>
<th>Exposure route</th>
<th>Risk per 10,000 exposures to an infected source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood transfusion</td>
<td>9,000</td>
</tr>
<tr>
<td>Needle-sharing IDU</td>
<td>67</td>
</tr>
<tr>
<td>Receptive anal intercourse</td>
<td>50</td>
</tr>
<tr>
<td>Percutaneous needle stick</td>
<td>30</td>
</tr>
<tr>
<td>Receptive penile-vaginal intercourse</td>
<td>10</td>
</tr>
<tr>
<td>Insertive anal intercourse</td>
<td>6.5</td>
</tr>
<tr>
<td>Insertive penile-vaginal intercourse</td>
<td>6</td>
</tr>
<tr>
<td>Receptive oral intercourse</td>
<td>1</td>
</tr>
<tr>
<td>Insertive oral intercourse</td>
<td>0.5</td>
</tr>
</tbody>
</table>
6. According to the CDC 2015, screening for syphilis should be undertaken by which one of the following tests?

A. Dark-field microscopy
B. Nontreponemal serology (e.g., RPR)
C. Fluorescent treponemal antibody absorption test
D. Weil-Felix Test
Genital Ulcers

- Think herpes (HSV), syphilis, chancroid
- Specific tests
  - Serology for *T. pallidum*
  - Culture or antigen for HSV
  - Culture for *H. ducreyi*
  - HIV testing
- Biopsy ulcers that do not respond to initial therapy
Figure 38. Primary and Secondary Syphilis — Rates of Reported Cases by County, United States, 2018

* Per 100,000.

1 In 2018, 1,498 (47.7%) of 3,142 counties in the United States reported no cases of primary and secondary syphilis. See section A1.4 in the Appendix for more information on county-level rates.

Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention
Diagnosis of Syphilis

• **Definitive test**
  - Dark-field microscopy

• **Nontreponemal serology**
  - RPR and VDRL (screening)
  - Correlates with disease activity (4-fold decline [two dilutions] in titer by 6 months); rarely (+) for life

• **Treponemal antibody**
  - FTA-ABS (confirmation test)
    - Correlates poorly with disease activity; not used to assess treatment response; may remain (+)

• **VDRL-CSF for neurosyphilis**
  - Highly specific, low sensitivity

CDC 2015 still recommends nontreponemal followed by treponemal for screening/diagnosis.
Syphilis

USPSTF 2016

- Strongly recommends that persons at increased risk for syphilis be screened (Grade A)
  - Men who have sex with men
  - Men/women living with HIV
  - History of incarceration
  - History of commercial sex work
  - Male < 29 years of age (high prevalence areas)
- Recommends AGAINST screening persons NOT at increased risk
Syphilis: Treatment

CDC 2015

- Benzathine PCN G
  - 2.4 million units IM
  - Preferred drug for treatment of **ALL stages EXCEPT late latent/tertiary neurosyphilis**

- Desensitization if PCN allergy
  - Documented limited data on alternatives – doxycycline/tetracycline – advise 14-day course
  - Emergence of azithromycin-resistant *T. pallidum* – should not be routinely used to treat

- Jarisch-Herxheimer
  - Acute febrile reaction occurring in first 24 hrs after treatment
Syphilis: Treatment

CDC 2015

- **Late latent/tertiary**
  - Benzathine PCN G
    - 7.2 million units administered as 3 doses of 2.4 million units IM q week

- **Neurosyphilis**
  - Aqueous crystalline PCN G
    - 18-24 million units/day, administered as 3-4 million units IV q 4 hours or continuous infusion for 10-14 days
  - Procaine penicillin
    - 2.4 million units IM once daily plus probenecid 500 mg po QID for 10-14 days
Chancroid

- Painful genital ulcers, painful inguinal lymphadenopathy
- 10% co-infected with HIV/syphilis
- H. ducreyi
  Co-factor for HIV transmission (more Tx failures if HIV [+])
  Check HIV, VDRL
- **Primary treatment**
  - Azithromycin
  - Ceftriaxone
  - Ciprofloxacin
  - Erythromycin
Granuloma Inguinale

- Painless, ulcerative lesions
  - No lymphadenopathy
  - Highly vascular lesions
- Klebsiella granulomatis
  - Donovan bodies on biopsy
- Primary treatment
  - Doxycycline
- Alternatives
  - Ciprofloxacin
  - Erythromycin
  - Azithromycin
  - Trimethoprim-sulfa

From: CDC
Lymphogranuloma Venereum

- Rare in USA
- Chlamydia trachomatis
- Painful lymphadenopathy
- **Primary treatment**
  - Doxycycline
- **Alternative**
  - Erythromycin
7. A 35 yo man sees you in the office to establish care. You learn his parents were born in southeast Asia. Although he was born in the United States (U.S.), he does not have any vaccination records from his childhood. During the visit he mentions that a relative was recently diagnosed with hepatitis B virus (HBV) infection and asks whether he should be screened. **According to the USPSTF, which one of the following screening recommendations is appropriate for this patient?**

A. Screen for HBV infection because he is at high risk
B. Do not screen for HBV infection, but provide the first does of the HBV vaccination series
C. Do not screen for HBV infection because he was born in the US
D. Screen for HBV infection because he is at high risk of developing chronic HBV infection and dying from cirrhosis or hepatocellular carcinoma.
Hepatitis B (HBV)

*USPSTF 2019*

- The USPSTF strongly recommends screening for HBV infection in pregnant women at their first prenatal visit. *Grade: A Recommendation*
The USPSTF recommends screening for hepatitis B virus infection in persons at high risk for infection. Grade: B Recommendation.

- HIV-positive persons
- Injection drug users
- Household contacts of persons with HBV infection
- Men who have sex with men
- Hemodialysis or cytotoxic or immunosuppressive therapy
- People born in countries and regions with a high prevalence of HBV infection (≥2%)

✓ U.S.-born persons not vaccinated as infants whose parents were born in regions with a high prevalence of HBV infection (≥5%); e.g., sub-Saharan Africa and southeast and central Asia
Prevalence of Hepatitis B Surface Antigen in Adults Aged 19 to 49 Years, 2005

Prevention

• Healthcare professionals exposed to HBsAg-positive patients
  – Give hepatitis B immune globulin after the exposure and start on the hepatitis B vaccine series if not previously vaccinated.

• Newborns of mothers infected with HBV
  – Give hepatitis B immune globulin after delivery and start on the hepatitis B vaccine series.

Hepatitis C

- In the U.S., estimated 4.1 million persons have been infected with hepatitis C virus (HCV), of whom an estimated 3.2 (95% confidence interval [CI] = 2.7–3.9) million are living with the infection.
- New infections continue to be reported, particularly among persons who inject drugs and persons exposed to HCV-contaminated blood in healthcare settings with inadequate infection control.
Hepatitis C Screening

CDC: 10 November 2011

• Proposal: Recommend one-time screening of all baby boomers (1945-1965).
  - Baby-boomers account for about three-quarters of those who die with HCV infection (liver cancer or fibrosis).
  - Estimated 80 million baby boomers would be screened and about 3.2 million infections diagnosed.

• Efforts coincide with May 2011 approval of two new protease inhibitors for HCV
  - Boceprevir (Victrelis, Merck & Co.)
  - Telaprevir (Incivek, Vertex Pharmaceuticals) – No longer on market
The USPSTF recommends screening for hepatitis C virus (HCV) infection in persons at high risk for infection. Grade: **B Recommendation**

The USPSTF also recommends offering **one-time** screening for HCV infection to adults born between 1945 and 1965. Grade: **B Recommendation**
CDC 2013 and HCV
May 7, 2013, MMWR. Early Release on the MMWR website (http://www.cdc.gov/mmwr)

• Update in guidance
  − Changes in availability of certain commercial HCV antibody tests
  − Evidence that many persons identified as reactive by an HCV antibody test might not subsequently be evaluated to determine if current HCV infection
  − Significant advances in the development of antiviral agents
• Previous guidance has focused on strategies to detect and confirm HCV antibody.
  − Reactive results from HCV antibody testing cannot distinguish between persons whose past HCV infection has resolved and those who are currently HCV infected.
  − Persons with current infection who are not identified as currently infected will not receive appropriate preventive services, clinical evaluation, and medical treatment.
• **Testing strategies must ensure the identification of those persons with current HCV infection.**
Recommended Testing Sequence for Identifying Current Hepatitis C Virus (HCV) Infection – CDC 2013

- CDC 2013

May 7, 2013, MMWR. Early Release on the MMWR website (http://www.cdc.gov/mmwr)
<table>
<thead>
<tr>
<th>Condition</th>
<th>Intervention</th>
<th>CDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>STIs in lower-risk patients (e.g., in monogamous relationships, using</td>
<td>Screening for exposure, counseling</td>
<td>• At least annually as outlined below</td>
</tr>
<tr>
<td>condoms consistently)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STIs in high-risk patients (e.g., multiple sex partners, inconsistent</td>
<td>Screening for exposure and disease, counseling</td>
<td>• Three to six months for MSM who have multiple or anonymous partners,</td>
</tr>
<tr>
<td>condom use, substance use during sex)</td>
<td></td>
<td>or who use illicit drugs with sex</td>
</tr>
<tr>
<td>Chlamydia</td>
<td>NAAT of a rectal swab</td>
<td>• At least annually in men who have had <strong>receptive anal</strong></td>
</tr>
<tr>
<td></td>
<td>Urethral test (NAAT of urine sample)</td>
<td>intercourse in the previous year, <strong>regardless</strong> of condom use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• At least annually in men who have had <strong>insertive intercourse</strong> in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the previous year, <strong>regardless</strong> of condom use</td>
</tr>
<tr>
<td>Gonorrhea</td>
<td>Pharyngeal NAAT</td>
<td>• At least annually for men who have had receptive <strong>oral</strong></td>
</tr>
<tr>
<td></td>
<td>NAAT of a rectal swab</td>
<td>intercourse in the previous year, regardless of condom use</td>
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<tr>
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<td>• At least annually in men who have had <strong>receptive anal</strong></td>
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<td>Condition</td>
<td>Intervention</td>
<td>CDC</td>
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</tr>
<tr>
<td>Hepatitis A or B virus infection</td>
<td>Screening and vaccination</td>
<td>• Vaccination recommended for all MSM in whom previous infection or vaccination cannot be documented; all MSM should be tested for HBsAg</td>
</tr>
<tr>
<td>Hepatitis C virus infection</td>
<td>Screening</td>
<td>• Screening is recommended for MSM born between 1945 and 1965, and other MSM if risk factors* are present; HCV testing is recommended for MSM with HIV infection at least annually</td>
</tr>
<tr>
<td>Herpes simplex virus 2 infection</td>
<td>Type-specific serologic testing</td>
<td>• Test MSM with genital ulcers or other mucocutaneous lesions</td>
</tr>
<tr>
<td>HIV infection</td>
<td>HIV serologic testing (type 1 and 2 antibody)</td>
<td>• At least annually for sexually active MSM if HIV status is unknown or negative, and the patient or his sex partner(s) have had more than one sex partner since the most recent HIV test</td>
</tr>
<tr>
<td>Syphilis</td>
<td>Serologic testing</td>
<td>• At least annually for sexually active MSM</td>
</tr>
</tbody>
</table>

# Best Practice Recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>SOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision of expedited partner treatment lessens the risk of reinfection for patients treated for <em>N. gonorrhoeae</em> or <em>C. trachomatis</em> infection.</td>
<td>B</td>
</tr>
<tr>
<td>Tinidazole (Tindamax) is an appropriate treatment option for metronidazole (Flagyl)-resistant trichomoniasis.</td>
<td>B</td>
</tr>
<tr>
<td>Provide or refer for intensive behavioral counseling in all sexually active adolescents (regardless of risk) and in adults who are at increased risk of sexually transmitted infection.</td>
<td>B</td>
</tr>
<tr>
<td>Screen for chlamydia and gonorrhea in sexually active nonpregnant female adolescents and adults 24 years and younger, and in older women who are at increased risk.</td>
<td>B</td>
</tr>
<tr>
<td>Screen for syphilis, HIV infection, and hepatitis B in men and women at increased risk.</td>
<td>A</td>
</tr>
</tbody>
</table>
THANK YOU!
Answers

1. B
2. C
3. B
4. C
5. D
6. B
7. A
References

Supplemental Slides
HPV/Genital Warts

**Condyloma Acuminata**

- Caused by various types of HPV (6 and 11 most commonly – 90%)
- Average time to development of new anogenital warts after infection is ~ 2-3 months.
- Young sexually active people
  - Range of manifestations
    - Small, unnoticed, regress without therapeutic intervention (immunocompetent)
    - Multiply, expand in size, produce symptoms
      - Itching, irritation, bleeding
      - Mass effect
        - Interfere with hygiene, function, sexual activity
  - Range of emotions
    - Psychological sequelae – typical concerns about STI
<table>
<thead>
<tr>
<th>Location</th>
<th>Possible Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anogenital (keratinized epithelium)</td>
<td>Podophyllotoxin, cryotherapy, DCA/TCA, surgical removal, Interferon alpha, Imiquimod, Sinecatechins</td>
</tr>
<tr>
<td>Vagina (mucosal epithelium)</td>
<td>DCA/TCA (can be repeated weekly, if necessary), Cryotherapy with liquid nitrogen; avoid cryo-probe, Laser vaporization</td>
</tr>
<tr>
<td>Cervix</td>
<td>Exclude HSIL, cryotherapy</td>
</tr>
<tr>
<td>Anal</td>
<td>Cryotherapy with liquid nitrogen, DCA/TCA, Surgical removal</td>
</tr>
</tbody>
</table>
Peripheral Vascular Disease

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Albany Medical College, Albany, New York
Disclosure Statement

It is the policy of the AAFP that all individuals in a position to control content disclose any relationships with commercial interests upon nomination/invitation of participation. Disclosure documents are reviewed for potential conflicts of interest. If conflicts are identified, they are resolved prior to confirmation of participation. Only participants who have no conflict of interest or who agree to an identified resolution process prior to their participation were involved in this CME activity.

All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.
Learning Objectives

1. Recognize the signs and symptoms of abdominal aortic aneurysms and aortic dissection.
2. Define claudication.
3. Describe the physical findings in chronic arterial insufficiency.
4. List some of the means for objective documentation of occlusive disease.
5. Recognize some of the supportive measures for patients with claudication.
6. Describe the benefits of walking programs for patients with claudication.
7. List the medications available to improve walking distance in patients with peripheral vascular disease.
Aortic Diseases

- Aortic dissection (thoracic)
- Abdominal aortic aneurysm (AAA)
Abdominal Aortic Aneurysm (AAA)

- Aneurysm is >50% in vessel diameter
- Normal aorta diameter is 1.8-2.0 cm
- 2-5% prevalence in elderly populations
- Average age of Dx: 65
- 13th most common cause of death in U.S.
- 10th most common cause of death in men
Abdominal Aortic Aneurysm (AAA)

- Location: 95% are infrarenal
- **Pathogenesis: Atherosclerosis**
  (Thoracic and suprarenal aneurysms do occur—...think Marfan’s, Ehlers-Danlos, syphilis)
- Male to female ratio: 3-8:1
Abdominal Aortic Aneurysm (AAA): Mortality

- Rupture: 60% of patients die before arrival
- Only 50% that do arrive alive, survive
- Overall mortality rate (with rupture) = 80%
1. Because of the prevalence and its lethality, the USPSTF recommends that ultrasound screening be performed in which patients?

A. One-time screening for men ages 65-75, who have ever smoked
B. One-time screening for men ages 65-75, regardless of smoking history
C. One-time screening for both men and women ages 65-75, who have ever smoked
D. One-time screening for both men and women ages 65-75, regardless of smoking history
Should You Ultrasound “Screen” Patients for AAA?
USPSTF Recommendations: 2014

• (+) Screen 1 time for abdominal aortic aneurysm (AAA) with ultrasonography in men aged 65-75 years who have ever smoked (grade B)

• Selectively offer screening for AAA in men aged 65-75 years who have never smoked (grade C).

• There is too little evidence to recommend for or against screening for AAA in women who have ever smoked (grade I).

• (-) Do not screen for AAA in women who have never smoked (grade D)
Should You US “Screen” Patients for AAA? Why not women???

Chichester Trial

<table>
<thead>
<tr>
<th>Methods</th>
<th>9342 women, ages 65-80 randomly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assigned to</td>
<td>Screening vs. control (no screening)</td>
</tr>
</tbody>
</table>
| Results            | • At 5 years, no difference in AAA mortality  
                       • At 10 years, no difference in AAA rupture rate |

Scott, RA; et al. Br J Surg; 1995
Medicare Part B Covers One-time AAA Screening for:

- Men aged 65-75 years who have ever smoked
- (+) Family Hx AAA (1st degree relative)
2. You identified an abdominal aortic aneurysm (AAA) in your patient.

At what size (in centimeters) should you refer your patient for surgical intervention?

A. 3-3.5 cm
B. 4-4.5 cm
C. 5-5.5 cm
D. 6-6.5 cm
AAA: Risk of Rupture

AAA: Risk of Rupture

- Rate of increase = *Is exponential!!!!*
- Smaller aneurysms expand slower
  *(Conversely, larger aneurysms expand faster)*

<table>
<thead>
<tr>
<th>Aneurysm size</th>
<th>Mean yearly increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0-3.9 cm</td>
<td>0.20 cm</td>
</tr>
<tr>
<td>4.0-4.0 cm</td>
<td>0.34 cm</td>
</tr>
<tr>
<td>5.0-5.9 cm</td>
<td>0.64 cm</td>
</tr>
</tbody>
</table>

You Have Identified a Small AAA. How Often Should You Get a F/U Ultrasound?

<table>
<thead>
<tr>
<th>Diameter, cm</th>
<th>Surveillance recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0-3.9</td>
<td>36 months</td>
</tr>
<tr>
<td>4.0-4.9</td>
<td>12 months</td>
</tr>
<tr>
<td>5.0-5.4</td>
<td>6 months</td>
</tr>
</tbody>
</table>

*Society of Vascular Surgery* 2018

Aortic Dissection: Who Is at Risk?

• Ages: 40-80, average age: 63
• Males: 2:1
• Hypertension: 76%
  - Prior cardiac surgery 16%
  - *Marfan’s 5% (more common in younger patients)
  - Cocaine use: 2%
  - Peri/post-partum

Marfan’s Syndrome: Clinical Features

- Above-average height
- Disproportionally long, slender limbs
- Scoliosis
- Thoracic lordosis
- Pectus carinatum or Pectus excavatum
- Abnormal joint flexibility
  - Thumb sign (Steinberg’s sign)
- High-arched palate
- Flat feet
- Lens dislocation
- Spontaneous pneumothorax

Images courtesy of wikipedia
A Pet Peeve

- AAA do not “dissect”
- Aortic dissections are NOT aneurysms

The pathophysiology is different!!!!
AAA
Atherosclerosis

Aortic dissection
Hypertension
Aortic Dissection: Location

Stanford Classification

- Ascending Aorta (60-65%) Type A
- Descending Aorta (30-35%) Type B

(After origin of subclavian artery)
<table>
<thead>
<tr>
<th>Symptom</th>
<th>Type A</th>
<th>Type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Pain</td>
<td>94%</td>
<td>98%</td>
</tr>
<tr>
<td>Anterior CP</td>
<td>79%</td>
<td>63%</td>
</tr>
<tr>
<td>Back pain</td>
<td>43%</td>
<td>64%</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>22%</td>
<td>42%</td>
</tr>
<tr>
<td>Tearing/ripping</td>
<td>49%</td>
<td>52%</td>
</tr>
<tr>
<td>Migrating</td>
<td>15%</td>
<td>19%</td>
</tr>
<tr>
<td>Syncope</td>
<td>19%</td>
<td>4%</td>
</tr>
<tr>
<td>Hypertensive</td>
<td>36%</td>
<td>70%</td>
</tr>
<tr>
<td>Hypotensive/shock</td>
<td>25%</td>
<td>4%</td>
</tr>
<tr>
<td>Pulse deficits</td>
<td>30%</td>
<td>20%</td>
</tr>
</tbody>
</table>
Aortic Dissection: Diagnosis

- Echocardiography
  1. Transthoracic (TTE)
  2. Transesophageal (TEE)
- CT-Angiography
- MRI
- Aortography

All are acceptable, depends on what you have available!

Image reprinted with permission from Joel E Fishman, MD, PhD, University of Miami School of Medicine, published by Medscape Drugs & Diseases (http://emedicine.medscape.com/), Aortic Dissection Imaging, 2016, available at: https://emedicine.medscape.com/article/416776-overview.
Aortic Dissection: Management

2 Goals

• Lower blood pressure to BP sys 90-110
  IV nitroprusside
• Lower velocity of LV ejection
  IV esmolol

*Pearl: Start with your B-Blocker*
Arterial Occlusive Disease

• Chronic due to: Atherosclerosis
  => Claudication

• Acute due to: Thromboembolic
  => 5 “P’s”
Claudication: Definition

- Reproducible ischemic muscle pain
  - That occurs with exercise,
  - Relieved with rest

*It’s stable angina … of the legs!!!*
Claudication: Presentation

- Symptoms are distal to the location of occlusion
  - Calf symptoms → femoral- popliteal disease
  - Calf and thigh → profunda femoral artery
  - Thigh, hip, buttock pain, with impotence → aortoiliac disease (Leriche Syndrome)
Chronic Arterial Occlusive Disease
Differential Diagnosis

- Spinal stenosis – “Pseudoclaudication”
- Spinal cord tumors
- Lumbar radiculopathy
- DJD
- DVT
3. A 68 yo male presents with complaints of an aching pain in both thighs when he walks about one block. The pain subsides within about 1-2 minutes after he stops ambulating. The best initial test in this case is:

A. Perform an ankle-brachial index (ABI)
B. Perform bilateral leg ultrasound
C. Perform pulse volume recordings (PVR)
D. Perform lower extremity magnetic resonance arteriogram (MRA)
The ankle-brachial index (ABI) is a measure used to evaluate arterial blood flow to the legs. It is calculated as the ratio of the highest ankle pressure to the highest brachial pressure:

\[
\text{Right ankle-brachial index} = \frac{\text{Highest right ankle pressure (mm Hg)}}{\text{Highest arm pressure (mm Hg)}}
\]

\[
\text{Left ankle-brachial index} = \frac{\text{Highest left ankle pressure (mm Hg)}}{\text{Highest arm pressure (mm Hg)}}
\]

**Example**

\[
\frac{\text{Highest ankle pressure}}{\text{Highest brachial pressure}} = \frac{92 \text{ mm Hg}}{164 \text{ mm Hg}} = 0.56 = \text{Moderate obstruction}
\]

**Interpretation of calculated index**

- Above 0.90 — normal
- 0.71–0.90 — mild obstruction
- 0.41–0.70 — moderate obstruction
- 0.00–0.40 — severe obstruction

Used with permission © New England Journal of Medicine
The New England Journal of Medicine
Fig 2, Peripheral Vascular Disease
Hennion D, Am Fam Phys, Sept 1, 2013 p.306-310
# Chronic Arterial Occlusive Disease

## Screening: Ankle-Brachial Pressure Index

<table>
<thead>
<tr>
<th>ABI</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9 - 1.40</td>
<td>Normal</td>
</tr>
<tr>
<td>0.7 - 0.89</td>
<td>Mild</td>
</tr>
<tr>
<td>0.4 - 0.69</td>
<td>Moderate</td>
</tr>
<tr>
<td>&lt;0.4</td>
<td>Severe</td>
</tr>
</tbody>
</table>

- Use higher of 2 brachial pressures if different
- Use higher of 2 ankle pressures (DP or PT) if different
- CPT # 93922
Screening: Ankle-Brachial Pressure Index

What if the value is markedly elevated??

Example: \[
\frac{\text{ankle BP}_{\text{sys}}}{\text{brachial BP}_{\text{sys}}} = \frac{210}{130} = 1.6
\]

- An ABI >1.4 indicates noncompressible arteries (calcified vessels)
- 1.4% of adults >40 yo have ABI >1.4
  - Accounts for approx 20% of all adults with PVD.

**Bottom Line:** “Normal” ABI = 0.9-1.4
4. When obtaining an ABI, AHA/ACC recommends obtaining the brachial (arm) systolic BP in both arms and using the higher of the 2 readings. However, if a difference in systolic BP >20 mm between the arms, the most likely diagnosis is?

A. Acute aortic dissection
B. Chronic aortic aneurysm
C. Subclavian artery stenosis
D. A mediastinal mass/tumor
Subclavian Artery Stenosis

• Most often due to atherosclerosis
• Usually asymptomatic – requires no intervention.

• Only intervene if these develop…
  – Subclavian steal syndrome
  – Upper extremity claudication
  – Coronary steal syndrome
Peripheral Artery Disease: Management

Risk factor modification
- Smoking cessation
- Hypertension
- Diabetes mellitus
- Antiplatelet therapy
  - Aspirin: 75-325mg qd or
  - Clopidogrel: 75mg qd

Note: not dual antiplatelet therapy (DAPT)

Intervention
- Exercise
- Cilostazol (Pletal)
- Lipid lowering agents
- Ramipril
PAD: Interventions

1. **Supervised exercise training**
   - 32 trials: => improve pain-free walking* 
     - Improved pain-free walking by 90 yards 
     - Does not improve ABI

2. **Lipid-lowering agents**
   - 7 small trials: => improve pain-free walking**
     - Improved pain-free walking by 96 yards

PAD: Interventions

3. Drug therapy for claudication

• Cilostazol (Pletal)
  - Inhibits phosphodiesterase type 3
  - Mechanism of action is unclear
  - 15 double-blind, randomized, placebo-controlled trials =>
    • Improved pain-free walking*
    • Approx by 41 yards**

PAD: Interventions

4. Drug therapy for claudication – A new player

- Ramipril 10 mg qd
- Methods: double-blind randomized trial
- Results: At 6 months, 75-second increase in pain-free walking time, and 255-second increase in maximum walking time

Ahimastos, AA, et al. JAMA, Feb 6, 2013
PAD: Management

Risk factor modification

Mild/moderate symptoms
- Exercise
- Drug therapy

Symptoms improve

Critical leg ischemia

Symptoms worsen

Imaging only when considering revascularization

Localize the lesion
- Pulse volume recording
- Magnetic resonance angiography (MRA)
- Conventional angiography
Chronic Arterial Occlusive Disease: As Disease Progresses

• Pain at rest in foot or toes (sometimes noted as paresthesias/numbness)
• Worse with legs elevated, relieved with legs dependent
• Develops leg edema
Chronic Arterial Occlusive Disease: As Disease Progresses

- Hair loss, smooth shiny skin
- Thickened nails
- Pallor with leg elevation and
- Rubor with legs dependent
- Bruits, decreased pulses
- Cyanosis, ulceration, gangrene
<table>
<thead>
<tr>
<th>Feature</th>
<th>Venous</th>
<th>Arterial</th>
<th>Ulcer Type</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underlying condition</td>
<td>Varicose veins, previous deep-vein thrombosis, obesity, pregnancy, recurrent phlebitis</td>
<td>Diabetes, hypertension, smoking, previous vascular disease</td>
<td>Diabetes, trauma, prolonged pressure</td>
<td>Limited mobility</td>
</tr>
<tr>
<td>Ulcer location</td>
<td>Area between the lower calf and the medial malleolus</td>
<td>Pressure points, toes and feet, lateral malleolus and tibial areas</td>
<td>Plantar aspect of foot, tip of the toe, lateral to fifth metatarsal</td>
<td>Bony prominences, heel</td>
</tr>
<tr>
<td>Ulcer characteristic</td>
<td>Shallow and flat margins, moderate-to-heavy exudate, slough at base with granulation tissue</td>
<td>Punched out and deep, irregular shape, unhealthy wound bed, presence of necrotic tissue, minimal exudate unless infected</td>
<td>Deep, surrounded by callus, insensate</td>
<td>Deep, often macerated</td>
</tr>
<tr>
<td>Condition of leg or foot</td>
<td>Hemosiderin staining, thickening and fibrosis, eczematous and itchy skin, limb edema, normal capillary refill</td>
<td>Thin shiny skin, reduced hair growth, cool skin, pallor on leg elevation, absent or weak pulses, delayed capillary refill, gangrene</td>
<td>Dry, cracked, insensate, calluses</td>
<td>Atrophic skin, loss of muscle mass</td>
</tr>
<tr>
<td>Treatment</td>
<td>Compression therapy, leg elevation, surgical management</td>
<td>Revascularization, anti-platelet medications, management of risk factors</td>
<td>Off-loading of pressure, topical growth factors</td>
<td>Off-loading of pressure; reduction of excessive moisture, shear, and friction; adequate nutrition</td>
</tr>
</tbody>
</table>
So, should you screen all at-risk, asymptomatic patients with an ABI?

2013, 2018: USPSTF notes **Insufficient Evidence** for routine screening for PAD in asymptomatic adults

**Rating: I Level Recommendation**
5. A 72 yo female presents to the ED with sudden severe R leg pain, located from the knee to toes. Her past medical history is significant for HTN and DM. Exam: Vitals: 160/90, pulse = 120 and irregular, afebrile. Lungs are clear. Heart: rapid irregularly, irregular pulse. The right leg is cool to touch, pale in color, and you are unable to obtain posterior tibial or dorsalis pedis pulse.

At this point, you should:

A. Start heparin and immediately consult a vascular surgeon
B. Immediately obtain an ultrasound of the lower extremity
C. Immediately obtain an echocardiogram
D. Immediately obtain an abdominal aortic ultrasound
Acute Arterial Occlusion

• Thromboembolic
• Heart is most common source: 80-90%

• Presentation: The 5 “P’s”
  - “P”ain
  - “P”allor
  - “P”aresthesia
  - “P”ulselessness
  - “P”aralysis
Acute Arterial Occlusion

• Cardioarterial emboli: Where do they lodge?
  - Lower extremities: 65-70% (usually at bifurcations)
  - Cerebral arteries: 20-25%
  - Upper extremities: 5-10%
  - Visceral arteries: 5-10%

  Don’t miss: Acute SMA occlusion
  “Pain out of proportion to physical findings”
6. A 76 yo male with a Hx of HTN, hyperlipidemia, and smoking presents with a painful toe. He denies trauma. No Hx of atrial fibrillation. The toes are dusky blue in color. He has 2+ posterior tibial and 1+ dorsalis pedis pulses.

The most likely diagnosis is:

A. Acute gout
B. Raynaud’s
C. Cellulitis
D. Blue toe syndrome
**Acute Arterial Occlusion**

- **Arterioarterial emboli: The Blue Toe Syndrome**
  - Cholesterol or atherothrombotic emboli
  - Occludes small vessels
  - Don’t be fooled
    - Pulses remain present
    - Often confused with bruising
  - Can involve multiple organs – especially kidneys
  - Can confirm diagnosis with
    - Skin or muscle biopsy
    - Cholesterol crystals on funduscopic exam
Raynaud’s disease: Raynaud’s phenomenon

recurrent vasospasm of the fingers/toes/tip of nose in response to stress or cold exposure

• **Primary:** idiopathic (no underlying disease)
• **Secondary:** associated with another illness
  • Rheumatic
    • Progressive systemic sclerosis/scleroderma
    • Mixed/Undifferentiated connective tissue disease, SLE
    • Dermatomyositis, Sjogren’s
  • Hematologic
    • Cryoglobulins
    • Paraneoplastic syndromes

3-5% of population
Most do not seek treatment
Thank you!
Answers

1. A
2. C
3. A
4. C
5. A
6. D
Supplemental Slides
Raynaud’s phenomenon: Diagnosis

- **Dx:** biphasic white (pallor) and blue (cyanosis) change in skin color
  - **Primary vs. Secondary:**
    - primary seen in younger patients (ages 15-30)
    - 37% initially dx as primary are later discovery to be secondary
    - secondary has abnormal capillaroscopy

*Figure 1. Findings in Patients with Raynaud’s Phenomenon.*
Panel A shows the pallor phase, and Panel B the cyanotic phase. Panel C shows normal nailfold capillaries, which would be indicative of healthy persons or those with primary Raynaud’s phenomenon, and Panel D the enlarged capillary loops that are typical of scleroderma microvascular disease, as seen with the use of capillaroscopy.