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Blackbook
Approaches to Medical Presentations

Produced by The Cumming School of Medicine, University of Calgary
Blackbook: Approaches to Medical Presentations

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Ainna Preet Randhawa
Vaneet Randhawa

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Editorial Board
Dr. Henry Mandin
Dr. Kevin McLaughlin
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A Message from the Editors

Welcome to the Twelfth Edition of Blackbook! This ongoing project is the result of the hard work and dedication of medical students and faculty at the University of Calgary, Cumming School of Medicine. We are proud that healthcare practitioners and trainees across North America find Blackbook to be a useful tool.

Blackbook continues to evolve and improve during each edition. In this newest print we have added and modified several schemes, including a new page for interpretation of pulmonary function tests, among numerous smaller edits and spelling corrections. We’re working on an open access, online version of Blackbook that will link to and integrate our other project, Calgary Cards (cards.ucalgary.ca). Cards is another study aid that employs student-authored patient scenarios in MCQ format. If students are struggling in a particular area (e.g., acid-base questions), cards is a great way to get some extra practice. Cards is free and in constant development - check it out!

As always, we welcome feedback, suggestions, edits, or ideas for new schemes. Please e-mail us at blackbk@ucalgary.ca.
Thank you and happy learning!
Rebecca Phillips, Ainya Preet Randhawa & Vaneet Randhawa
Introduction to Schemes

The material presented in this book is intended to assist learners in organizing their knowledge into information packets, which are more effective for the resolution of the patient problems they will encounter. There are three major factors that influence learning and the retrieval of medical knowledge from memory: meaning, encoding specificity (the context and sequence for learning), and practice on the task of remembering. Of the three, the strongest influence is the degree of meaning that can be imposed on information. To achieve success, experts organize and “chunk” information into meaningful configurations, thereby reducing the memory load.

These meaningful configurations or systematically arranged networks of connected facts are termed schemata. As new information becomes available, it is integrated into schemes already in existence, thus permitting learning to take place. Knowledge organized into schemes (basic science and clinical information integrated into meaningful networks of concepts and facts) is useful for both information storage and retrieval. To become excellent in diagnosis, it is necessary to practice retrieving from memory information necessary for problem resolution, thus facilitating an organized approach to problem solving (scheme-driven problem solving).
The domain of medicine can be broken down to 121 (+/- 5) clinical presentations, which represent a common or important way in which a patient, group of patients, community or population presents to a physician, and expects the physician to recommend a method for managing the situation. For a given clinical presentation, the number of possible diagnoses may be sufficiently large that it is not possible to consider them all at once, or even remember all the possibilities. By classifying diagnoses into schemes, for each clinical presentation, the myriad of possible diagnoses become more manageable ‘groups’ of diagnoses. This thus becomes a very powerful tool for both organization of knowledge memory (its primary role at the undergraduate medical education stage), as well as subsequent medical problem solving.

There is no single right way to approach any given clinical presentation. Each of the schemes provided represents one approach that proved useful and meaningful to one experienced, expert author. A modified, personalized scheme may be better than someone else’s scheme, and certainly better than having no scheme at all. It is important to keep in mind, before creating a scheme, the five fundamentals of scheme creation that were used to develop this book.

If a scheme is to be useful, the answers to the next five questions should be positive:
1. Is it simple and easy to remember? (Does it reduce memory load by “chunking” information into categories and subcategories?)
2. Does it provide an organizational structure that is easy to alter?
3. Does the organizing principle of the scheme enhance the meaning of the information?
4. Does the organizing principle of the scheme mirror encoding specificity (both context and process specificity)?
5. Does the scheme aid in problem solving? (E.g. does it differentiate between large categories initially, and subsequently progressively smaller ones until a single diagnosis is reached?)

By adhering to these principles, the schemes presented in this book, or any modifications to them done by the reader, will enhance knowledge storage and long term retrieval from memory, while making the medical problem-solving task a more accurate and enjoyable endeavour.

Dr. Henry Mandin
Dr. Sylvain Coderre
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Historical Editors
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Abnormal Rhythm

Types of Arrhythmia

Bradyarrhythmia
(<60 bpm)
- Sinus Bradycardia
- Sick Sinus Syndrome
- SA Block
- AV Block (1st/2nd/3rd degree)
- Junctional Escape Rhythm
- Ventricular Escape Rhythm

Abnormal Beats
- Premature atrial contraction
- Premature ventricular contraction

Tachyarrhythmia
(>100 bpm)

Narrow QRS (<120 msec)
SVT

Wide QRS (>120 msec)
VT or SVT with aberrancy

Regular Rhythm SVT
(constant R-R Interval)
- Sinus Tachycardia
- Monofocal Ectopic Atrial Tachycardia
- Aflutter
- AVNRT
- AVRT (ie. WPW)

Irregular Rhythm SVT
(variable R-R interval)
- AFib
- AFLutter with Variable AV Conduction
- Multifocal Atrial Tachycardia

Regular Rhythm
(constant R-R Interval)
- Monomorphic VT
- Regular rhythm SVT with conduction aberrancy

Irregular Rhythm
(variable R-R interval)
- Polymorphic VT (including Tosades de Pointes if in a setting of long QT)
- Irregular rhythm SVT with conduction aberrancy

Abnormal Beats

Regular Rhythm
(constant R-R Interval)
- Sinus Tachycardia
- Monofocal Ectopic Atrial Tachycardia
- Aflutter
- AVNRT
- AVRT (ie. WPW)

Irregular Rhythm
(variable R-R interval)
- AFib
- AFLutter with Variable AV Conduction
- Multifocal Atrial Tachycardia

Wide QRS (>120 msec)
VT or SVT with aberrancy

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- Monofocal Ectopic Atrial Tachycardia
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(variable R-R interval)
- AFib
- AFLutter with Variable AV Conduction
- Multifocal Atrial Tachycardia

Wide QRS (>120 msec)
VT or SVT with aberrancy

Regular Rhythm
(constant R-R Interval)
- Monomorphic VT
- Regular rhythm SVT with conduction aberrancy

Irregular Rhythm
(variable R-R interval)
- Polymorphic VT (including Tosades de Pointes if in a setting of long QT)
- Irregular rhythm SVT with conduction aberrancy
Abnormal Rhythm (2)

Causes of Arrhythmia

May present as: palpitations, dizziness, syncope, chest discomfort

Cardiac

Non-Cardiac

Structural
- Valve disease
- Cardiomyopathy

Electrical Conduction Abnormalities
- Ectopic foci
- Accessory pathway
- Scar tissue (previous MI)

High Output State
- Anemia
- Fever/infection
- Pregnancy

Metabolic
- Hypoglycemia
- Thyrotoxicosis
- Pheochromocytoma

Drugs
- Alcohol
- Caffeine
- Sympathomimetics
- Anticholinergics
- Cocaine

Psychiatric
- Panic Attack
- Generalized Anxiety Disorder
Chest Discomfort

Cardiovascular

Chest Discomfort

Cardiovascular
- Outflow Obstruction
  - Aortic Stenosis
- Ischemic
  - Myocardial Infarction*
  - Stable/Unstable Angina*
- Non-Ischemic
  - Aortic Dissection*
  - Dilating Aneurysm*
  - Pericarditis
  - Myocarditis

* Denotes acutely life-threatening causes
Chest Discomfort
Pulmonary / Mediastinal

Chest Discomfort

- Cardiovascular
- Pulmonary/Mediastinal
- Other

Cardiovascular
- Vascular
  - Pulmonary Embolism*
    (chest pain often not present)
  - Pulmonary Hypertension

Pulmonary/Mediastinal
- Chest Wall/Pleura
  - Pneumothorax*
  - Pleural Effusion
  - Pleuritis/Serositis

Other
- Parenchymal
  - Pneumonia with pleurisy*
  - Tuberculosis*
  - Neoplasm*
  - Sarcoidosis

* Denotes acutely life-threatening causes
Chest Discomfort

Other

Cardiovascular

Pulmonary/Mediastinal

Other

Gastrointestinal

• Gastro-Esophageal Reflux Disease
• Biliary Disease
• Peptic Ulcer Disease
• Pancreatitis*
• Esophageal Spasm
• Esophageal Perforation*

Musculoskeletal

• Costochondritis
• Muscular Injury
• Trauma

Neurologic/Psychiatric

• Anxiety/Panic
• Herpes Simplex Virus/Post-Herpetic Neuralgia
• Somatoform Disorder
• Spinal Radiculopathy

* Denotes acutely life-threatening causes
**Hypertension**

**Primary (Essential) (95%)**
- Onset between age 20 and 50.
- Positive family history.
- No features of secondary hypertension.

- Long-standing
- Uncontrolled
- Drug Withdrawal

**Secondary (5%)**
- Onset age < 20 or > 50 years.
- No family history.
- Hypertensive urgency.
- Resistant hypertension.

**Exogenous**
- Corticosteroids
- Oral Contraceptive Pills
- Cocaine
- Black licorice
- Medications

**Renal**
- Renal parenchymal disease
  - CKD
  - AKI
  - Glomerulonephritis
- Renovascular disease
  - (unilateral and bilateral renal artery stenosis)

**Mechanical**
- Aortic coarctation
- Obstructive Sleep Apnea

**Endocrine**
- Glucocorticoid excess (*Cushing syndrome or disease*)
- Catecholamine excess (*pheochromocytoma*)
- Mineralocorticoid excess (*primary aldosteronism*)
- Hyperthyroidism (mainly systolic hypertension)
- Hypothyroidism (mainly diastolic hypertension)
- Hyperparathyroidism
- Pregnancy (*Gestational hypertension*)

**Definition of hypertension:**
- Systolic BP ≥ 140mmHg or Diastolic BP ≥ 90mmHg
- Isolated systolic hypertension in the elderly: ≥ 160mmHg
- Diabetes mellitus ≥ 130/80mmHg
- Note: In children, the definition of hypertension is different (either systolic or diastolic BP >95thile), but the approach is the same.

**Hypertensive Urgency:**
- BP usually >180/110mmHg or asymptomatic Diastolic BP >130mmHg with target organ damage usually present but not acutely changing
- Hypertensive Emergency: BP usually >220/140mmHg with evolving target organ damage
Hypertension in Pregnancy

**Hypertension in Pregnancy**
DBP ≥ 90mmHg, based on two measurements

- Pre-existing Hypertension
  - Before Pregnancy OR <20 weeks gestational age
    - No Proteinuria
      - Chronic Hypertension
        - Primary
        - Secondary
    - Proteinuria (≥0.3g/24hr urine) OR one or more Adverse Conditions*
      - Pre-existing Hypertension with Pre-Eclampsia
- Gestational Hypertension
  - Previously normotensive, >20 weeks gestational age
    - No Proteinuria
      - Proteinuria (≥0.3g/24hr urine) OR one or more Adverse Conditions*
        - Gestational Hypertension with Pre-Eclampsia
    - Pre-Eclampsia + Seizures/Coma
      - Eclampsia

**Adverse Conditions**: (SOGC, 2008)
- Persistent or new/unalusual headache
- Visual disturbances
- Persistent abdominal/RUQ pain
- Severe nausea or vomiting
- Chest pain/dyspnea
- Severe hypertension

**Maternal**
- Pulmonary Edema
- Suspected placental abruption
- Elevated serum creatinine/AST/ALT/LDH
- Platelet <100x109/L
- Serum albumin <20g/L

**Fetal**
- Oligohydramnios
- Intrauterine growth restriction
- Absent/reversed end-diastolic flow in the umbilical artery
- Intrauterine fetal death

Clinical Pearl: BP should always be measured in a sitting position for a pregnant patient.
Left-Sided Heart Failure

Valvular Disease (Preserved Diastolic/Systolic Function)

• Mitral Stenosis
• Mitral Regurgitation
• Aortic Stenosis
• Aortic Regurgitation

Myocardial

Systolic Dysfunction (Reduced Ejection Fraction)

• Uncontrolled Severe Hypertension
• Aortic Stenosis (Severe)

Diastolic Dysfunction (Preserved Ejection Fraction)

• Transient Myocardial Ischemia
• Left Ventricular Hypertrophy
• Restrictive Cardiomyopathy
• Pericardial Constriction

Impaired Contractility

Coronary Artery Disease

• Myocardial Infarction
• Transient Myocardial Ischemia

Chronic Volume Overload

• Mitral Regurgitation
• Aortic Regurgitation

Dilated Cardiomyopathies

• Infiltrative
• Infectious
• Toxic (alcohol, cocaine)
• Genetic

Ejection Fraction = $\frac{SV}{EDV} = \frac{EDV - ESV}{EDV}$

SV = Stroke Volume
EDV = End-Diastolic Volume
ESV = End-Systolic Volume
Isolated Right-Sided Heart Failure

Note: all left-sided heart failure can also lead to right-sided heart failure (the most common cause of right heart failure is left heart failure)

Cardiac

- Right Ventricle Infarction
- Restrictive Cardiomyopathy

Valves

- Pulmonary Stenosis
- Tricuspid Regurgitation

Pericardium

- Constrictive Pericarditis
- Pericardial Tamponade

Pulmonary

- Chronic Obstructive Pulmonary Disease
- Diffuse Lung Disease
- Acute Respiratory Distress Syndrome
- Chronic Lung Infection
- Bronchiectasis

Myocardium

- Pulmonary Embolism
- Primary Pulmonary Arterial Hypertension
- Pulmonary Veno-Occlusive Disease

Parenchyma

Vasculature

Rule out Left-Sided Heart Failure (Most Common)
Cardiovascular

Pulse Abnormalities

Unequal/Delayed
- Obstructive arterial disease (ie. Atherosclerosis)
- Aortic dissection
- Aortic aneurysm
- Aortic coarctation
- Takayasu disease
- Normal variant

Pulsus Alternans
Variation in pulse amplitude with alternate beats
- Left heart failure

Pulsus Paradoxus
Exaggerated inspiratory drop in arterial pressure >10mmHg
- Cardiac tamponade
- AECOPD/ Acute Exacerbation of Asthma
- Hypovolemic shock
- Constrictive Pericarditis
- Restrictive Cardiomyopathy

Aortic Stenosis
- Anacrotic
- Pulsus parvus (small amplitude)
- Pulsus tardus (delayed/slow upstroke)

Water Hammer Pulse
Rapid upstroke followed by rapid collapse
- Aortic regurgitation
- High output states (ie. Anemia, hypoglycemia)
Cardiovascular

**Shock**

- Warm Extremities
- Cold Extremities

**Distributive Shock**
- Low JVP
- Sepsis
- Anaphylaxis
- Burns
- Neurogenic

**Cardiogenic Shock**
- Bibasilar Lung Crackles
- Myocardial Ischemia or Infarction
- Left-sided Valvular Disease
- Arrhythmia
- Cardiomyopathy (ie. HOCM)

**Obstructive Shock**
- Normal/Decreased Breath Sounds
- Pulmonary Embolism
- Tension Pneumothorax
- Cardiac Tamponade

**Hypovolemic Shock**
- (Rule out Decompensated Distributive Shock)
- Hemorrhage
- Dehydration
- Vomiting
- Diarrhea
- Interstitial Fluid Redistribution

**High JVP**

**Low JVP**
Syncope

**Neurocardiogenic**
- Vasovagal
- Orthostatic Hypotension
- Autonomic Neuropathy
- Situational (micturition, coughing, defecation)

**Cardiac**

**Respiratory**
- Pulmonary Embolism
- Hypoxia
- Hypercapnia

**Other**
- Hypoglycemia
- Anemia
- Medications (CCB, BB, Nitrates, Diuretics)
- TIA
- Psychiatric
- Intoxication
- Migraine

**CO = SV x HR**

**Stroke Volume**

**Heart Rate/Rhythm**

**Contractility**
- MI
- DCM

**Afterload**
- Mitral/Aortic Stenosis
- HCM (LVOT)

**Preload**
- Blood Loss/Hypotension
- Mitral Stenosis
- Cardiac Tamponade
- Constrictive Pericarditis

**Tachyarrhythmia**
- VT/VFib
- AFib/AFlutter
- AVNRT/AVRT

**Bradyarrhythmia**
- Sick Sinus Syndrome (SA Node)
- 2nd/3rd degree AV Block
- Pacemaker Malfunction
- Tachy-Brady Syndrome

Rule out Seizure

Cardiovascular

14
Systolic Murmur

Benign & Stenotic

- Systolic Murmur
  - Benign/Flow/Hyperdynamic
    - Pregnancy
    - Fever
    - Anemia
  - Stenosis
  - Incompetent Valve
  - Other

  - Supravalvular
    - Aortic Coarctation
    - Supravalvular Aortic Stenosis (rings, webs)
  - Subvalvular
    - Hypertrophic Obstructive Cardiomyopathy
    - Subvalvular Aortic Stenosis (rings, webs)
  - Valvular
    - Aortic Stenosis*
      - Uni-/Bicuspid
      - Degenerative (Tricuspid)
      - Rheumatic Heart Disease
    - Pulmonary Stenosis*
Systolic Murmur

Valvular & Other

- Benign/Flow/ Hyperdynamic
  - Stenotic
  - Incompetent Valve
  - Other
    - Ventricular Septal Defect

Mitral Regurgitation*
  - Leaflet/Annulus
    - Prolapse*
    - Dilated cardiomyopathy
    - Endocarditis
    - Hypertrophic Cardiomyopathy
    - Rheumatic Fever
    - Marfan’s Disease
  - Chordae Tendineae
    - Rupture
    - Endocarditis
    - Rheumatic Fever
    - Trauma
  - Papillary Muscle Dysfunction
    - Ischemia
    - Infarct
    - Rupture

Tricuspid Regurgitation*
  - Dilation of Right Ventricle/Annulus
    - Dilated cardiomyopathy
    - MI
    - Pulmonary Hypertension
  - Leaflet
    - Prolapse*
    - Endocarditis
    - Hypertrophic Cardiomyopathy
    - Ebstein’s Anomaly
    - Carcinoid

* Mitral Valve Prolapse (OS – Opening Snap)

S1  S2

S1  OS  S2

S1  S2

• Mitral Regurgitation/
Diastolic Murmurs

- Early Diastolic
  - Aortic Regurgitation*
  - Pulmonary Regurgitation (Graham-Steell Murmur)*

- Mid-Diastolic
  - Mitral Stenosis*
  - Tricuspid Stenosis*
  - Severe Aortic Regurgitation (Austin Flint Murmur)
  - Atrial Myxoma Prolapse

- Late Diastolic
  - Mitral Stenosis*
  - Tricuspid Stenosis*
  - Myxoma

* Mitral Stenosis/Tricuspid Stenosis (OS – opening snap)
Respiratory

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Pulmonary Function Tests

Interpretation

- **FEV₁/FVC ≥ LLN**
  - **FVC ≥ LLN**
    - **TLC ≤ LLN**
      - **Restriction**
        - **DL,co ≥ LLN**
          - Normal
          - Pulmonary Hypertension, Anemia, Carboxyhemoglobinemia
        - **DL,co ≥ LLN**
          - Chest Wall or Neuromuscular Disorders
    - **TLC ≥ LLN**
      - **Obstruction**
        - **Interstitial Lung Disease**
    - **Mixed Defect**
      - **Emphysematous COPD**
      - **Asthma or Non-Emphysematous COPD**

LLN: Lower limit of Normal

Acid-Base Disorder
Pulmonary

Acid-Base Disorder

pH < 7.35
Acidemia

Metabolic Acidosis

• Elevated Anion Gap

See “Metabolic Acidosis Elevated Anion Gap” on page 120

• Normal Anion Gap

See “Metabolic Acidosis Normal Anion Gap” on page 121

pH 7.35-7.45
Normal pH

Respiratory Acidosis

Chronic

Hypoventilation present for hours to days

Acute

Hypoventilation present for minutes to hours

Metabolic Alkalosis

Chronic

Hyperventilation present for hours to days

Acute

Hyperventilation present for minutes to hours

pH > 7.45
Alkalemia

Respiratory Alkalosis

Mixed Acid-Base Disorder

Appropriate Compensation: Ratio (CO₂:HCO₃⁻)

Metabolic Acidosis 12:10
Metabolic Alkalosis 7:10
Acute Respiratory Acidosis 10:1
Chronic Respiratory Acidosis 10:3
Acute Respiratory Alkalosis 10:2
Chronic Respiratory Alkalosis 10:4
Chest Discomfort

Cardiovascular

![Diagram]

- **Ischemic**
  - Myocardial Infarction*
  - Stable/Unstable Angina*

- **Non-Ischemic**
  - Pericarditis
  - Myocarditis
  - Aortic Dissection*

* Potentially acutely life-threatening
Chest Discomfort

Pulmonary

- Pneumothorax (Tension*)
- Pleuritis/Serositis
- Pleural Effusion
- Malignant Mesothelioma
- Pneumonia*
- Pulmonary Embolism*
- Malignancy
- Sarcoidosis
- Acute Chest Syndrome

* Potentially acutely life-threatening
Chest Discomfort

Other

- Cardiovascular
- Pulmonary/Mediastinal
- Other

- Gastrointestinal
  - GERD
  - Biliary Disease
  - Peptic Ulcer Disease
  - Pancreatitis*
  - Esophageal Spasm
  - Esophageal Perforation*

- Musculoskeletal
  - Costochondritis
  - Muscular Injury
  - Trauma

- Neurologic/Psychiatric
  - Anxiety/Panic
  - Herpes Simplex Virus/Post-Herpetic Neuralgia
  - Somatoform Disorder
  - Spinal Radiculopathy
Chest Trauma Complications

- Cardiac
  - Cardiac Tamponade*
  - Pericarditis
  - Myocardial Contusion
  - Acute Aortic Rupture*

- Chest Wall
  - Rib Fractures
  - Flail Chest*
  - Diaphragm Injury
  - Esophageal Injury

- Lung
  - Pulmonary Contusion
  - Pneumothorax (Tension*)
  - Hemothorax

*Potentially acutely life-threatening
Cough

Chronic

Chronic Cough ( > 8 wks )

- Normal Chest X-Ray
  - Normal Spirometry
    - Obstructive Disease (FEV1/FVC < LLN)
      - Asthma
      - COPD
  - Upper Airway
    - Rhinosinusitis/ Upper Airway Cough Syndrome
- Lower Airway
  - Asthma
  - Post-Infectious
  - Smoker’s Cough
  - Non-Asthmatic Eosinophilic Bronchitis
  - Aspiration

Cough & Dyspnea & Fever

- Abnormal Chest X-Ray
  - Chronic Infection
    (Eg. Fungal, Tuberculosis)
  - Neoplasm
  - CHF
  - Interstitial Disease
  - Foreign Body
  - Bronchiectasis

Other

- ACE Inhibitor
- Reflux-Associated Cough
- Psychogenic Cough
- Vocal Cord Dysfunction
Cough, Dyspnea & Fever

Chronic Cough ( > 8 wks )
- Normal CXR
  - Acute Bronchitis
  - AECOPD
- Infectious
  - Viral Pneumonia
  - Bacterial Pneumonia
  - Tuberculosis
  - Fungal Pneumonia (Immuno-compromised host)
  - Septic Emboli

Cough & Dyspnea & Fever
- Abnormal CXR
- Non-Infectious
  - Pulmonary Embolism
  - Cryptogenic Organizing Pneumonia
  - Pulmonary Vasculitis

* Potentially acutely life-threatening
Dyspnea

Acute

Dyspnea

Acute
Presents in minutes to hours

Cardiovascular
• Myocardial Infarction*
• Cardiac Tamponade*
• CHF

Pleural
• Pneumothorax (Tension*)

Parenchymal
• Pneumonia

Vascular
• Pulmonary Embolism*

Lower Airway (Wheeze)
• Asthma*
• AECOPD

Airway
• Aspiration*
• Anaphylaxis*

Respiratory

Chronic
Dyspnea Chronic

Cardiac

Dyspnea

Acute
- Presents in minutes to hours

Chronic

Cardiac

Pulmonary

Other

Pericardial
- Effusion
- Cardiac Tamponade*
- Constriction

Myocardial
- Systolic Dysfunction
- Diastolic Dysfunction
- Restrictive Cardiomyopathy

Valvular
- Stenosis
- Regurgitation
- Sub-Valvular Disease

Coronary Artery Disease
- Stable Angina
- Acute Coronary Syndrome*

Arrhythmia
- Atrial Fibrillation
- Bradyarrhythmia
- Tachyarrhythmia

* Potentially acutely life-threatening
Dyspnea Chronic

Pulmonary / Other

- Respiratory

Dyspnea

Acute
- Presents in minutes to hours

Chronic

Cardiac

Pulmonary

Airway Obstruction
- Asthma
- COPD
- Bronchiectasis

Abnormal Parenchyma
- ILD
- CHF
- Sarcoidosis

Pleural Abnormalities
- Pleural Effusions
- Pleural Thickening/Masses

Chest Wall Abnormalities
- Neuromuscular Weakness
- Kyphoscoliosis
- Abdominal Distention

Alveoli
- Pneumonia
- ARDS
- COPD
- Neoplasm

Interstitium

Vessels
- Pulmonary Embolism*
- Pulmonary Hypertension

Other
- Anemia
- Anxiety
- Deconditioning
- Hyperthyroidism
- Metabolic Acidosis
Excessive Daytime Sleepiness

Differentiate Fatigue from Sleepiness

Insufficient Sleep
- Poor Sleep Hygiene
- Insomnia
- Behavioral Sleep Deprivation (Eg. Shift Work)

Sleep Disorders
- Obstructive/Central Sleep Apnea
- Restless Legs Syndrome
- Periodic Limb Movement Disorder
- Narcolepsy
- Obesity Hypoventilation Syndrome

Medical/Psychiatric Disorders
- Neurologic Disorders (Eg. Parkinson’s, MS)
- Head Trauma
- Depression
- Anxiety

Other
- Medications (Eg. Benzodiazepines, Antihistamines, Opioid Analgesics, Antipsychotics)
- Drug Abuse (Eg. Alcohol, Opioids)
Hemoptysis

 Massive Hemoptysis
 (>100 mL in 24 hours)
 - Malignancy
 - Bronchiectasis
 - Abscess/Mycetoma
 - Arteriovenous Malformation

 Non-Massive Hemoptysis

 Normal
 - Hematemesis
 - Epistaxis
 - Bronchitis

 Focal Abnormality

 Diffuse Abnormality
 - CHF
 - Bronchiectasis
 - Pulmonary Vasculitis

 Infection
 - Bacterial
 - Viral
 - Tuberculosis
 - Fungal

 Malignancy

 Pulmonary Vasculitis
 - Lupus Erythematosus
 - Goodpasture’s Syndrome
 - Granulomatosis with polyangiitis /microscopic polyangiitis

 Vascular
 - Pulmonary Embolism
 - Arteriovenous Malformation
Alveolar-Arterial Gradient = $P_{A\text{O}_2} - P_{a\text{O}_2}$

$P_{A\text{O}_2} = F_{\text{O}_2} (P_{\text{b}-\text{H}_2\text{O}}) - (P_{\text{a\text{CO}_2}/0.8)}$

*In Calgary, $P_b = 660\text{mmHg}, \text{Sea level } P_b = 760\text{mmHg}*

**Potentially acutely life-threatening.**

**VSDs will be a Right-to-left shunt in infancy, become a Left-to-Right shunt in childhood to adulthood, and revert back to a right-to-left shunt when the left ventricle fails in severe disease, contributing to Eisenmenger's Syndrome.**
Lung Nodule

New Nodule

Multiple Nodules

Solitary Nodule

Malignancy
• Primary lung cancer
• Metastases ("cannonball lesions"; Eg. Melanoma, Head & Neck, Sarcoma, Colon, Kidney, Breast, Testicle)

Infection
• Fungal
• Tuberculosis
• Septic Embolism
• Parasitic

Inflammation
• Rheumatoid Arthritis
• Granulomatosis with polyangiitis (GPA)/microscopic polyangiitis (MPA)
• Sarcoidosis
• Pneumoconiosis

Vascular
• Arteriovenous Malformation

*N Potentially acutely life-threatening
Mediastinal Mass

- Anterior
  - Thyroid
  - Thymoma
  - Teratoma
  - “Terrible” Lymphoma

- Middle
  - Aneurysm
  - Lymphadenopathy
  - Cystic (Bronchial, Pericardial, Esophageal)

- Posterior
  - Neurogenic Tumour
  - Esophageal Lesion
  - Diaphragmatic Hernia

*Potentially acutely life-threatening*
Pleural Effusion

Thoracic Ultrasound should be used to perform Diagnostic Thoracentesis

Exudate
- Use Light’s Criteria
  - Pulmonary
    - Infectious
    - Neoplastic
    - Inflammatory (RA, SLE)
    - Pulmonary Embolus*
    - Chylothorax
    - Hemothorax
  - Gastrointestinal
    - Ruptured Esophagus*
    - Pancreatitis

Transudate
- Use Light’s Criteria
  - Increased Hydrostatic Pressure
    - Congestive Heart Failure
    - Renal Failure with Hypervolemia
    - (Early) Pulmonary Embolus
  - Decreased Oncotic Pressure
    - Cirrhosis
    - Nephrotic Syndrome

Light’s Criteria
- Pleural Fluid Protein/Serum Protein > 0.5
- Pleural Fluid Lactate Dehydrogenase (LDH)/Serum LDH > 0.6
- Pleural Fluid LDH > 2/3 Serum LDH Upper Limit of Normal

* Potentially acutely life-threatening
Pulmonary Hypertension

- Pulmonary Arterial Hypertension
  - Idiopathic
  - Associated with:
    - Connective Tissue Disease
    - Portal Hypertension
    - Congenital Heart Disease
    - HIV

- Left-Sided Heart Dysfunction
  - Systolic
  - Diastolic
  - Valvular

- Lung Disease and/or Hypoxemia
  - COPD
  - Interstitial Lung Disease
  - Sleep-Disordered Breathing

- Chronic Thromboembolic Disease

- Miscellaneous
  - Hematologic Disorders
  - Metabolic Disorders
Hematologic

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Overall Approach to Anemia

Anemia

- Blood Loss
  - Normocytic/Normochromic RBCs on Smear
    - Acute Bleed
    - Chronic Bleed
  - Any combination of:
    - Decreased Reticulocytes
    - MCV, MCH, MCHC, Serum Iron, Ferritin
    - Increased TIBC, Hypochromic RBCs

- Decreased RBC Production
  - Normal/Decreased Reticulocytes
    - Iron Deficiency
    - B12/Folate Deficiency
    - Aplastic Anemia
    - Anemia of Chronic Disease
    - Marrow Infiltration

- Increased RBC Destruction
  - Increased Reticulocytes, Increased Unconjugated Bilirubin, Spherocytes on Smear

- Congenital
  - Hemoglobinopathy
  - Thalassemia
  - RBC Membrane Disorder

- Acquired
  - Immune
  - Non-Immune
Approach to Anemia

Mean Corpuscular Volume

Anemia

Low Mean Corpuscular Volume (<80 fl)
- Iron Deficiency
- Thalassemia
- Lead Poisoning
- Anemia of Chronic Disease

Normal Mean Corpuscular Volume (80-100 fl)
- Bleeding
- Hemolysis
- Marrow Failure
- Anemia of Chronic Disease (e.g. Renal Disease, Liver Disease, Endocrinopathy, Chronic Inflammation, Chronic Infection)

High Mean Corpuscular Volume (>100 fl)
- B12 Deficiency
- Folate Deficiency
- Drugs
- Reticulocytosis
- Liver Disease
- Hypothyroidism
- Myelodysplasia
Anemia with Elevated MCV

- Normal Blood Smear
  - Drugs
- Oval Macrocytes Hypersegmented Neutrophils
- RBCs in Rouleaux Formation
  - Multiple Myeloma
- Dysplastic
  - Myelodysplastic Syndromes
- Macrocytosis Target Cells Normal WBCs

Anemia with elevated Mean Corpuscular Volume (MCV)

Rule out Reticulocytosis

- Low RBC Folate
  - Dietary Deficiency
  - Malabsorption
  - Increased Requirement (e.g. Pregnancy)
- Low Serum B12 Antibody Testing
- Anti-IF Antibodies Present
  - Pernicious Anemia
- Anti-IF Antibodies Not Present
  - Small Bowel Disorder
  - Pancreatic Disease
  - Parasites
  - Pernicious Anemia
- Normal Liver Function Tests
  - Rule out B12 and Folate Deficiency
- Abnormal Liver Function Tests
  - Liver Disease
Anemia with Normal MCV

**Anemia with normal Mean Corpuscular Volume**

- **Decreased WBCs**
  - **Decreased/Normal Reticulocytosis**
    - Marrow Aplasia
    - Marrow Infiltration

- **Increased Reticulocytosis**
  - Primary Hypersplenism
  - Secondary (e.g. RA, SLE, PRV, Chronic)

- **Normal/Increased WBCs**
  - **Increased Reticulocytosis**
    - Renal Failure
    - Inflammation
    - Cancer
    - Hypothyroid
    - Pregnancy
    - Early Iron Deficiency

- **Normal Reticulocytosis**

  **Polychromatic Macrocyes, Normal RBCs**
  - Acute Bleed
  - Hemolysis

  **Polychromatic Macrocyes, RBC Spherocytes, RBC Fragments**
  - Microangiopathic Hemolytic Anemias (MAHA)

  **Abnormal RBCs, Sickle Cells, Target Cells**
  - Hemoglobinopathy
Anemia with Low MCV

Anemia with Low Mean Corpuscular Volume

Decreased Heme Synthesis or Decreased Globin Synthesis

Ferritin decreased, serum iron decreased, TIBC increased
Fe/TIBC <18%
MCV/RBC >13
- Iron Deficiency (Eg Causes: DChronic Blood Loss, Occult Dbleed, Malabsorption, Dietary DDeficiency)

Ferritin normal/increased, serum iron decreased, TIBC normal/decreased
Fe/TIBC >18%
- Anemia Secondary to NInflammation

Ferritin normal/increased, Serum iron normal, TIBC Normal
MCV/RBC <13,
+/− basophilic stippling,
+/− increased reticulocytes

Increased HgbA2
Normal HgbA
- β-Thalassemia Minor

Increased HgbA2
Increased HgbF
No HgbA
- β-Thalassemia Major

Increased HgbH, HgbH inclusions in RBC
- α-Thalassemia 2-3 digene deletion

Other
- e.g. HgbE, HgbC, etc.
Approach to Bleeding / Bruising

Platelets & Vascular System

- **Bleeding/Brusing**
  - **Platelets**
    - **Thrombocytopenia**
      - Quantitative Defect
        - Decreased Production
        - Increased Destruction
        - Abnormal Sequestration
        - (See thrombocytopenia scheme)
    - **Disordered Platelet Function**
      - Qualitative Defect
      - Connective Tissue Disorders
      - HereditaryTelangiectasia
  - **Vascular System**
  - **Coagulation Proteins**
    - **Congenital**
      - Rare
      - (See thrombocytopenia scheme)
    - **Acquired**
      - Drugs (e.g. ASA)
      - Renal Disease
      - Steroids
      - Vasculitis
Approach to Bleeding / Bruising

Coagulation Proteins

- Platelets
- Vascular System
- Coagulation Proteins

**Bleeding/Brusing**

**Congenital**
- Factor VIII Deficiency
- Factor IX Deficiency
- Von Willebrand’s Disease
- Other deficiencies

**Acquired**
- Anticoagulation (Iatrogenic)
- Liver Disease
- Vitamin K Deficiency
- Disseminated Intravascular Coagulation
Approach to Prolonged PT (INR), Prolonged PTT

Long PT (INR), Long PTT

Factor Deficiency

- Congenital
  - Factor X
  - Factor V
  - Factor II
  - Fibrinogen
- Disseminated Intravascular Coagulation
- Vitamin K Deficiency
  (decreases levels of Factors II, VII, IX, X, and Protein C+S)

Acquired

- Liver Disease

Inhibitor

- Drugs
  - Heparin
- Autoantibodies to a Clotting Factor in the Common Pathway (Rare)

Antagonist

- Coumadin

Notes:
- PT more sensitive to Vitamin K deficiency; therefore PT used for monitoring Coumadin therapy (PTT only affected in very severe cases)
- PTT more sensitive to heparin; therefore PTT used for monitoring heparin therapy (PT only affected in very severe cases)
Prolonged PT (INR), Normal PTT

Normal PTT/Long PT

Sufficient Vitamin K
- Congenital Clotting Factor Deficiency – Extrinsic Factor (Factor VII Deficiency)

Insufficient Vitamin K

Vitamin K Deficiency

Child/Adult
- Antibiotics and Poor Nutrition
- Fat Malabsorption

Vitamin K Antagonist
- Coumadin (Warfarin) use

Newborn
- Hemorrhagic Disease of the Newborn
Hematologic

Prolonged PTT, Normal PT (INR)

Bleeding Tendency

Long PTT/Normal PT

Bleeding Tendency

No Bleeding Tendency

Congenital

X-Linked Disorder
  • Factor VIII Deficiency (Hemophilia A)
  • Factor IX Deficiency (Hemophilia B)

Autosomal Recessive Disorder
  • Factor XI Deficiency (Hemophilia C)

Autosomal Dominant Disorder
  • von Willebrand’s Disease with a low Factor VIII

Acquired

Autoantibodies
  • Factor VIII Inhibitor
  • Other Factors (rare)

Drugs
  • Heparin
Prolonged PTT, Normal PT (INR)

No Bleeding Tendency

Long PTT/Normal PT

Bleeding Tendency

- Congenital

  (Intrinsic Pathway Factor Deficiency)

  - Factor XII
  - Prekallikrein (Fletcher Factor)
  - High Molecular Weight Kininogen (Fitzgerald Factor)

No Bleeding Tendency

Acquired

- Antiphospholipid Antibodies (APLA)
Hematologic Approach to Splenomegaly

- Evidence of portal hypertension or coagulopathy?
  - Congestive
    - Cirrhosis
    - Thrombus (e.g. Hepatic, Portal, Splenic)
  - Infectious
    - Bacterial
    - Viral (EBV)
    - Parasitic
    - Fungal
  - Infiltrative
    - Systemic Lupus Erythematosus
    - Sarcoidosis
    - Felty’s Disease
    - Serum Sickness
  - Inflammatory
    - Hemolytic Disease
      - Sickle Cell Disease (children)
      - Thalassemia
      - Congenital Spherocytosis
      - Acquired causes
  - Blood smear abnormalities?
  - Non-Malignant
    - Amyloidosis
    - Gaucher’s Disease
    - Glycogen Storage Disease
  - Malignant
    - Lymphoma
    - Leukemia
    - Myeloproliferative disorders (e.g. polycythemia vera, essential thrombocytosis, myelofibrosis)
Fever in the Immunocompromised Host

Cellular Defect
- Cell Mediated Immunity
  - T-Cells Affected
  - Pneumonia
  - Aspergillus
  - Candida
  - Pneumocystis jirovecii
  - CNS Infection

Structural Defect
- Asplenia/Hyposplenism
  - Bacteremia/Septic Shock
  - Encapsulated Bacteria

Protein Defect
- Neutropenia or Neutrophil Dysfunction
  - Aphthous Ulceration
  - Perirectal Infection
  - Abscess Formation
  - Soft Tissue and Visceral Infection
  - Periodontal Disease

- Complement Deficiency
  - Encapsulated Bacteriemia
    - Streptococcus pneumoniae
    - Haemophilus influenzae
    - Neisseria spp.

- Hypogammaglobulinemia
  - Recurrent Sinusitis
  - Pneumonia
  - Bronchitis
  - Chronic Diarrhea
    - Giardia Infection
Lymphadenopathy

Diffuse

Diffuse Lymphadenopathy

Reactive

- Systemic Inflammatory
  - Systemic Lupus Erythematosus
  - Sarcoidosis
  - Rheumatoid Arthritis
  - Pseudotumor

- Infectious
  - EBV
  - CMV
  - HIV
  - Tuberculosis
  - Hepatitis

- Other
  - Acne
  - Allergy
  - Insect Bites
  - Young age

Leukemia

- Monoclonal Lymphocytes on Biopsy
- Reed-Sternberg Cells on Biopsy

- Leukemia
  - Non-Hodgkin’s Lymphoma
  - Hodgkin’s Lymphoma
- Acute Lymphoblastic Leukemia (Pancytopenia, WBC differential includes Blasts)
- Chronic Lymphocytic Leukemia (CBC with Lymphocytes)

Asymptomatic, Age > 50

History of Bleeding, Infection, Fatigue
Lymphadenopathy

Localized

<table>
<thead>
<tr>
<th>Localized Lymphadenopathy</th>
</tr>
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<tbody>
<tr>
<td><strong>Reactive</strong></td>
</tr>
<tr>
<td><strong>Inflammatory</strong></td>
</tr>
<tr>
<td>• Allergy</td>
</tr>
<tr>
<td>• Acne</td>
</tr>
<tr>
<td>• Insect bites</td>
</tr>
<tr>
<td><strong>Infectious</strong></td>
</tr>
<tr>
<td>• Bacterial (e.g. Pharyngitis, Cellulitis, Lymphadenitis)</td>
</tr>
<tr>
<td><strong>Neoplastic</strong></td>
</tr>
<tr>
<td><strong>Stage I-II Lymphoma</strong></td>
</tr>
<tr>
<td>• Non-Hodgkin’s Lymphoma</td>
</tr>
<tr>
<td>• Hodgkin’s Lymphoma</td>
</tr>
<tr>
<td><strong>Metastatic Carcinoma</strong></td>
</tr>
<tr>
<td>• Nasopharyngeal</td>
</tr>
<tr>
<td>• Head/Neck</td>
</tr>
<tr>
<td>• Thyroid</td>
</tr>
<tr>
<td>• Breast</td>
</tr>
<tr>
<td>• GI Tract</td>
</tr>
<tr>
<td>• Melanoma</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cervical</th>
<th>Supraclavicular</th>
<th>Axillary</th>
<th>Epitrochlear (Always pathologic)</th>
<th>Inguinal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anterior</strong></td>
<td>• Infection (e.g. Mononucleosis, Toxoplasmosis)</td>
<td>• Thoracic Malignancy (Breast, Mediastinum, Lungs, Esophagus)</td>
<td>• Infection (Arm, Thoracic Wall, Breast)</td>
<td>• Leg Infection</td>
</tr>
<tr>
<td>• TB</td>
<td>• Abdominal Malignancy (Virchow’s Node)</td>
<td>• Cancer (in absence of infection in upper extremity)</td>
<td>• Lymphoma</td>
<td>• Sexually Transmitted Infection</td>
</tr>
<tr>
<td>• Lymphoma</td>
<td>• Head/Neck Malignancy</td>
<td></td>
<td>• Sarcomiosis</td>
<td>• Cancer</td>
</tr>
<tr>
<td>• Kikuchi Disease</td>
<td></td>
<td></td>
<td>• Tularemia</td>
<td></td>
</tr>
</tbody>
</table>
Increased Neutrophils

Reactive (Orderly WBC differential)
- Infection
  - Bacterial
  - Abscess
  - Viral
- Medications
  - Corticosteroids
  - Lithium
  - Epinephrine
- Cancer
  - Solid Tumour (e.g. Lung, Bladder, Colon)
- Other
  - Inflammation
  - Tissue necrosis
  - Physical stimuli
  - Emotional stimuli
  - Metabolic disorders
  - Asplenia

Neoplastic (Disorderly WBC differential)
- Myeloproliferative Disorder
  - Chronic myelogenous leukemia
  - Polycythemia vera
- Acute Leukemia (pancytopenia, blast cells)
Neutropenia
Decreased Neutrophils Only

- Isolated Neutrophil Decrease
  - Congenital
  - Decreased Marrow Production
    - Chronic
  - Idiopathic
- Bicytopenia/Pancytopenia
  (Neutrophils and Other Cell Lines Decreased)
  - Increased Consumption
    - Septicemia
      - Gram Positive Bacteria
      - Gram Negative Bacteria
  - Increased Destruction
    - Systemic Lupus Erythematosus
    - Rheumatoid Arthritis

- Medications
  - Anticonvulsants
  - Antibiotics
  - Antithyroid
  - Antihypertensive
  - Antirheumatic
  - Antistroke
  - Antipsychotic
  - Antineoplastic

- Viral Infection
  - Epstein-Barr Virus
  - Cytomegalovirus
  - Childhood viruses
  - HIV
  - Influenza
Neutropenia

Bicytopenia / Pancytopenia

- Decreased Production
  - Marrow Infiltration
    - Hematologic and non-hematologic malignancies
    - Infection
    - Primary Myelofibrosis
  - Stem cell damage or suppression
    - Chemotherapy
    - Radiation
    - Drugs
    - Toxins
    - Aplastic Anemia
    - Myelodysplasia
  - Nutritional deficiency
    - B12/folate/combined deficiencies

- Sequestration
  - Splenomegaly
Polycythemia

Polycythemia (Erythrocytosis)

Relative
Normal RBC Mass/
Decreased Plasma Volume

• Burns
• Diarrhea
• Dehydration
• Idiopathic

True
Elevated RBC Mass

JAK-2 Negative
Elevated Erythropoietin
Reactive
Rule out exogenous cause of high EPO

JAK-2 Positive
Low/Normal Erythropoietin,
O₂ Saturation ≥ 90%,
Splenomegaly, Increased PMNs

• Polycythemia Vera

High Affinity Hemoglobin
O₂ Saturation ≥ 90%
Increased carboxyhemoglobin
Abnormal P450 determination
Smoking, positive Family History,
early onset

Hypoxia
O₂ saturation ≤ 90%

Erythropoietin Secreting Tumor
O₂ Saturation ≥ 90%
Abnormal Abdominal Ultrasound

Heart Murmur,
Cyanosis without
Pulmonary Disease

• Cyanotic Heart Disease

Abnormal Chest X-Ray
Shortness of Breath, Cough,
Smoking, Snoring
Chronic Chest Symptoms

• Sleep Apnea
• Chronic Pulmonary Disease

Congenital Hemoglobinopathy
Familial Polycythemia
Carboxyhemoglobin
Suspected Deep Vein Thrombosis (DVT)

Well’s Criteria for DVT

<table>
<thead>
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<th>Condition</th>
<th>Score</th>
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<tbody>
<tr>
<td>Active Cancer</td>
<td>(1)</td>
</tr>
<tr>
<td>Paralysis, paresis, recent immobilization of lower extremity</td>
<td>(1)</td>
</tr>
<tr>
<td>Recently bedridden for &gt;3 days, or major surgery in last 4 weeks</td>
<td>(1)</td>
</tr>
<tr>
<td>Localized tenderness along distribution of the deep venous system</td>
<td>(1)</td>
</tr>
<tr>
<td>Entire leg swollen</td>
<td>(1)</td>
</tr>
<tr>
<td>Calf swelling by &gt;3 cm compared to asymptomatic leg</td>
<td>(1)</td>
</tr>
<tr>
<td>Pitting edema (greater in symptomatic leg)</td>
<td>(1)</td>
</tr>
<tr>
<td>Collateral, nonvaricose superficial veins</td>
<td>(1)</td>
</tr>
<tr>
<td>Alternative diagnosis as or more likely than DVT</td>
<td>(2)</td>
</tr>
<tr>
<td>Previously documented DVT</td>
<td>(1)</td>
</tr>
</tbody>
</table>

Suspected Pulmonary Embolism (PE)

Calculate Clinical Probability Score

Low: ≤ 4 Points

- Negative D-Dimer
  - STOP

- Positive D-Dimer
  - CT-PA or Compression U/S
    - Negative CT-PE
      - Low Clinical Suspicion
        - STOP
      - High Clinical Suspicion
        - Compression U/S
          - Non-Diagnostic
          - Positive CT-PA
            - TREAT
            - Positive
            - Negative
              - Repeat U/S in 1 Week

High: > 4 Points

- Negative D-Dimer
  - STOP

- Positive D-Dimer
  - CT-PA or Compression U/S
    - Negative CT-PE
      - Low Clinical Suspicion
        - STOP
      - High Clinical Suspicion
        - Compression U/S
          - Non-Diagnostic
          - Positive CT-PA
            - TREAT
            - Positive
            - Negative
              - Repeat U/S in 1 Week

Well’s Criteria for PE

- Clinical Signs and Symptoms of DVT (leg swelling and pain with palpation of the deep veins) (3.0)
- Alternative diagnosis less likely than PE (3.0)
- Heart rate >100bpm (1.5)
- Immobilization or surgery in last 4 weeks (1.5)
- Previous DVT or PE (1.5)
- Hemoptysis (1.0)
- Malignancy (ongoing or previous 6 months) (1.0)

Thrombocytopenia

Low Platelet Count

Decreased Production
- Decreased Megakaryopoiesis
  - Aplastic Anemia
  - Toxic Damage (e.g., Chemotherapy)
  - Displacement (e.g., Leukemia, Tumour)

Increased Sequestration
- Splenomegaly

Increased Destruction
- Ineffective Megakaryopoiesis
  - B12 Deficiency
  - Folate Deficiency
  - Folate Antagonist (methotrexate)
  - Drugs
- Immune
  - HELLP Syndrome
  - TTP/HUS
  - DIC
  - Vasculitis
  - Infection
  - Foreign Surface (e.g., Prosthetic Heart Valve)
- Non-Immune

Autoimmune
- ITP
- SLE
- CLL
- APLA

Alloimmune
- anti-HLA antibodies

Drugs
- Quinidine
- HIT
- Others
Thrombocytosis

- Reactive
- Spurious
- Autonomous

Infectious
- Acute or Chronic
- IBD
- Rheumatic disorders
- Celiac disease

Inflammatory
- Post-op surgery
- Trauma
- Burns

Tissue Damage
- Rebound effect following treatment of ITP
- Rebound effect following ETOH induced thrombocytopenia

Non malignant hematologic conditions
- Essential thrombocytosis
- Polycythemia Vera
- Chronic Myelogenous Leukemia
- Primary Myelofibrosis

Other
- Post-splenectomy or hyposplenic states
- Non-hematologic malignancy
- Iron deficiency anemia
Hemolysis

Extravascular
Spleen and RES-mediated hemolysis

Intravascular
Hemolysis within circulation

Extrinsic to RBC

Intrinsc to RBC

Infections
- Malaria
- Babesiosis
- C. perfringens

Complement-Mediated
- Cold AIHA
- PCH
- PNH
- Drug-induced immune-complex hemolytic anemia
- Acute HTR

Mechanical Shearing
- MAHA (TTP, DIC, HUS)
- Prosthetic heart valves
- Atriovenous malformations

Immune-Mediated
- Warm AIHA
- Cold AIHA
- Alloimmune delayed HTR
- Drug-induced AIHA

Abnormal Hgb & Hgb Defects
- Thalassemia
- Sickle cell
- Unstable Hgb

Membrane Defects
- Hereditary spheroctytosis
- Hereditary elliptocytosis

RBC Enzyme Defects
- G6PD deficiency
- PK deficiency
# Gastrointestinal

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Scott Assen
Jonathan Seto
Jacob Charette

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Dr. Sylvain Coderre
Dr. Kelly Burak
Abdominal Distention

- Ascites
  - Mechanical obstruction
    - Adhesions 60%
    - Volvulus 3%
    - Malignancy 20%
    - Herniation 10%
  - Acute Colonic
    - Ogilvie's Syndrome
      - Trauma/Surgery
      - Medical Conditions (e.g. Myocardial Infarction, Congestive Heart Failure)
      - Drugs
      - Retroperitoneal Hemorrhage/Malignancy
  - Toxic Megacolon
    - Inflammatory
    - Infectious
    - Ischemic
- Bowel Dilatation
  - Paralytic Ileus
    - Peritonitis
    - Post-surgical
    - Hypothyroidism
  - Myopathic
    - Scleroderma
    - Familial Myopathy
- Other Causes
  - Pseudo-obstruction
    - Enteric (e.g. Amyloidosis, Paraneoplastic, Narcotics)
    - Extrinsic (e.g. Multiple Sclerosis, Spinal Injury, Stroke)
  - Chronic Intestinal
Abdominal Distention

Ascites

Abdominal Distention

- Ascites
  - High Albumin Gradient (SAAG)*
    - >11 g/L serum-fluid albumin
      - Portal Hypertension
        - Cirrhosis
        - Alcoholic Hepatitis
        - Portal vein thrombus
        - Budd-Chiari Syndrome
      - Cardiac
        - Congestive Heart Failure
        - Constrictive Pericarditis
  - Low Albumin Gradient (SAAG)*
    - <11 g/L serum-albumin gradient
      - Peritoneal
        - Carcinomatosis
        - Infection (Neutrophils > 250/cc)
      - Other Causes
        - Pancreatitis
        - Serositis
        - Nephrotic Syndrome

Clinical pearl: “rule of 97”: SAAG 97% accurate. If high SAAG, 97% of time it is cirrhosis/portal hypertension. If low SAAG, 97% time carcinomatosis (and cytology 97% sensitive)

*Serum Ascites Albumin Gradient (SAAG) = [Serum albumin] – [Peritoneal fluid albumin]
Abdominal Distention

Other Causes

- Ascites
- Bowel Dilatation
- Other Causes

- Pelvic Mass
  - Pregnancy
  - Fibroids
  - Ovarian Mass
  - Bladder Mass
  - Malignancy
  - Obesity

- Feces/Flatus
  - Constipation
  - Irritable Bowel Syndrome
  - Carbohydrate Malabsorption
  - Diet (Lactose Intolerance)
  - Chronic Obstruction

- Organomegaly
  - Hepatomegaly
  - Splenomegaly
  - Hydronephrosis
  - Renal Cysts
  - Aortic Aneurysm

6 Fs of Abdominal Distention
- Fluid
- Feces
- Flatus
- Fetus
- Fibroids and benign masses
- Fatal tumour
Abdominal Mass

Exclude pregnancy/hernia/abdominal wall mass

Organomegaly
- Liver
- Spleen
- Kidneys (e.g. Cysts, Cystic Renal Cell Carcinoma, Hydronephrosis)

Neoplastic
- Gastrointestinal Tumours (e.g. Colonic, Gastric, Pancreatic)
- Gynecologic Tumors (e.g. Ovarian, Uterine)
- Lymphoma/Sarcoma

Other Causes

Feces
- Vascular (Abdominal Aortic Aneurysm)

Pulsatile

Pseudoneoplastic
- Pancreatic Pseudocyst
Abdominal Pain (Adult)

Acute - Diffuse

Acute Abdominal Pain
(<72 hours)

Look For Surgical Abdomen
Upper Quadrant: R/O Cardiac, Pulmonary, Renal, Musculoskeletal Causes
Lower Quadrant: R/O Genitourinary Causes

Diffuse

Peritonitic
- Pancreatitis
- Bowel Obstruction
- Viscus Perforation
- Intraperitoneal Hemorrhage (ruptured AAA)

Non-Peritonitic
- Gastroenteritis
- Irritable Bowel Syndrome
- Constipation
- Metabolic Disease (e.g. Diabetic Ketoacidosis)
- Mesenteric Ischemia
- Mesenteric Thrombus
- Sickle Cell Anemia
- Musculoskeletal
- Trauma
- Peptic Ulcer Disease

Localized
Abdominal Pain (Adult)

Acute - Localized

Acute Abdominal Pain (<72 hours)

Look For Surgical Abdomen
Upper Quadrant: R/O Cardiac, Pulmonary, Renal, Musculoskeletal Causes
Lower Quadrant: R/O Genitourinary Causes

Diffuse

Upper Quadrant

Non-Peritoneal

Right Upper Quadrant
- Biliary Colic
- Hepatitis
- Hepatic Abscess
- Bowel Obstruction
- Pyelonephritis

Epigastric
- Peptic Ulcer Disease
- Gastritis
- Esophageal Rupture
- Biliary Colic

Peritoneal

Left Upper Quadrant
- Splenic Infarct
- Splenic Abscess
- Splenic Rupture

Non-Peritoneal

Bowel
- Appendicitis
- Diverticulitis
- Incarcerated Hernia

Peritoneal

Lower Quadrant

Pelvic/Adrenal
- Ectopic Pregnancy
- Ovarian Torsion
- Pelvic Inflammatory Disease
- Salpingitis
Abdominal Pain (Adult)

Chronic - Constant

- Recurrent abdominal pain? Consider tumor
  - Upper Quadrant/Epigastric? Consider cardiac causes
  - Lower quadrant? Consider genitourinary causes

- Constant
  - Upper Quadrant
    - Gastroesophageal Reflux Disease
    - Peptic Ulcer Disease
    - Chronic Pancreatitis
    - Pancreatic Tumor
    - Gastric Cancer
    - Liver Distention (e.g. Hepatomegaly, Tumor, Fat)
    - Splenic (e.g. Abscess, Splenomegaly) – very rare

- Cramping/Fleeting
  - Lower Quadrant
    - Crohn’s Disease
    - Gynecologic (e.g. Tumor, Endometriosis)

- Post-Prandial
  - Any Location/Diffuse
    - Ascites
    - Muscle Wall
    - Neuropathic pain
    - Somatization
Abdominal Pain (Adult)
Chronic - Crampy / Fleeting

Chronic Abdominal Pain

Recurrent abdominal pain? Consider tumor
Upper Quadrant/Epigastric? Consider cardiac causes
Lower quadrant? Consider genitourinary causes

Constant

Cramping/Fleeting

Post-Prandial

Upper Quadrant
- Biliary Colic/Cholelithiasis
- Choledocholithiasis
- Sphincter of Oddi Dysfunction
- Renal Colic

Lower Quadrant
- Bloating (e.g. Celiac Disease, Lactose Intolerance)
- Renal colic
- Irritable Bowel Syndrome
- Endometriosis

Any Location/Diffuse
- Bowel Obstruction (e.g. Adhesions, Crohn’s, Volvulus, Neoplasm, Hernia)
- Irritable Bowel Syndrome
Abdominal Pain (Adult)

Chronic - Post-Prandial

Chronic Abdominal Pain

Recurrent abdominal pain? Consider tumor
Upper Quadrant/Epigastric? Consider cardiac causes
Lower quadrant? Consider genitourinary causes

Constant

Cramping/Fleeting

Post-Prandial

Upper Quadrant
- Biliary Colic/Cholelithiasis
- Gastroesophageal Reflux Disease
- Peptic Ulcer Disease/Dyspepsia
- Gastric Cancer
- Chronic Pancreatitis
- Obstructing Colon Cancer

Lower Quadrant
- Obstructing Colon Cancer
- Lactose Intolerance

Any Location/Diffuse
- Bowel Obstruction (e.g. Adhesions, Crohn's, Volvulus, Neoplasm, Hernia)
- Mesenteric Angina
Anorectal Pain

Exclude: Poor Hygiene, Dietary, Anal Trauma

Internal Lesion

Diagnosis of Exclusion

External Lesion

• Proctalgia

Proctitis
• Inflammation
• Infection (Including Sexually Transmitted)

Other
• Malignancy
• Solitary Rectal Ulcer

Dermatologic
• Dermatitis
• Psoriasis

Anorectal Disease
• Fissure
• Fistula/Abscess (Crohn’s)
• Hemorrhoid
Acute Diarrhea

**Acute Diarrhea**

> 2-3 loose stools/day, >175-235 g/day; > 48 hours, <14 days

**Infectious**
- **Diarrhea Predominant**
- **Nausea/Vomiting Predominant**
  - *Bacillus cereus*
  - *Staphylococcus aureus*

**Ischemic**
- **Non-Bloody**
  - Crohn’s Ileitis
  - Crohn’s Colitis
- **Bloody**
  - Ulcerative Colitis
  - Crohn’s Colitis

**Inflammatory**
- **Bacterial (e.g. *E. coli*, *C. difficile*, *Salmonella, Campylobacter, Shigella*)**
- **Parasitic (e.g. *E. histolytica*)**

**Dietary**
- Drugs (Antibiotics, Laxatives, Antacids)
- Toxins

**C. difficile** is under “large bowel” but presents with non-bloody diarrhea usually.

Ischemic colitis is a self-limiting illness in most (due to vascular network from SMA, IMA, iliacs) whereas small bowel ischemia is an abdominal catastrophe (only one supply, SMA).
Chronic Diarrhea

Small Bowel

Chronic Diarrhea

>3 Loose Stools/Day, > 14 days
Exclude Chronic Inflammation

Steatorrhea
Oily/Foul/Hard to Flush

Large Bowel
Small Volume/Bloody/Painful/
Tenesmus/Urgency

Small Bowel
Large Volume/Watery

Secretory

Disordered Motility
• Irritable Bowel Syndrome (diagnosis of exclusion)
• Diabetic Neuropathy
• Hyperthyroidism

Mucosal
• Crohn’s Disease (Screen with CBC, albumin, ESR, endoscopy)
• Celiac Disease (screen with TTG)
• Chronic Inflammation
• Whipple’s Disease

Tumors

Mucosal
• Gastrinoma
• Carcinoid Syndrome
• Mastocystosis

Neoplastic
• Adenocarcinoma
• Lymphoma

Osmotic
• Magnesium, Phosphate, Sulfate
• Carbohydrate Malabsorption
• Lactose Intolerance
Chronic Diarrhea
Steatorrhea & Large Bowel

Chronic Diarrhea
>3 Loose Stools/Day, > 14 days
Exclude Chronic Inflammation

Steatorrhea
Oily/Foul/Hard to Flush

- Maldigestive
  - Pancreatic Insufficiency

- Malabsorptive
  - Celiac Disease
  - Mucosal Disease
  - Ileal Crohn’s Disease

Large Bowel
Small Volume/Bloody/Painful/
Tenesmus/Urgency

- Motility
  - Irritable Bowel Syndrome
  - Hyperthyroid

- Inflammatory
  - Inflammatory Bowel Disease
  - Radiation Colitis
  - Ischemic Colitis

Small Bowel
Large Volume/Watery

- Secretory
  - Villous Adenoma
  - Colon Cancer
  - Microscopic Colitis

Primary Malabsorption

Secondary Malabsorption

Bacterial Overgrowth
Liver Cholestasis
Mesenteric Ischemia
Short Bowel/ Resection
Infrequency (< 3 bowel movements/week)? Sensation of Blockage or incomplete evacuation? Straining?

Altered Bowel Function

Diet/Lifestyle
- Fibre
- Calories
- Fluid
- Exercise
- Psychosocial

Medications
- Neurally Active Medications (e.g. Opiates, Anti-Hypertensives)
- Cation Related (e.g. Iron, Aluminum, Calcium, Potassium)
- Anticholinergic (e.g. Antispasmodics, Antidepressants, Antipsychotics)

Severe Idiopathic

Colonic Inertia

Outlet Delay
- Pelvic Floor Dyssynergia

Irritable Bowel

Secondary Causes
Constipation (Adult)

Secondary Causes

- Infrequency (< 3 bowel movements/week)?
- Sensation of Blockage or incomplete evacuation? Straining?

- Altered Bowel Function
- Severe Idiopathic

Secondary Causes

- Neurogenic
  - Peripheral
    - Hirschsprung’s Disease
    - Autonomic Neuropathy
    - Pseudo-obstruction
  - Central
    - Multiple Sclerosis
    - Parkinson’s Disease
    - Spinal Cord/Sacral/Cauda Equina Injury

- Non-Neurogenic
  - Metabolic
    - Hypothyroidism
    - Hypokalemia
    - Hypercalcemia
  - Colorectal Disease
    - Colon Cancer
    - Colonic Stricture
      (Inflammatory Bowel Disease and Diverticular Disease)
Constipation (Pediatric)

- Infrequent Bowel Movements? Hard, Small stools? Painful evacuation? Encopresis?

- Neonate/Infant
  - Dietary/Functional
    - Insufficient Volume/Bulk
  - Neurologic
    - Hirschsprung’s Disease
    - Imperforate Anus
    - Anal Atresia
    - Intestinal Stenosis
    - Intestinal Atresia

- Older Child
  - Dietary/Functional
    - Insufficient Bulk/Fluid
    - Withholding
    - Painful (e.g. Fissures)
  - Anatomic
    - Bowel Obstruction
    - Pseudo-obstruction
  - Neurologic
    - Hirschsprung’s Disease
    - Spinal Cord Lesions
    - Myotonia Congenita
    - Guillain-Barré Syndrome
Dysphagia

If heartburn present: Consider GERD

Oropharyngeal Dysphagia
Immediate Difficulty
Difficulty initiating swallowing?
Choking? Nasal Regurgitation?

Structural
- Tumors
- Zenker’s Diverticulum
- Foreign Body

Neuromuscular/Toxic/Metabolic
- Myasthenia Gravis
- CNS Tumors
- Cerebrovascular Accident
- Multiple Sclerosis
- Amyotrophic Lateral Sclerosis
- Polymyositis

Functional

Esophageal Dysphagia
Delayed Difficulty
Food sticks seconds later/ Further down?

Motor Disorder
Solids and/or Liquids

Mechanical Obstruction
Solids only

Intermittent Symptoms
- Esophageal Spasm

Progressive Symptoms
- Scleroderma
- Achalasia
- Diabetic Neuropathy

Intermittent Symptoms
- Schatzki Ring
- Esophageal Web
- Eosinophilic Esophagitis

Progressive Symptoms
- Reflux Stricture
- Esophageal Cancer
Elevated Liver Enzymes

**Hepatocellular**
- ALT or AST > ALP

  **Severe**
  - ALT > 15x ULN
    - Viral
    - Drugs/Toxins
    - Ischemia
    - Autoimmune
    - Wilson’s
    - Pregnancy
      - AFLP
      - HELLP

  **Moderate**
  - ALT 5–15x ULN
    - Viral
    - Drugs
    - AIH
    - Wilson’s
    - Hemochromatosis
    - NAFLD
    - Others

  **Mild**
  - ALT < 5x ULN
    - NAFLD
    - Alcohol
    - Viral
    - Hemochromatosis
    - Drugs
    - AIH
    - A1AT deficiency
    - Wilson’s
    - Others
    - Cholestatic disease

  **Cholestatic (does not always cause Jaundice)**
  - ALP > ALT or AST

  **US – Normal Bile Ducts**
  - PBC
  - PSC
  - Alcoholic hepatitis
  - Drugs
  - TPN
  - Sepsis
  - Infiltrative
    - Sarcoid
    - Amyloid
    - Malignancy
    - Infection
    - Cirrhosis (any)
    - Congenital
      - Biliary Atresia
      - Alagille Syndrome
      - Progressive Familial Intracholestasis

  **US – Dilated Bile Ducts**
  - Common Bile Duct Stone
  - Biliary stricture
  - PSC
  - Worms/flukes
  - Cholangiocarcinoma
  - Pancreatic cancer
  - Others

**Dx ALF if**
- ↑INR and hepatic encephalopathy

**ETOH hepatitis**
- usually cholestatic, and usually ALT < 300

**NAFLD**
- 10% population

**Dx by biopsy**
- ± MRI/MRCP

**ERCP for dx and therapy**

**Dx by biopsy ± MRI/MRCP**

**ETOH hepatitis**
- usually cholestatic, and usually ALT < 300

**NAFLD**
- 10% population
Hepatomegaly

Rule out concurrent splenomegaly and jaundice

Infiltrative
- Right Heart Failure
- Budd-Chiari Syndrome
- Constrictive Pericarditis

Congestive

Infectious
- Hepatitis A, B, C
- Mononucleosis
- Tuberculosis
- Bacterial Cholangitis
- Abscess
- Schistosomiasis

Inflammatory
- Alcoholic Hepatitis
- Autoimmune Hepatitis
- Drug Induced Hepatitis
- Sarcoidosis
- Histiocytosis X
- Primary Sclerosing Cholangitis
- Primary Biliary Cirrhosis

Malignant
- Primary Carcinoma
- Metastases
- Lymphoma
- Leukemia
- Polycythemia
- Multiple Myeloma

Non-Malignant
- Fatty Liver
- Cysts
- Hemochromatosis
- Wilson’s Disease
- Amyloidosis
- Myelofibrosis
Jaundice

- **Pre-Hepatic**
  - Unconjugated Hyperbilirubinemia

- **Hepatic**
  - Conjugated Hyperbilirubinemia
    - Hepatocellular
    - Cholestatic
    - Dubin Johnson
    - See *Elevated Liver Enzymes* scheme

- **Post-Hepatic**
  - Usually has Duct Dilatation on Ultrasound

**Increased Production**
- Hemolysis
- Ineffective Erythropoiesis
- Hematoma

**Decreased Hepatic Uptake**
- Sepsis
- Drugs (e.g. Rifampin)

**Decreased Conjugation**
- Gilbert’s Syndrome
- Crigler-Najjar Syndromes (I and II)

**Biliary Duct Compression**
- Malignancy
- Metastases
- Pancreatitis

**Intraductal Obstruction**
- Gallstones
- Biliary Stricture
- Cholangiocarcinoma
- Primary Sclerosing Cholangitis
Liver Mass

Cystic

- Benign
  - Simple
  - Complex
    - Cyst
    - Polycystic Liver Disease
    - Caroli’s

- Proliferative
  - Cystadenoma

- Infectious
  - Hydatid Cyst

Malignant

- Proliferative
  - Hemangioma
  - Focal Nodular Hyperplasia
  - Adenoma

- Infectious
  - Abscess

Solid

- Benign
  - Primary Malignancy
    - Hepatocellular Carcinoma
    - Cholangiocarcinoma
  - Secondary Malignancy
    - Metastases (e.g. Lung, Colon, Breast)
Mouth Disorders (Adult & Elderly)

Mouth Disorders

Consider oral manifestations of systemic disease

Teeth
- GERD (Dissolves enamel)
- Sjögren’s Syndrome (Dental Caries)

Mucous Membrane

Ulcerating

Gastrointestinal
- Crohn's Disease
- Ulcerative Colitis
- NSAIDs

Other
- Canker Sore
- Cold Sore
- Anemia
- Langerhan's Cell Histiocytosis
- Granulomatosis with polyangiitis (GPA)/microscopic polyangiitis (MPA)
- Sarcoidosis
- Drug Induced
- Sexually Transmitted Infection

Lighter (White)
- Gingivitis
- Kawasaki Disease (Strawberry Tongue)
- Other Gum Disease
- Mucocele
- Allergic Reaction

Non-Ulcerating

Darker (Red)
- Chronic Liver Disease
- Sjögren's Syndrome
- Acromegaly
- Amyloidosis
- Psoriasis
- Gingival Hyperplasia
- Dry Mouth

Non-Neoplastic
- Candidiasis
- Lichen Planus
- Anemia

Neoplastic
- Leukoplakia
- Squamous Cell Carcinoma
Nausea & Vomiting
Gastrointestinal Disease

Nausea and Vomiting

Gastrointestinal Disease

Other Systemic Disease

Upper Gastrointestinal

Hepatobiliary

- Acute Hepatitis
- Acute Cholecystitis
- Cholelithiasis
- Choledocholithiasis
- Acute Pancreatitis

Lower Gastrointestinal

Acute
- Infectious Gastroenteritis
- Gastric/Duodenal Obstruction
- Gastric Volvulus

Chronic
- Gastroesophageal Reflux Disease
- Peptic Ulcer Disease
- Gastroparesis

Acute
- Infectious Gastroenteritis
- Small/Large Bowel Obstruction
- Acute Appendicitis
- Mesenteric Ischemia
- Acute Diverticulitis

Chronic
- Inflammatory Bowel Disease
- Colonic Neoplasm
Nausea & Vomiting
Other Systemic Disease

Gastrointestinal Disease

Endocrine/Metabolic
- Pregnancy
- Diabetes/ DKA
- Uremia
- Hypercalcemia
- Addison’s Disease
- Thyroid Disease

Other
- Sepsis (e.g. Pyelonephritis, Pneumonia)
- Radiation Sickness
- Acute Myocardial Infarction

Drugs/Toxins
- Chemotherapy
- Antibiotics
- Ethanol
- Carbon Monoxide
- Heavy Metal
- Nicotine

Central Nervous System

High Intracranial Pressure
- Hemorrhage
- Meningitis
- Infarction
- Malignancy
- Head Trauma

Vestibular (Inner Ear)
- Ear Infection
- Motion Sickness
- Vestibular Migraine
- Ménière’s Disease

Psychiatric
- Self-Induced (Bulimia)
- Cyclic Vomiting
- Psychogenic
Stool Incontinence

Intact Pelvic Floor
- Trauma/Surgery
  - Surgery: Anorectal, Prostate, Bowel
  - Pelvic Fracture
  - Pelvic Inflammation

Affected Pelvic Floor
- Nerve/Sphincter Damage
  - Vaginal Delivery
  - Rectal Prolapse
  - Severe Hemorrhoid
- Congenital Anorectal Malformation

Chronic Constipation
- Stool Impaction with overflow
- Encopresis

Neurological Conditions
- Age-Related (e.g. Dementia, Strokes)
- Neuropathy (e.g. Diabetes, Congenital Megacolon, Hirschsprung’s Disease)
- Multiple Sclerosis
- Tumors/Trauma (e.g. Brain, Spinal Cord, Cauda Equina)

Diarrheal Conditions
- Inflammatory Bowel Disease
- Irritable Bowel Syndrome
- Chronic Laxative Use

Stress and Emotional Problems

Gastrointestinal
Upper Gastronintestinal Bleed
(Hematemesis / Melena)

Acute Hematemesis/Melena

Blood in vomitus?/black, tarry stools

If Melena, 5-10% colorectal/small bowel. Exclude bleeding disorder.

Peptic Ulcer Disease (55%)

Portal Hypertension (15%)

Other

- Gastro-esophageal varices

Gastric Acid Hypersecretion
- Zollinger-Ellison Syndrome

Non-Steroidal Anti-Inflammatory Drugs

Stress (ICU Setting)

Helicobacter Pylori

Retching?

Mallory Weiss Tear
- Benign
- Malignancy

Tumors

Esophagitis/Gastritis
Lower Gastrointestinal Bleed

Occult (Stool + Occult blood and/or iron deficiency anemia)
- Colorectal cancer
- Angiodysplasia (colon or small bowel)
- Occult UGI bleeding (ulcer, esophagitis, gastritis, cancer)
- Other: small bowel tumors, asymptomatic IBD

Overt Bleeding

In Patient
- RULE OUT BRISK Upper GI bleed, Diverticular bleed,
- Acute colitis (ischemia, infectious, inflammatory),
- Small bowel source (e.g. Meckel's, tumor),
- Angiodysplasia

Out Patient
- Perianal Disease (most common)
- Inflammatory Bowel Disease
- Colorectal Cancer
Weight Gain

Increased Intake
- Dietary
- Social/Behavioural
- Iatrogenic

Decreased Expenditure
- Sedentary Lifestyle
- Smoking Cessation

Neurogenic/Genetic
- Depression
- Dementia

Hypothalamic/Pituitary
- Hypothalamic Syndrome
- Growth Hormone Deficiency

Gonadic
- Polycystic Ovarian Syndrome
- Hypogonadism

Other Causes
- Cushing’s Disease
- Hypothyroidism
Weight Loss

- GI illness (upper and lower)
- Psychiatric (Depression, eating disorders)
- Poverty
- Abuse
- Dementia
- Anorexia as an Adverse Drug Effect

- Small Bowel Disease (e.g. Crohn’s Disease, Celiac Disease)
- Pancreatic Insufficiency
- Cholestatic Liver Disease
- Protein-losing Enteropathy (e.g. Inflammatory Bowel Disease)

- Increased Protein/Energy Requirements (e.g. Post-Surgical, Infections, Trauma, Burns)
- Cancer
- Hyperthyroidism
- Chronic Cardiac/Respiratory distress (e.g. COPD)
- Chronic Renal Failure
- Adrenal Insufficiency
- Poorly Controlled Diabetes Mellitus
- HIV
Renal

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Dr. Andrew Wade
Dr. Sophia Chou
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Mollie Ferris
Kody Johnson
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Vera Krejcik
Keith Lawson
Vanessa Millar
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Maria Wu

Student Editors
Colin Roscher (Co-editor)
Mark Elliot (Co-editor)

Faculty Editor
Dr. Kevin McLaughlin
Acute Kidney Injury

FeNa = 100 × \( \frac{\text{Serum Creatinine} \times \text{Urine Na}}{\text{Serum Na} \times \text{Urine Creatinine}} \)

Acute increase in creatinine by at least 50%

Pre-Renal
(FeNa < 1%, bland urine sediment)

- Hepatorenal syndromes
- Drugs
- Emboli

Renal Hypoperfusion

- Shock

Systemic Hypotension

Renal
(FeNa > 2%)

Urinalysis and CBC

Tubular
(Thrombocytopenia and schistocytes on CBC)

- Cast nephropathy (multiple myeloma)
- Urate crystals
- Calcium Oxalate (Ethylene glycol)

Tubular Obstruction

- Shiga-like toxin (E. coli)
- Drugs
- HIV
- Malignancy

TTP/HUS

Vascular

Glomerular
(RBC casts, dysmorphic RBCs)

- Anti-GBM antibodies
- Immune-complex deposition (IgA, post-strep, lupus)
- Pauci-immune (Granulomatosis with polyangiitis /microscopic polyangiitis)

Rapidly Progressive Glomerulonephritis

Post-Renal
(Obstruction/hydronephrosis on U/S)

- Benign Prostatic Hyperplasia
- Constipation
- Prostate Cancer
- Urolithiasis

Interstitial
(Sterile pyuria, eosinophilia)

- Drugs (NSAIDs, Abx, allopurinol, PPI)
- Infections (CMV, strep, legionella)
- Immune (lupus, sarcoid, Sjögren)

Acute Interstitial Nephritis

Acute Tubular Necrosis
(Epithelial cell casts)

- Ischemia (severe hypotension)
- Toxins (contrast, aminoglycosides, chemotherapy)
- Pigments
Chronic Kidney Disease

Decreased kidney function (eGFR < 60 ml/min/1.73 m²) persistent over at least 3 months

Pre-Renal
(Evidence of Renovascular disease)
- Ateroemboli
- Renal artery stenosis
- Drugs
- Chronic hypoperfusion

Renal
(Abnormal urinalysis: proteinuria/pyuria)
- Atherosclerosis
- Diabetes
- Hypertension

Post-Renal
(Obstruction/hydronephrosis on U/S)
- Reflux nephropathy
- Benign prostatic hyperplasia
- Constipation
- Prostate cancer

Tubular
(Family history, ultrasound)
- Polycystic kidney disease
- Medullary cystic disease
- Nephronophthisis

Vascular
(Other small vessel disease)
- Atherosclerosis

Glomerular
(Proteinuria)
- Diabetes
- Hypertension

Interstitial
(Sterile pyuria, WBC casts, eosinophiluria)
- Drugs (NSAIDs, analgesics)
- Infections (chronic pyelonephritis)
- Immune (sarcoid, Sjögren)
- Multiple myeloma
- Hyperoxaluria
- Hypercalcemia
- Hyperphosphatemia
Dysuria

Pyuria
- Leukocytes on Dipstick/Microscopy

Bacteriuria & Hematuria
- Dipstick positive for nitrites (if infected with enterobacteria).
- • Gonococcal
  • Non-Gonococcal (e.g. Chlamydia, Trichomonas)

No Bacteriuria & No Hematuria
- Dipstick negative for nitrites.
- • Candida
  • Herpes Simplex Virus

No Pyuria
- No Leukocytes on Dipstick/Microscopy

Urethritis
- • Candida
  • Gardnerella
  • Neoplasm

Vaginitis
- • Candida

Non-Pathogenic
- • Estrogen deficiency
  • Interstitial cystitis
  • Radiation cystitis

Upper Urinary Tract Infection/Pyelonephritis
- WBC Casts

Lower Urinary Tract Infection/Cystitis
- WBC Clumps
Generalized Edema

- **Overfill** (Increased renal sodium retention, Urine Na > 40meq/L)
  - NSAIDs
  - AKI/CKD
  - Nephrotic Syndrome

- **Underfill** (Urine Na < 20meq/L)

  - Signs of left ventricular failure

  - **Altered Startling Forces** (Absolute decrease in EABV)
  - **Congestive Heart Failure** “forward failure” (Relative decrease in EABV)

  - Low serum albumin due to loss or impaired synthesis

  - Severely ill (e.g. in ICU)

- **Increased Interstitial Oncotic Pressure**
  - Myxedema (Hypothyroid)

- **Increased Capillary Hydrostatic Pressure**
  - Right heart failure
  - Constrictive pericarditis
  - Portal hypertension
  - Pregnancy

- **Decreased Capillary Oncotic Pressure**
  - Nephrotic syndrome
  - Cirrhosis

- **Increased Capillary Permeability**
  - Inflammation
  - Sepsis
  - Acute Respiratory Distress Syndrome
  - Allergies
  - Burns/Trauma
Hematuria

Red blood cells on urine microscopy. Must exclude false positives from myoglobinuria, beet, drugs (pyridium, phenytoin, rifampin, nitrofurantoin), or menstruation

Extraglomerular
(Isomorphic RBCs with no casts)

Urinary Tract Infection?
(Pyuria +/- nitrites with bacteria on microscopy)

Glomerular
(Dysomorphic RBCs and/or RBC casts)

Isolated extraglomerular hematuria is presumed to be secondary to malignancy until proven otherwise

Upper Tract
(above bladder)
- Vascular
- Tubulointerstitial
- Calculi (see scheme for renal colic)
- Trauma
- Neoplasm/Cyst (see schemes for renal mass)

Lower Tract
(bladder & below)
- Trauma
- Neoplasm
- BPH
- Calculi

Isolated Hematuria with benign sediment
(injury to epithelial side of glomerular capillary wall)
- IgA nephropathy
- Thin GBM disease
- Hereditary nephritis (Alport’s)

Isolated Hematuria with active sediment
(injury to the endothelial side of glomerular capillary wall)
- Anti-GBM antibodies
- Immune-complex deposition (IgA, post-strep, lupus)
- Pauci-immune disease (Granulomatosis with polyangiitis/microscopic polyangiitis)

Hematuria with active sediment and >3.5g/day
(nephrotic range) Proteinuria
(injury to both endothelial and epithelial capillary wall)
- Membranoproliferative glomerulonephritis
- Lupus glomerulonephritis
- Post-Infectious glomerulonephritis
**Hyperkalemia**

Intercellular Shift

- **Hyperkalemia**
  - Serum Potassium > 5.5 mmol/L

- **Reduced Excretion**
  - Transcellular Shift
  - Appropriate renal excretion (GFR, TTKG, distal flow adequate)

- **Increased Intake**
  - (IV potassium with reduced excretion)

- **Increased Release**
  - Increased serum osmoles, increased urate, phosphate, creatinine kinase
  - Non-Anion Gap Metabolic Acidosis
  - Hyperosmolarity
  - Cell Lysis (e.g., Tumor Lysis Syndrome, rhabdomyolysis)

- **Decreased Entry**
  - Decreased Na⁺-H⁺ Exchanger
  - Decreased Na⁺-K⁺-ATPase
  - Insulin Deficiency/Resistance
  - β₂ antagonism
  - α₁ agonism
  - Digoxin

**TTKG** = \( \frac{(K_{\text{Urine}} \times \text{Osm}_{\text{Serum}})}{(K_{\text{Serum}} \times \text{Osm}_{\text{Urine}})} \)

Exclude pseudohyperkalemia

Leukocytosis, thrombocytosis, hemolysis
Hyperkalemia

Reduced Excretion

Hyperkalemia

Serum potassium > 5.5 mmol/L

Exclude pseudohyperkalemia
Leukocytosis, thrombocytosis, hemolysis

Reduced Excretion

Increased Intake
(IV potassium with reduced excretion)

Transcellular Shift

Principal Cell Problem
TTKG < 7

Reduced flow through distal nephron
TTKG > 7, Urine Na < 20meq/L

Decreased Glomerular Filtration Rate
Increased Creatinine

High Renin High Aldosterone

• ENaC blockers
• AIN/CIN
• Obstruction

High Renin Low Aldosterone

• ACEi/ARB
• Adrenal insufficiency
• Heparin

Low Renin Low Aldosterone

• Diabetic nephropathy
• β2 antagonism
• NSAIDs

Exclude pseudohyperkalemia
Leukocytosis, thrombocytosis, hemolysis

TTKG = (K_{Urine} \times Osm_{Serum})/(K_{Serum} \times Osm_{Urine})
Hypokalemia

Serum Potassium < 3.5 mmol/L

Increased Loss

Renal Loss
Urine loss > 20 mmol/d

High distal [K]
TTKG > 4

EABV contracted

• Loop diuretics/
  Bartter’s syndrome
• Thiazide diuretics/
  Gittelman’s syndrome
• Magnesium depletion

Normal or expanded EABV

High renin
High aldosterone

• Renal artery stenosis
• Hyperaldosteronism

Low renin
High aldosterone

Low renin
Low aldosterone

• Licorice intake
• Liddle’s syndrome

Decreased intake
(rare cause in isolation)

GI loss
Urine loss < 20 mmol/d

• Diarrhea
• Vomiting
• NG suction
• Laxatives

Transcellular shift

• Insulin
• β2 agonists
• alkalemia
• Refeeding syndrome
• Rapid hematopoiesis
• Hypothermia
• Thyrotoxic periodic paralysis/familial hypokalemic periodic paralysis

Volume Status Assessment

Low renin
Low aldosterone

Renal artery stenosis

High renin
High aldosterone

• Hyperaldosteronism

Low renin
Low aldosterone

• Licorice intake
• Liddle’s syndrome

High distal flow
TTKG < 4

• Polyuria

High renin
High aldosterone

• Hyperaldosteronism

Low renin
Low aldosterone

• Licorice intake
• Liddle’s syndrome

Normal or expanded EABV

EABV contracted

• Loop diuretics/
  Bartter’s syndrome
• Thiazide diuretics/
  Gittelman’s syndrome
• Magnesium depletion

High distal [K]
TTKG > 4

Renal Loss
Urine loss > 20 mmol/d
Hypernatremia

Hypernatremia
Excess free water loss

Serum Sodium >145 mmol/L

High Urine Volume
>3L/24 hours
Renal water loss

High Urine Osmolality
> 300 mmol/kg
• Hypertonic saline administration
• Osmotic diuresis
  (see Polyuria scheme)
  e.g., mannitol, glucosuria

Low Urine Osmolality
< 300 mmol/kg

Low Urine Volume
<3L/24 hours

Non-renal losses
• Diabetes Insipidus

Hypodipsia
Decreased intake of water
• Decreased level of consciousness
• No access to water

GI loss
• Watery Diarrhea

Insensible loss
• Burns
• ICU patients
• Fever
• Inadequate intake for exercise-related loss
• Hyperventilation
Hyponatremia

Hyponatremia

Serum Sodium <135 mmol/L

Hypo-osmolar plasma
Posm < 280 mmol/kg

Impaired H20 Excretion
- Reduced GFR
- Diuretics

Intact H20 Excretion

Hyper-osmolar urine
Uosm > 100 mmol/kg
ADH expression

Hypo-osmolar urine
Uosm < 100 mmol/kg
ADH suppression

Syndrome of Inappropriate ADH
Euvolemic; no physiologic stimulus to ADH

- Pain/Post-op
- Neurologic trauma
- Drugs
- Pulmonary pathology
- Malignancy

Reduced EABV
Urine [Na+] < 20mmol/L

True hypovolemia
- Bleeding
- GI losses
- Renal losses
  (especially thiazide diuretics)

With edema
- Congestive heart failure
- Cirrhosis
- Nephrotic syndrome
- Reduced GFR
- AKI/CRF

Hormonal changes
- Hypothyroidism
- Adrenal insufficiency
- Pregnancy

* serum sodium correction in hyperglycemia:
  $[Na^+]_{corrected} = [Na^+] + (0.3 \times ([glucose] - 5))$
Hypertension

Hypertension
BP > 140/90 (>130/80 for DM)

Hypertensive urgency or emergency (any visit)
Hypertension with end-organ damage or DM (visit 2)
Diagnosis based on repeat clinic visits, Ambulatory blood pressure monitor, Self/Home pressure monitoring (visit 3+)

Essential (Primary) Hypertension

Secondary Hypertension

Cardiac Output
(Volume dependent)

Systemic Vascular Resistance
(Vasoconstrictive)

Renal Parenchymal Diseases
- Glomerulonephritis
- Nephritic syndrome
- AKI/CKD

Mineralocorticoid Excess
- Conn’s syndrome
- NSAIDs
- Licorice
- Liddle’s syndrome
- Bilateral RAS

Vasoconstrictors
- Sympathetic nervous system (ie. cocaine, pheochromocytoma)
- Steroids (Cushing’s, exogenous steroids)
- Renin-Angiotensin stimulation (OCP)
- Alcohol abuse/ withdrawal

Anatomic Causes
- Aortic coarctation
- Unilateral RAS

Metabolic Causes
- Hyperthyroidism
- Hypercalcemia
- Pheochromocytoma

Consider secondary HTN
- Onset <20yo, >50yo
- No FHx
- Hypertensive urgency
- Refractory hypertension (multi-drug resistance)
Increased Urinary Frequency

Non-increased urine volume (<2mL/min)
Rule out polyuria

Intrinsic to Urinary Tract

Urinary Tract Infection
(See Dysuria scheme)

Urinary Obstruction
- Benign prostatic hyperplasia
- Prostatitis
- Prostate cancer
- Nephrolithiasis

Extrinsic to Urinary Tract

Urinary Obstruction
- Vulvovaginitis
- Bladder compression/Pregnancy

Small volume bladder

Detrusor Hyperactivity
- Overactive Bladder
- Diabetes
- MS
- Irritant drugs: Diuretics, caffeine, alcohol
Nephrolithiasis

Radio-opaque
Calcium-containing
90% of stones

Hard Stones
Calcium oxalate/phosphate
80% of stones
- Increased PTH
- High salt intake
- High protein intake

Soft Stones
Struvite Stones
10% of stones
- Urinary tract infection

Cysteine Stones
Non Calcium containing, but opaque
- Cystinuria

Uric Acid Stones
- Hyperuricosuria
- High protein intake

Hyperoxaluria
- Enteric overproduction
- Low calcium intake
- Dietary
- Ethylene glycol ingestion

Stones with decreased solubility
- Low urine volume
- Hypocitraturia
- RTA type I
- High protein intake

Anatomical problem
- Medullary sponge kidney

Hypercalciuria
- Increased PTH
- High salt intake
- High protein intake

Radiolucent
Non-calcium
10% of stones
Polyuria

Urine Output > 3L/day
Increased Urine Volume (>2ml/min)

Osmotic Diuresis
Urine Osmolality > Serum Osmolality

- Hyperglycemia (uncontrolled Diabetes Mellitus)
- Mannitol administration
- Increased urea concentration (e.g. Recovery from Acute Renal Failure, increased protein feeds, Hypercatabolism [Burns, Steroids], GI Bleed)
- NaCl administration

Water Diuresis
Urine Osmolality < Serum Osmolality

Hypotonic Urine Following Water Deprivation Test
Excessive Loss

Give DDAVP

Uosm Increased by >50%
Proper kidney response

- Central Diabetes Insipidus

Uosm unchanged or increased by <50%
Unresponsive Kidney

- Nephrogenic Diabetes Insipidus
Proteinuria

Persistent Proteinuria

>150mg/d protein present on repeat testing including overnight testing

Tubular Proteinuria
(Negative urine dip = no albuminuria)

Urine Protein Electrophoresis

- Monoclonal protein
- Negative

Overflow

- Multiple Myeloma
- MGUS

Poor reabsorption

- RTA
- Fanconi’s syndrome
- Drugs

Glomerular Proteinuria
(Positive urine dip = albuminuria)

Urine Microscopy

Active urine sediment
WBC/RBC casts

- IgA nephropathy
- Membranoproliferative GN
- Mesangial proliferative
- Anti-GBM antibodies
- Granulomatosis with polyangiitis (GPA)/microscopic polyangiitis (MPA)
- SLE
- HSP
- Post-infectious GN

Bland urine sediment

- FSGS
- Minimal change disease
- Membranous nephropathy
- HTN
- Diabetes
- Protein deposition (e.g., Amyloidosis)

Transient Proteinuria

- Exercise
- Fever
- UTI

Orthostatic Proteinuria

- Tall adolescents
Renal Mass

Solid

Renal Mass

Solid

Benign
- <3 cm in size
- Presence of fat on CT
  - Angiomyolipoma (hamartoma)
  - Oncocytoma
  - Tuberous Sclerosis

Suspicious
- >3 cm in size
  - Renal Cell Carcinoma
  - Wilm’s tumor (nephroblastoma)
  - Metastatic spread to kidneys

Cystic
Renal Mass

Cystic

- Simple Cysts
  - No family history of ADPKD
  - Normal sized kidneys
  - No cysts in other organs

- Polycystic
  - Multiple bilateral cysts
  - Positive family history
  - Enlarged kidneys
  - Cysts in other organs
  - Polycystic Kidney Disease
  - Tuberous Sclerosis
  - Von Hippel-Lindau Syndrome

- Carcinoma
  - No signs of infection
  - Renal Cell Carcinoma

- Abscess
  - Fever and leukocytosis
  - Positive Gallium scan

- Suspicious
  - Septated/Loculated on ultrasound
  - Irregular border on ultrasound/CT
  - Enhancing with CT contrast

- Benign
  - Anechoic on ultrasound
  - Well-demarcated on ultrasound/CT
  - Non-enhancing with CT contrast

- Solid
Scrotal Mass

Painful

Sudden Onset

- Testicular Torsion
- Torsion of the Testicular Appendix
- Trauma
- Incarcerated Hernia

Gradual Onset

- Acute Epididymitis
- Epididymo-orchitis

If with Dysuria see Dysuria scheme

Painless

Trans-illuminates

Trans-illuminates

- Epididymal Cyst
- Spermatocele

Spermatic Cord

- Communicatinghydrocele
- Indirect hernia

Hydrocele

- Communicating/non-communicating
- Traumatic/Reactive

Tumor

- Solid = Tumor until proven otherwise

Varicocele

- Soft/"Bag of Worms"
- Germ cell
  - Seminoma, Teratoma, Mixed
- Non-germ cell

Does Not Trans-illuminates
Suspected Acid-Base Disturbance

Suspected Acid-Base Disorder

Acidemia (pH < 7.35)
- Metabolic Acidosis
  - (HCO₃⁻ < 24mmol/L)
  - CO₂ : HCO₃⁻ 12:10
  - Anion Gap
    - Methanol
    - Uremia
    - Diabetic Ketoacidosis
    - Propylene Glycol
    - Isoniazid
    - Lactic Acidosis
    - Ethylene Glycol
    - Acetylsalicylic Acid

Normal pH
- Respiratory Acidosis
  - (pCO₂ > 40 mmHg)
  - Non-Anion Gap
  - Acute CO₂ : HCO₃⁻ 10:1
  - Chronic CO₂ : HCO₃⁻ 10:3
- Metabolic Alkalosis
  - (HCO₃⁻ > 28mmol/L)
  - CO₂ : HCO₃⁻ 7:10

Alkalemia (pH > 7.45)
- Respiratory Alkalosis
  - (pCO₂ < 35 mmHg)
  - Acute CO₂ : HCO₃⁻ 10:2
  - Chronic CO₂ : HCO₃⁻ 10:4

- Normal Arterial Blood Gas
- Mixed Acid-Base Disorder

Appropriate Compensation: Ratio (CO₂:HCO₃⁻)
- Metabolic Acidosis: 12:10
- Metabolic Alkalosis: 7:10
- Acute Respiratory Acidosis: 10:1
- Chronic Respiratory Acidosis: 10:3
- Acute Respiratory Alkalosis: 10:2
- Chronic Respiratory Alkalosis: 10:4

Anion Gap = Na - (Cl + HCO₃⁻) (normal AG ~12)

Diagnosis of Mixed Metabolic Disorders in Patients with Metabolic Acidosis:
- Anion Gap Not Increased
- Non-Anion Gap Acidosis Alone
- ΔAnion Gap = ΔHCO₃⁻ Acidosis Acidosis Alone
- ΔAnion Gap < ΔHCO₃⁻ Mixed Anion Gap Acidosis + Non-Anion Gap Acidosis
- ΔAnion Gap > ΔHCO₃⁻ Mixed Anion Gap Acidosis + Metabolic Alkalosis
Metabolic Acidosis

Elevated Anion Gap

Need to correct anion gap for albumin: For every drop of 10 for albumin (from 40) add 2.5 to the anion gap

Elevated Anion Gap (>12) (Gain of H+)

- Elevated serum creatinine

- Excess acid addition

- Decreased NH₄⁺ production and anion secretion
  - • AKI/CKD

  - Positive serum salicylate level
  - Salicylate poisoning

  - Elevated serum lactate
  - Lactic acidosis
  - • Shock
  - • Drugs
  - • Inborn errors

  - Positive serum ketones
  - Ketosis
  - • Diabetic ketoacidosis
  - • Starvation/alcoholic ketosis

  - Elevated osmolar gap
  - Toxic alcohol ingestion
  - • Ethylene/Propylene glycol
  - • Methanol

  - Other ingestion
  - • Paraldehyde, Iron, Isoniazid, Toluene, Cyanide

Normal Anion Gap (≤12) (loss of HCO₃⁻)
Metabolic Acidosis

Normal Anion Gap

**Metabolic Acidosis**

Need to correct anion gap for albumin: For every drop of 10 for albumin (from 40) add 2.5 to the anion gap

**Elevated Anion Gap (>14)**
(Acid Gain)

- **GI Tract Loss**
  (Negative urine net charge)
  - Diarrhea
  - Fistula

History of diarrhea?

**Normal Anion Gap (≤14)**
(Loss of Bicarbonate)

**Renal Loss**

**Direct Loss**
Negative U net charge
High $F_{\text{HCO}_3}$
- RTA Type II
- Carbonic anhydrase inhibitor

**Indirect Loss**
Positive U net charge

**Principal Cell Problem**
Low TTKG
- RTA Type IV

**α- Intercalated Cell Problem**
High TTKG
- RTA Type I

TTKG = ($K_{\text{Urine}} \times Osm_{\text{Serum}}$)/(K$_{\text{Serum}} \times Osm_{\text{Urine}}$)

Urine net charge = $U_{Na} + U_{K} - U_{Cl}$

**Principal Cell Problem**
Low TTKG

**α- Intercalated Cell Problem**
High TTKG
Metabolic Alkalosis

Sustained Metabolic Alkalosis

Expanded Effective Arterial Blood Volume
No signs of volume depletion

Contracted Effective Arterial Blood Volume
Signs of volume depletion

Gastrointestinal Loss
Low $U\text{Cl}^-$

- Gastric
  - Vomiting
  - NG suction

- Lower Bowel
  - Villous adenoma
  - Laxative abuse
  - Chloridorrhea

Renal Loss
High $U\text{Cl}^-$

- Non-reabsorbed anions
  - Penicillins

- Impaired tubular transport
  - Diuretics (loop/thiazide)
  - Hypomagnesemia
  - Barrter's/Gitelman's

High Renin
High Aldosterone

- Malignant Hypertension
- Renovascular Hypertension
- Renin-Secreting Tumor

Low Renin
High Aldosterone

- Aldosterone-secreting mass
- Adrenal hyperplasia
- Glucocorticoid remediable aldosteronism

Low Renin
Low Aldosterone

- Licorice
- Liddle's Syndrome
- Enzyme deficiency

Renal Failure with Ingestion

- Milk-Alkali syndrome
- Bicarbonate ingestion

Rule Out

- IV Bicarbonate
- Acute correction of hypercapnia

Transient

Volume Status Assessment
Urinary Incontinence

Transient
Easily reversible cause
- Delirium/confusional states
- Infection (UTI)
- Atrophic urethritis/vaginitis
- Pharmaceuticals
- Psychological/psychiatric
- Excessive urine output
- Restricted mobility
- Stool impaction

Overflow Incontinence
Distended bladder with high post-void residual volume
Continuous small volume leakage
+/- Precipitated by stress maneuvers

Urge Incontinence
Detrusor overactivity
Abrupt urgency
Moderate to large leakage of urine
Precipitated by cold temperature & running water

Stress Incontinence
Failure of urethral sphincter to remain closed
Small Volume
Precipitated by stress maneuvers
More common in multiparous women

Impaired Detrusor Contraction
Signs of autonomic neuropathy or spinal cord disease, cauda equina syndrome, anticholinergic medications

Established
Not easily reversible cause

Bladder Outlet Obstruction
Urinary Tract Obstruction

**Upper Tract**
- Bladder NOT distended on ultrasound
- Hematuria, flank pain, +/- N/V

**Lower Tract**
- Distended bladder on ultrasound
- Urgency, frequency, hesitancy, nocturia

**CT KUB**

**Intraluminal**
- Retroperitoneal Fibrosis
- Cancer

**Extraluminal**
- Ureteropelvic junction obstruction

**Intramural**
- Carcinoma (until proven otherwise)
- Bladder stone
- Thrombus (frank hematuria)

**Mass**
- Urothelial cell carcinoma
- Squamous cell carcinoma

**Stone**
- Calcium oxalate
- Calcium phosphate
- Uric acid [radiolucent on x-ray]
- Struvite
- Cysteine

**Bladder**
- BPH
- Prostate cancer
- Urethral stricture
- Posterior Urethral valves

**Outflow Tract**
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Abnormal Lipid Profile

Combined & Decreased HDL

Abnormal Serum Lipid Profile

- Increased LDL
- Increased Triglycerides
- Increased Cholesterol and Triglycerides
- Decreased HDL

Genetic Causes
- Familial Combined Hyperlipidemia
- Familial Dysbetalipoproteinemia

Secondary Causes
- Nephrotic Syndrome
- Drugs
- Diabetes
- Hypothyroidism

Genetic Causes
- Apo-A1 Deficiency/Variant
- Tangier Disease
- LCAT Deficiency
- Primary Hypoalphalipoproteinemia

Secondary Causes
- Sedentary Lifestyle
- Smoking
- Androgens

Physical signs:
- Hypertriglyceridemia: eruptive xanthoma, lipemia retinalis
- Increased IDL: palmar crease xanthoma, tuberous xanthoma
- Increased LDL: tendon xanthomata on Achilles tendon, knuckles
Abnormal Lipid Profile
Increased LDL & Increased Triglycerides

Abnormal Serum Lipid Profile

Increased LDL
- Genetic Causes
  - Polygenic
  - Hypercholesterolemia
  - Familial Hypercholesterolemia
  - Familial Defective ApoB-100
  - LDLr deficiency
- Secondary Causes
  - Hypothyroid
  - Obstructive Liver Disease
  - Nephrotic Syndrome

Increased Triglycerides
- Genetic Causes
  - Familial Hypertriglyceridemia
  - Familial LPL Deficiency
  - Apo-CII Deficiency
- Secondary Causes
  - Diabetes
  - Alcohol
  - Increased Estrogen (e.g. Pregnancy, Hormone Replacement Therapy, Oral Contraceptive)

Increased Cholesterol and Triglycerides
- Genetic Causes

Decreased HDL
- Secondary Causes

Physical signs:
- Hypertriglyceridemia: eruptive xanthoma, lipemia retinalis
- Increased LDL: palmar crease xanthoma, tuberous xanthoma
- Increased LDL: tendon xanthomata on Achilles tendon, knuckles
Abnormal Serum TSH

Decreased TSH
- Decreased Free T4
  - Hypopituitarism
- Normal Free T4
- Increased Free T4
  - Thyrotoxicosis

Increased TSH
- Decreased Free T4
  - Hypothyroidism*
- Normal Free T4
  - Sub-clinical Hypothyroidism**
  - Recovery from Non- Thyroid Illness
- Increased Free T4
  - T3 Toxicosis

*Refer to Hyperthyroidism (1) on page 150
**Refer to Hyperthyroidism (2) on page 151
Adrenal Mass

Benign

**Benign Adrenal Mass**

Most common neoplasm is Benign Non-Functioning Adenoma

---

**Signs of Hormone Excess**

- **Hyperplasia**
  - Often Bilateral
  - • Congenital Adrenal Hyperplasia
  - • ACTH Dependent
  - • ACTH Independent
  - • Macronodular Hyperplasia

- **Androgen Excess**
  - Virilization/ Hirsutism
  - • Estrogen Releasing Adenoma (High Plasma E₂ + Clinical Picture)

- **Estrogen Excess**
  - Feminization, Early Puberty, Heavy Menses
  - • Glucocorticoid Releasing Adenoma (Positive Dexamethasone Suppression Test)

- **Glucocorticoid Excess**
  - Cushingoid Features
  - • Aldosterone Releasing Adenoma (High Aldosterone: Renin Ratio)

- **Aldosterone Excess**
  - Hypertension +/- Hypokalemia/Alkalosis
  - • Pheochromocytoma (Paroxysmal Hypertension, Headache, Diaphoresis, Palpitations, Anxiety)
  - • Other Source (e.g. Polycystic Ovarian Syndrome, Congenital Adrenal Hyperplasia)

- **Silent/Non-Functioning Mass**
  - • Non-functioning Adenoma
  - • Lipoma
  - • Myelolipoma
  - • Ganglioneuroma

- **Rule of 10’s For Pheochromocytoma:**
  - 10% are Malignant
  - 10% are Bilateral
  - 10% are Extra-Adrenal
  - 10% are Familial
  - 10% are not Associated with Hypertension

---

**Normal DHEAS**

- • Other Source (e.g. Polycystic Ovarian Syndrome, Congenital Adrenal Hyperplasia)

---

**Other**

- • Cyst
- • Pseudocyst
- • Hematoma
- • Infection (TB, Fungal)
- • Amyloidosis
Adrenal Mass

Malignant

Malignant Adrenal Mass

Suggestive of Malignancy: Inhomogenous Density, Delay in CT Contrast Washout (<50% in 10 minutes), Irregular Shape, Diameter >4cm, Calcification, >20 Hounsfield Units on CT, Vascularity of Mass, Hypointense to Liver on T1 Weighted MRI – DO NOT Biopsy

Signs of Hormone Excess

Androgen Excess
Virilization/ Hirsutism

Estrogen Excess
Feminization, Early Puberty, Heavy Menses

Glucocorticoid Excess
Cushingoid Features

Aldosterone Excess
Hypertension +/- Hypokalemia/Alkalosis

Positive 24-Hour Metanephrines + Nor-Metanephrines

Silent/Non-Functioning Mass

Normal DHEAS
• Other Source (e.g. Polycystic Ovarian Syndrome, Congenital Adrenal Hyperplasia)

High DHEAS
• Androgen Releasing Carcinoma (e.g. Adrenocortical Carcinoma)

No Signs of Hormone Excess

Positive 24-Hour Metanephrines + Nor-Metanephrines

Silent/Non-Functioning Mass

Lymphoma Metastases (Often Bilateral) Adrenal Carcinoma

Rule of 10’s For Pheochromocytoma:
10% are Malignant
10% are Bilateral
10% are Extra-Adrenal
10% are Familial
10% are not Associated with Hypertension
Amenorrhea

Rule Out Pregnancy

Low/Normal FSH

Bleed With Progestin Challenge

- Polycystic Ovarian Syndrome

Hypothalamic-Pituitary Axis

No Bleed With Progestin Challenge

- Hyperprolactinemia
- Infiltrative or Inflammatory Lesion
- Tumors
- Infarction
- Empty Sella Syndrome
- Apoplexy

Organic Cause

Failed Progestin Challenge

- Congenital GnRH Deficiency
- Exogenous Androgen Use
- Congenital Structural Abnormalities
- Functional
- Hypothalamic
- Amenorrhea (e.g., Weight Loss, Eating Disorders, Exercise, Stress, Prolonged Illness)

Elevated FSH

- Premature Ovarian Failure
- Menopause
- Spontaneous

If bleed with progestin challenge = estrogenized
If no bleed with progestin challenge = non-estrogenized
Breast Discharge

- **True Galactorrhea** (on microscopy)

  - Abnormal TSH/ Prolactin
    - High Prolactin + Normal TSH
      - Microprolactinoma
      - Steroid Hormone Intake
      - Chronic Renal Failure
      - Stress (e.g. Pregnancy, Breast Stimulation, Trauma/Surgery)
    - High Prolactin + Normal/ Low TSH
      - Pituitary Macroadenoma
      - Dopamine Inhibition
      - Pituitary Stalk Compression/Lesion
    - Autonomous Production
      - Renal Cancer or Failure
      - Lactotroph Adenoma
      - Bronchogenic Tumor
      - Contraceptive Pill/Patch/Ring
  - Normal TSH/ Prolactin
    - Idiopathic

- **Other Breast Discharge**
  - Neoplasm (usually blood)
  - Other Internal Breast Discharge

- Other Breast Discharge
Gynecomastia

Increased Estrogen & Increased HCG

Gynecomastia

True Gynecomastia

Pseudogynecomastia
  Fat Deposition Only

Physiologic
  • Newborns
  • Pubescent/Adolescent
  • Elderly

Normal Blood Work
  • Idiopathic

Increased Estrogen

Increased HCG

Increased LH

Decreased Testosterone & Normal/Low LH

No Testicular Mass on Ultrasound
  • Adrenal Neoplasm
  • Increased Extraglomerular Aromatase Activity
  • Liver Disease

Testicular Mass on Ultrasound
  • Leydig Cell Tumor
  • Sertoli Cell Tumor

No Testicular Mass on Ultrasound

Testicular Mass on Ultrasound
  • Extragonadal Germ Cell Tumor
  • HCG Secreting Non-Trophoblastic Neoplasm
  • Testicular Germ Cell Tumor
Gynecomastia

Increased LH & Decreased Testosterone

True Gynecomastia

- Normal Blood Work

- Increased Estrogen

Increased Testosterone

- Testicular Germ Cell Tumor
- Hyperthyroidism

Increased T4, Decreased TSH

- Androgen Resistance

Normal T4 and TSH

Pseudogynecomastia

- Fat Deposition Only

Increased HCG

Decreased Testosterone

- Hypogonadism
- Klinefelter’s Syndrome
- Kallman’s Syndrome
- Testicular Torsion
- Testicular Trauma
- Congenital Anorchia
- Viral Orchitis

- Prolactin Secreting Tumor

Increased Prolactin

- Non-Tumor Secondary Hypogonadism

Normal Prolactin

Physiologic

- Newborns
- Pubescent Adolescent
- Elderly

Increased LH

Decreased Testosterone & Normal/Low LH

- Normal Blood Work

Endocrinology
Hirsutism

Rule Out Virilization

Rapid Onset

Medications
- Steroids
- Danazol
- Progestin
- Containing Contraceptives

Increased Serum Testosterone
- Ovarian Neoplasm
- Hypertrichosis

Increased Serum DHEAS
- Adrenal Neoplasm

Slow Onset

Regular Menstrual Cycles
- Familial
- Idiopathic
- Ethnic Background

Irregular Menstrual Cycles
- Polycystic Ovarian Syndrome
- Cushing’s Syndrome
- 21-OH Congenital Adrenal Hyperplasia

Endocrinology
Hirsutism & Virilization

Androgen Excess

Hirsutism & Virilization

Androgen Excess
Normally With Menstrual Irregularity

Hypertrichosis
Non-Androgen Distribution

Ovarian
- Polycystic Ovarian Syndrome
- Hyperthecosis
- Tumor

Adrenal
- Congenital Adrenal Hyperplasia
- Cushing’s Syndrome Tumor

Low Serum Hormone Binding Globulin
- Obesity
- Liver Disease
- Insulin Resistance Syndrome

Medications
- Testosterone
- DHEA
- Danazol

Idiopathic Hirsutism
Normal Cycles and Androgen Levels
Hirsutism & Virilization

Hypertrichosis

Androgen Excess
Normally With Menstrual Irregularity

Hypertrichosis
Non-Androgen Distribution

Medications

• Phenytoin
• Cyclosporine
• Minoxidil
• Penicillamine
• Diazoxide

Medical/Other

• Hypothyroidism
• Anorexia Nervosa
• Malnutrition
• Porphyria
• Dermatomyositis
• Paraneoplastic Syndrome
• Familial
• Idiopathic
Hypercalcemia

Low PTH

Hypercalcemia
Total Calcium > 2.55 mmol/L; Ionized Calcium > 1.30 mmol/L

Measure In Fasting State

Normal/High PTH

Drug Side Effects
- Thiazide Diuretics
- Lithium
- Vitamin A/Isotretinoin

Low PTH

Malignancy
- PTH-Related Peptide (e.g. Breast, Kidney, Lung)
- Cytokine-Mediated Bone Resorption (e.g. Multiple Myeloma, Lymphomas)
- Metastatic Bone Disease

Vitamin D Related
- Excess Vitamin D/Calcitriol Intake
- Unregulated Conversion of 25-OH D3 to 1,25-(OH)2D3 (e.g. Granulomatous Disease, Lymphoma)

Other
- Excess Calcium Intake (e.g. Milk Alkali)
- Immobilization
- Adrenal Insufficiency
- Thyrotoxicosis
- Paget’s Disease

Corrected total serum calcium concentration (mmol/L) = measured total serum calcium concentration (mmol/L) + 0.02[40 g/L – albumin(g/L)]
Hypercalcemia

Total > 2.55 mmol/L; Ionized Calcium > 1.30 mmol/L

Measure In Fasting State

Normal/High PTH
- Adenoma
- Hyperplasia
- MEN 1 and 2A

Drug Side Effects
- Thiazide Diuretics
- Lithium
- Vitamin A/Isotretinoin

Low PTH

Primary Hyperparathyroidism

Tertiary Hyperparathyroidism
- Hypercalcemia (in the setting of long-standing secondary hyperparathyroidism) (e.g. Renal Failure, Post-Renal Transplant)

Familial Hypocalciuria Hypercalcemia
- Autosomal Dominant Calcium Receptor Mutation (CaSR)
- Other Familial Hypercalcemias (e.g. MEN)

Corrected total serum calcium concentration (mmol/L) = measured total serum calcium concentration (mmol/L) + 0.02[40 g/L – albumin(g/L)]
Hypocalcemia
High Phosphate

Hypocalcemia
Total Corrected Serum Calcium < 2.10 mmol/L

Low Phosphate
- Normal Creatinine
  - Low/Normal PTH
    - Hypoparathyroidism (e.g. Acquired, Autoimmune, Idiopathic, Congenital, Infiltrative)
    - Activating Mutation in Calcium Sensing Receptor (CaSR)
    - Hypomagnesemia
  - High PTH
    - PTH Resistance (Pseudo-hypoparathyroidism)
    - Calcium Complexing
      - (Citrate Infusion, Pancreatitis)

High Phosphate
- High Creatinine
  - Low PTH
    - Hypoparathyroidism with Chronic Kidney Disease
  - High PTH
    - Secondary Hyperparathyroidism
    - Rhabdomyolysis
    - Phosphate Poisoning

Corrected total serum calcium concentration (mmol/L) = measured total serum calcium concentration (mmol/L) + 0.02(40 g/L – albumin(g/L))
Hypocalcemia

Total Corrected Serum Calcium < 2.10 mmol/L

Low Phosphate

Low/Normal PTH
- Severe Malnutrition with Hypomagnesemia

High PTH
- Vitamin D Deficiency (e.g. Diet, Malabsorption, Phenytoin, Nephrotic Syndrome, Hepatobiliary Disease)
- Hereditary Vitamin D Resistance
- 1-α-Hydroxylase Deficiency

High Phosphate

Corrected total serum calcium concentration (mmol/L) = measured total serum calcium concentration (mmol/L) + 0.02(40 g/L – albumin[g/L])
Hypocalcemia
High / Low PTH

Hypocalcemia
Total Corrected Serum Calcium < 2.10 mmol/L

Low PTH
Hypoparathyroidism

Congenital (Pediatric)
- Ca-S-R
- DiGeorge

Acquired
- Post-operative neck
- Radiation
- Infiltrative disease
- Autoimmune polyendocrinopathy
- Hypomagnesemia

High PTH

25-OH D very low
- Malabsorption
- Short gut
- Gastric bypass
- Liver disease
- Increased Vit-D degradation (eg. anti-convulsants)

25-OH D not very low
- Chronic Renal Failure
- Severe hyperphosphatemia (eg. Tumor lysis syndrome, rhabdomyolysis, oral phosphate abuse/laxatives)

Corrected total serum calcium concentration (mmol/L) = measured total serum calcium concentration (mmol/L) + 0.02[40 g/L – albumin(g/L)]
Hyperglycemia

(> 6 mmol/L)

Diabetes Mellitus
- Impaired Glucose Tolerance
- Type 1 Diabetes
- Type 2 Diabetes
- Gestational Diabetes

Endocrinopathy
- Cushing’s Syndrome
- Acromegaly

Medications
- Corticosteroids
- Thiazide diuretics
- β agonists
- Others

Critical Illness/Physiologic Stress
- Stress Hyperglycemia (e.g. Trauma, Surgery, Burns, Sepsis)
- Shock
- Acute Pancreatitis
- Post-Stroke
- Post Myocardial Infarction

Signs/Symptoms of Hyperglycemia:
- Polyphagia, polydipsia, polyuria, blurred vision, fatigue and weight loss
Hypoglycemia

Hypoglycemia
(< 4 mmol/L)

Fasting Hypoglycemia
- Excess Insulin
- Medications (e.g. Insulin Secretagogues, β-Adrenergic Antagonists, Quinine, Salicylates, Pentamidine)
- Alcohol

Post-Prandial
(Reactive)
- Alimentary (e.g. in the setting of Gastric Surgery)
- Congenital Enzyme Deficiencies
- Idiopathic

Other Causes
- Critical Illness (e.g. Hepatic Failure, Renal Failure, Cardiac Failure)
- Sepsis
- Hypopituitarism
- Adrenal Insufficiency
- Hyperinsulinemic States (e.g. Glucagon, Catecholamine Deficiency, Insulinoma)
- Malnutrition/Anorexia Nervosa

Signs/Symptoms of Hypoglycemia:
- Neurogenic: irritability, tremor, anxiety, palpitations, tachycardia, sweating, pallor, paresthesias
- Neuroglycopenia: confusion, lethargy, abnormal behaviour, amnesia, weakness, blurred vision, seizures
Hyperphosphatemia

(> 1.46 mmol/L)

- **Transcellular Shift**
  - Rhabdomyolysis
  - Tumor Lysis
  - Metabolic or Respiratory Acidosis
  - Insulin Deficiency

- **Decreased Excretion**
  - $FE_{PO4} < 20\%$
  - Renal Disease
  - Hypoparathyroidism
  - Pseudo-hypoparathyroidism
  - Acromegaly
  - Bisphosphonate Therapy

- **Increased Intake/Absorption**
  - Hypervitaminosis D
  - Phosphate Supplementation
  - Phosphate Containing Enemas/Laxatives

- **Pseudo-hyperphosphatemia**
  - Multiple Myeloma
  - Hyperbilirubinemia
  - Hemolysis
  - Hyperlipidemia
  - Tumor Lysis

Normally in Context of Impaired Renal Function
Hypophosphatemia

**Hypophosphatemia**

(< 0.8 mmol/L)

- Transcellular Shift
  - Recovery From DKA
  - Refeeding Syndrome
  - Acute Respiratory Alkalosis
  - Hypokalemia
  - Hypomagnesemia
  - Burns

- Increased Excretion
  - GI
    - Small bowel diarrhea
    - Enteric Fistula
  - Renal
    - FePO4 > 5%
      - Hyperparathyroidism
      - Vitamin D Deficiency/Resistance
      - Hypophosphatemic Rickets
      - Oncogenic Osteomalacia
      - Fanconi Syndrome
      - Osmotic Diuresis
      - Acute Volume Expansion
      - Acetazolamide and Thiazide Diuretics

- Decreased Intake
  - Dietary deficiency
    - Anorexia
    - Chronic Alcoholism
  - Malabsorption
    - Aluminum/Magnesium Containing Antacids
    - Inflammatory Bowel Disease
    - Steatorrhea
    - Chronic Diarrhea

- GI
- Renal
- Dietary deficiency
- Malabsorption
Hyperthyroidism

High/Normal Radioiodine Uptake

- Autoimmune Thyroid Disease
  - Grave’s Disease
  - Positive anti-TSH Receptor Antibody
- Autonomous Thyroid Tissue
  - Toxic Adenoma
  - Toxic Multinodular Goiter
- TSH/HCG Excess
  - TSH-Secreting Pituitary Adenoma
  - Gestational Trophoblastic Neoplasm

Low Radioiodine Uptake

- Subacute Thyroiditis
  - Granulomatous
  - Lymphocytic
  - Postpartum
  - Amiodarone
  - Radiation
- Exogenous/Ectopic Hormone
  - Excessive Thyroid Drug
  - Struma Ovarii
Hypothyroidism

- Central Hypothyroidism
  - Isolated TSH Deficiency
  - Panhypopituitarism

- Primary Hypothyroidism

- Thyroid Hormone Resistance

- Iatrogenic

- Chronic

- Transient
  - Subacute Lymphocytic/Granulomatous
  - Thyroiditis
  - Post-Partum Thyroiditis
  - Subtotal Thyroidectomy

- Infiltrative Disease
  - Fibrous Thyroiditis
  - Hemosiderosis

- Congenital Thyroid Agenesis/Degeneration
  - Severe Iodine Deficiency

- Medications
  - Thionamides
  - Lithium
  - Amiodarone
  - Interferon

- Central Hypothyroidism
  - Hashimoto’s Thyroiditis
Male Sexual Dysfunction

Establish Dysfunction in Context: Partner Showing Less Desire is not Necessarily Impaired
Global Dysfunction is likely Organic Cause
Situational Impairment Most Likely Psychological

Erectile Dysfunction

Psychological
• Performance Anxiety
• Lack of Sensate
• Focus
• Mood Disorder
• Anxiety Disorder
• Stress
• Guilt
• Interpersonal Issues

Physiological
• Anti-hypertensives
• Anti-depressants
• Diuretics
• Benzodiazepines
• Alcohol
• Sympathomimetic Drugs (e.g. Cocaine, Amphetamines)

Pharmacological
• Hypo-testosteronism
• Prolactinemia
• Hyper-estrogenism
• Hypothyroidism
• Hyperthyroidism
• Chronic Pain

Psychological
• Mood Disorders
• Anxiety Disorders
• Guilt
• Stress
• Interpersonal Issues (e.g. Lack of trust in partner)
• Psychosis/Delusions
• Previous psycho-social trauma
• (e.g. Abuse)

Psychological

Desire Reduced/Absent

Physiological
• Anti-depressants
• Narcotics
• Anti-psychotics
• Anti-androgens
• Alcohol
• Benzodiazepines
• Hallucinogens

Pharmacological

Neurological
• Stroke
• Spinal Cord Injury
• Multiple Sclerosis
• Dementia
• Polyneuropathy

Physiological
• Hypo-testosteronism
• Prolactinemia
• Hypothyroidism
• Hyperthyroidism

Pelvis
• Trauma
• Pelvic Surgery
• Prostate Surgery
• Priapism
• Infection
• Bicycling

Other
• Hypertension
• Dyspareunia
• Dialysis

Chronic Disease
• Diabetes
• Cardiovascular Disease
• Peyronie’s
• Connective Tissue Disease

Pelvis
• Trauma
• Pelvic Surgery
• Prostate Surgery
• Priapism
• Infection
• Bicycling

Pelvis
• Hypertension
• Dyspareunia
• Dialysis

Other

Endocrinology
Sellar / Pituitary Mass

Adenoma
Primarily Anterior Pituitary

Hyperplasia

Non-Adenomatous

Inflammatory

Secreting

Non-Functioning

Vascular

Hamartoma

Neoplasm

Metastatic

- Prolactin
- GH
- ACTH
- TSH
- LH/FSH
- Mixed

- Oncocytoma
- Null Cell Adenoma

- Aneurysm
- Infarction

- Craniopharyngioma
- Meningioma
- Cyst
- Glioma
- Ependymoma

- Physiological (e.g. Pregnancy)
- Compensation (e.g. Hypothyroidism)
- Stimulatory (e.g. Ectopic GNRH, CRH)
- Infectious
- Autoimmune
- Giant Cell Granuloma
- Langerhan’s Cell
- Histiocytosis
- Sarcoidosis
Sellar / Pituitary Mass

Size

- Small (<1cm)
  - Hypersecretion
- Large (>1cm)
  - Hypersecretion
  - Hypossecretion
- Other
Short Stature

<3rd Percentile
Detailed History, Physical Exam, and Mid-Parental Target Height

Pathological/Abnormal

Disproportionate
- Skeletal Dysplasias
- (e.g. Achondroplasia)
- Rickets

Proportionate

Normal Puberty Onset (BA=CA)
- Familial Short Stature

Delayed Puberty Onset (BA<CA)
- Constitutional Short Stature (Late Bloomer)

No Dysmorphic Features

Dysmorphic Features
- Trisomy 21
- Noonan Syndrome
- Prader-Willi Syndrome
- Russell-Silver Syndrome
- Turner Syndrome

Short Stature

Deprivation
- Primary Malnutrition
- Psychosocial
- Deprivation

Endocrine
- Cushing’s Disease
- GH Deficiency
- IGF-1 Deficiency (e.g. Laron Dwarfism)
- Hypothyroidism
- Congenital Adrenal Hyperplasia
- Panhypopituitarism

Treatment
- Glucocorticoids
- Radiation
- Chemotherapy
- Bone Marrow Transplant

Chronic Disease
- GI (e.g. Celiac, IBD)
- Renal (e.g. CRF)
- Infection (e.g. Chronic UTI)
- Cardiopulmonary (e.g. Cystic Fibrosis, CHF)
- Inborn Metabolism Error
- Immunologic

Other
- Intrauterine Growth Retardation
- Bulimia Nervosa
- Anorexia Nervosa
- CNS Tumors (e.g. Craniopharyngioma)
Tall Stature

> 97th Percentile
Detailed History, Physical Exam, and Mid-Parental Target Height

No Other Obvious Abnormalities/Stigmata

- Normal Growth (BA=CA)
  - Familial Tall Stature
  - XYY Syndrome

- Non-Obese BMI
  - Early Puberty Onset
    - GH Excess
    - Hyperthyroidism

- Precocious Puberty
  - Adrenal Tumor
  - Ovarian Tumor
  - Testotoxicosis
  - Congenital Adrenal Hyperplasia

- Constitutional Tall Stature (Early Bloomer)

Accelerated Growth (BA>CA)

- Obese BMI
  - Exogenous Obesity

• Constitutional
  • Constitutional Tall Stature (Early Bloomer)

Other Obvious Abnormalities/Stigmata

- Disproportionate
  • Klinefelter’s Syndrome (XXY)
  • Soto’s Syndrome/Cerebral Gigantism
  • Marfan’s Syndrome
  • Homocystinuria
  • Sex Steroid Deficiency/Resistance
  • Acromegaly (Rare in Children)

• Bechwith-Weidmann Syndrome (Normalizing growth after birth)
  • Weaver Syndrome
  • XYY Syndrome
  • Neurofibromatosis 1
  • Hyperthyroidism (Untreated/Severe)

- Proportionate
Weight Gain / Obesity

Energy Related (Primary)

- Increased Intake
  - Sedentary Lifestyle
  - Smoking Cessation

- Decreased Expenditure

- Neuroendocrine
  - Polycystic Ovarian Syndrome
  - Hypothyroid
  - Cushing’s Syndrome
  - Hypogonadism
  - GH Deficiency
  - Hypothalamic Obesity

- Genetic
  - Autosomal Dominant
  - Autosomal Recessive
  - X-Linked
  - Chromosomal Abnormality

- Dietary
  - Progressive
  - Polyphagia
  - High-Fat Diet

- Social/Behavioural
  - Socioeconomic
  - Ethnicity
  - Psychological

- Iatrogenic
  - Drugs/Hormones
  - Tube Feeding
  - Hypothalamic Surgery
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Altered Level of Consciousness

Approach

Glasgow Coma Scale Score:
- 12-15 = Investigate
- 8-12 = Urgent Investigation
- ≤ 7 = Resuscitate + Investigate
- Rapidly Deteriorating = Resuscitate + Investigate

Clinical Exam
- Focal
  - Trauma
  - Stroke
  - Tumor
  - Hemorrhage
  - See Imaging Section
- Non-Focal
  - Refer to Blood Work and Imaging Sections

Blood Work
- Metabolic Abnormality
  - Hypoxia
  - Hypercapnea
  - Hyper/HypoNa
  - Hyper/HypoCa
  - Hyper/HypoK
  - Sepsis
- No Metabolic Abnormality
  - Postictal
  - Concussion
  - Meningitis
  - Encephalitis

Imaging
- Structural Abnormality
  - Epidural Hemorrhage
  - Subdural Hemorrhage
  - Intracranial Hemorrhage
  - Ischemia
  - Tumor
- Non-Structural
  - Post-Ictal
  - Concussion
  - Encephalitis
Altered Level of Consciousness

GCS ≤ 7

Altered LOC GCS ≤ 7

Brain Involvement

Focal Lesions
- Hemispheric
  - Hemorrhage
  - Traumatic
  - Ischemia/Infarction
  - Neoplastic Abscess
  - Skull fracture
  - Subdural hematoma
  - Intracranial Bleeding

Brain Stem
- Hemorrhage
- Traumatic
- Ischemia/Infarction
- Neoplastic Abscess
- Herniation
- Brain stem Lesion

Vascular
- Hypertensive encephalopathy
- Vasculitis
- TTP
- DIC
- Hypoxemia
- Multiple emboli

Infection
- Meningitis
- Encephalitis

Other
- Trauma/Concussion
- Post-ictal

Systemic Involvement

Excesses
- Liver/Renal Failure
- Carbon Dioxide Narcosis
- Metabolic Acidosis
- Hypernatremia
- Hypercalcemia
- Hypermagnesemia
- Hyperthermia
- Thyroid Storm

Deficiencies
- Hypoxemia
- Hypoglycemia
- B12/Thiamine deficiency
- Hyponatremia
- Hypocalcemia
- Hypomagnesemia
- Hypothermia
- Myxedema Coma

Drugs/Toxins
- Alcohols
- Barbituates
- Tranquilizers
- Other

*NB – must be direct or indirect bi-hemispheric involvement
Aphasia

Fluent

**Aphasia**

- **Fluent**: Grammatically correct, but nonsensical, tangential. Phonemic & semantic paraphasias
- **Non-Fluent**: Agrammatic, hesitant, but substantive communication

- **Impaired Repetition**
  - Impaired Comprehension: Wernicke’s Aphasia
  - Intact Comprehension: Conduction Aphasia

- **Intact Repetition**
  - Impaired Comprehension: Transcortical Sensory Aphasia
  - Intact Comprehension: Anomic Aphasia
Aphasia

Non-Fluent

Fluent
Grammatically correct, but nonsensical, tangential. Phonemic & semantic paraphasias

Impaired Repetition

Impaired Comprehension
- Global Aphasia

Intact Comprehension
- Broca’s Aphasia

Intact Repetition

Impaired Comprehension
- Mixed Transcortical Aphasia

Intact Comprehension
- Transcortical Motor Aphasia

Non-Fluent
Agrammatic, hesitant, but substantive communication
Back Pain

Always assess for red flags.
If no red flags, assess after 6 weeks

Acute/Subacute + Red Flags < 6 weeks
- Fracture
- Tumor/Infection
- Cauda Equina Syndrome
- Unresolved Radicular Symptoms

Chronic/Acute After 6 weeks + No Red Flags > 6 weeks
- Myelopathic
- Spondyloarthropathies or Osteoarthritis

Red Flags: bowel or bladder dysfunction, saddle paresthesia, constitutional symptoms, parasthesia, age >50, <18, IV drug use, neuromotor deficits, nocturnal pain, high energy trauma, past history of neoplasm
Cognitive Impairment

Dementia

Subcortical Dementia

- Treatable Cause
  - Normal Pressure Hydrocephalus
  - Chronic Meningitis
  - Chronic Drug Abuse
  - Tumor
  - Subdural Hematoma
  - B12 deficiency
  - Hypothyroidism
  - Hypoglycemia

- Early Extrapyramidal Features
  - Parkinson’s Disease with Dementia
  - Huntington’s Disease

- Rapidly Progressive
  - Creutzfeldt-Jakob Disease
  - Paraneoplastic disorder

Cortical Dementia

- Early Language and Behavioral Dysfunction
  - Fronto-temporal Dementia

- Abrupt Onset, Stepwise Progression
  - Vascular Dementia

- Early Impairment of Recent Memory
  - Alzheimer’s Dementia

- Early Extrapyramidal Features
  - Dementia with Lewy Bodies
Dysarthria

**Lower Motor Neuron**
- Slow, Low Volume, Breathy Speech
- Tongue and Facial Atrophy
- Fasciculations

**Upper Motor Neuron**
- Slow, strangulated, harsh voice
- Positive jaw jerk, hyperactive gag reflex. Emotional lability

**Ataxic (Cerebellar)**
- Irregular Rhythm and Pitch

**Extra-Pyramidal**
- Rapid, Low Volume, Monotone Speech

- Motor Neuron Disease
- Lesions of Cranial Nerves VII, IX, X, XII
- Myasthenia Gravis
- Muscular Dystrophy

- Bilateral Lacunar Internal Capsule Strokes
- Multiple Sclerosis
- Amyotrophic Lateral Sclerosis

- Spinal-Cerebellar Ataxia
- Multiple Sclerosis
- Alcohol
- Tumour
- Paraneoplastic Disorder

- Parkinson’s Disease
Falls in the Elderly

Falls Normally is a combination of multiple factors

- Intrinsic Factors
  - Presyncope/Syncope
    - Cardiac
    - Non-Cardiac
  - Sensory Impairments
    - Vision
    - Vestibular
    - Neuropathy
    - Proprioception
  - Neurological Psychiatric
    - Stroke
    - Parkinsonism
    - Cognition
    - Depression
    - Other
  - Performance Measures
    - Weakness
    - Decreased Balance
    - Gait Abnormalities
- Extrinsic Factors
  - Musculo-skeletal
    - Arthritis
  - Drugs
    - Polypharmacy – esp. >4 medications
    - Psychotropics
  - Environment
    - Rugs
    - Stairs
    - Lighting
Gait Disturbance

Movement Disorder

Sporadic
- Vascular
- Infection
- Toxic
- Nutrition
- Metabolic
- Inflammation
- Neoplasm
- Degenerative

Hereditary

Cerebellar Ataxia
- Progressive/ Degenerative
  - X-Linked/ Mitochondrial
    - Fragile X
  - Dominant
    - Spinocerebellar Ataxia
  - Recessive
    - Friedrich’s Ataxia
    - Telangiectasia
  - Intermittent
    - Hyperammonemia
    - Aminoaciduria
    - Pyruvate/Lactic Acid
  - Chronic Progressive
    - Tay-Sachs Disease
    - Niemann-Pick Disease

Sensory Ataxia
- Vestibular
- Visual
- Proprioceptive

See Movement Disorder schemes
Headache

Primary

Secondary

Usually episodic

Usually constant

No pattern

Other

In Clusters

Unilateral

• Migraine
  (Throbbing/Pulsating)

• Tension/Stress Headache
  (Tightening, Band-Like, Dull)

Bilateral

Autonomic Cephalgias

• Cluster Headache
  (Orbital, Sharp, Autonomic Dysfunction)
  • Hemicranial Continua

• Trigeminal Neuralgia
  (Shooting, stabbing)

Other

Last for seconds, separated by minutes to hours

Last for minutes to hours. Separated by hours. Sudden onset.

• Primary Cough Headache
• Primary Exertional Headache
• Primary Stabbing Headache

Other

Last for seconds, separated by minutes to hours

• Tension/Stress Headache
  (Tightening, Band-Like, Dull)

• Primary Cough Headache
• Primary Exertional Headache
• Primary Stabbing Headache

• Migraine
  (Throbbing/Pulsating)
Headache

Secondary, without Red Flag Symptoms

- **Primary**
  - Usually episodic

- **Secondary**
  - Usually constant

- **With Red Flag Symptoms**
  - Systemic symptoms, focal neurological signs, sudden onset, old age, progressive signs of increased intracranial pressure

- **No Red Flag Symptoms**

  - **Acute**
    - Sinusitis
    - Dental Abscess
    - Glaucoma
    - Traumatic Brain Injury
    - Acute Mountain Sickness

  - **Chronic**
    - Analgesic Induced Headache
    - Substance Withdrawal
**Upper Motor Neuron Weakness**

**Tone:** Spastic with clasp-knife resistance

**Reflexes:** Hyperactive +/- Clonus

**Pathological Reflexes:** Babinski/Hoffman

**Cerebral Hemisphere** (Contralateral motor cortex)
- Aphasia
- Apraxia
- Agnosia
- Agraphia
- Acalculia
- Alexia
- Anomia
- Anosognosia
- Asterognosia
- Seizures
- Personality Changes
- Cognition/Confusion, Dementia
- +/- Sensory Loss

**Contralateral/Sub-Cortical** (Corona radiata, Internal Capsule)
- May be without sensory loss
- May be combined with contralateral sensory loss

**Brain Stem**
- Diplopia
- Dysarthria
- Dysphagia
- Ptosis
- Decreased Level of Consciousness
- Cranial Nerve Palsies
- ‘Crossed’ Sensory Findings: ipsilateral facial and contralateral extremity findings

**Unilateral Spinal Cord Lesions Above ~C5**
- Brown-Sequard Syndrome (sensory loss to pain and temperature contralateral to weakness, vibration and proprioception loss ipsilateral to weakness)

**Hemiplegia**
Mechanisms of Pain

Pain

Nociceptive
Tissue Damage

Mixed
Nociceptive/Neuropathic

Neuropathic
Burning, shooting, gnawing, aching, lancinating

Visceral
(From organ/cavity lining)
Poorly localized, crampy, diffuse, deep sensation

Somatic

Deep
Less well-localized, dull, longer duration

Superficial
Well-localized, sharp, short duration

Central Nervous System
Deafferentation
Loss of sensory input

Peripheral Nervous System

• Post-Herpetic Neuralgia
• Neuroma
• Neuropathy

Sympathetic

• Phantom Limb
• Post-stroke
• Spinal injury

• Complex regional pain syndrome
Neurologic

Movement Disorder

Hyperkinetic

Movement Disorder

Hyperkinetic
Examples listed not exhaustive for all causes

Tics
- Tourette’s Syndrome
- Attention Deficit Hyperactivity Disorder
- Obsessive Compulsive Disorder

Dystonia
- Generalized dystonia
- Writer’s cramp
- Blepharospasm
- Cervical Dystonia

Stereotypies

Myoclonus
- Epilepsy
- Toxic/metabolic

Chorea
- Huntington’s Disease

Tremor

Bradykinetic

Athetosis

Ballism

Neurologic
Movement Disorder

Tremor

Hyperkinetic

Action Tremor
Occurs During Voluntary Muscle Movement
- Cerebellar Disease (e.g. spinocerebellar ataxia, Vitamin E deficiency, stroke, multiple sclerosis)

Tremor

Resting Tremor
Occurs at Rest
- Parkinson’s Disease
- Midbrain Tremor
- Wilson’s Disease
- Progressive supranuclear palsy
- Multiple System Atrophy
- Drug-Induced Parkinsonism

Bradykinetic

Postural Tremor
Occurs While Held Motionless Against Gravity
- Enhanced Physiologic Change
- Essential tremor
- Dystonia
- Metabolic Etiology (Thyroid, Liver, Kidney)
- Drugs (Lithium, Amiodarone, Valproate)
Neurologic Movement Disorder

Bradykinetic Movement Disorder

- Bradykinetic Parkinson's Disease (TRAP)
  - Resting Tremor
  - Cogwheel Rigidity
  - Akinesia/Bradykinesia
  - Postural Instability

- Drug-Induced Parkinsonism
  - Neuroleptics
  - Haloperidol
  - Metoclopramide
  - Procyclidine
  - Amiodarone
  - Verapamil

- Progressive Supranuclear Palsy
  - Characteristics:
    - Vertical Gaze Palsy
    - Axial rigidity > limb rigidity
    - +/- Tremor
    - Bradykinesia
    - Falling backwards

- Multiple System Atrophy
  - Characteristics:
    - Bradykinesia
    - +/- tremor
    - Cerebellar signs
    - Postural Hypotension
Peripheral Weakness

Objective Weakness

Upper Motor Neuron
- Increased tone and reflexes
- Babinski Reflex

Lower Motor Neuron
- Decreased tone and reflexes
- No Babinski reflex

Sensory Changes

Upper and Lower Motor Neuron
- Amyotrophic Lateral Sclerosis
- Cervical myeloradiculopathy
- Syrinx

No Objective Weakness
- Cardio-pulmonary disease
- Anemia
- Chronic Infection
- Malignancy
- Depression
- Deconditioning
- Arthritis
- Fibromyalgia
- Endocrine Disease

Neuromuscular Junction
- Fatigability, Variability, Oculomotor

Myopathy
- Proximal muscle involvement, elevated CK

Motor Neuron and Motor Neuropathy
- Atrophy, Fasciculations, Hyperreflexia

- Lead toxicity
- Progressive muscular atrophy
- Hodgkin’s lymphoma
- Polio
- Multifocal Motor Neuropathy
- Spinal Muscular Atrophy

- Myasthenia Gravis
- Lambert-Eaton Myasthenic Syndrome
- Botulism
- Congenital

- Polymyositis
- Duchenne Muscular Dystrophy
- Statin Toxicity
- Dermatomyositis
- Viral infection

See Peripheral Weakness: Sensory Changes scheme
Peripheral Weakness
Sensory Changes

Objective Lower Motor Neuron Weakness

Sensory Changes

Follows Distribution

Radiculopathy
- Disc
- Spondylosis
- Tumor
- Infection

Mononeuropathy

Polyneuropathy (Length Dependent)
- Diabetes
- Nutrition
- Alcohol
- Toxins
- Paraproteinemic
- Inherited
- Inflammation

Compression
- Carpal Tunnel
- Ulnar
- Peroneal
- Radial

Other
- Trauma
- Tumor
- Ischemia

No Sensory Changes

Does Not Follow Distribution

Mononeuritis Multiplex
- Vasculitis
- Diabetes

Plexopathy
- Brachial neuritis
- Diabetes
- Tumor

Polyradiculopathy
- Spondylosis
- Chronic
- Inflammatory
- Demyelinating
- Polyneuropathy
- Neoplasm
- Infection
Spell / Seizure

Epileptic Seizure

Unprovoked Recurrence
Epileptic Seizure

Unprovoked Recurrence

Unclassified

Proven Recurrence
Non-epileptic organic seizure/other

Focal Seizure

Unclassified

Generalized

Non-Convulsive
• Absence
• Atonic

Convulsive
• Myoclonic
• Clonic
• Tonic
• Tonic-Clonic

Non-Dyscognitive
Features of
• Aura
• Motor
• Autonomic

Dyscognitive

Evolving to Bilateral Convulsive Seizure

1 Previously named Simple Partial Seizure
2 Previously named Complex Partial Seizure
3 Previously named Secondary Generalized Tonic-Clonic Seizure
4 A focal seizure may evolve so rapidly to a bilateral convulsive seizure that no initial distinguishing features are apparent.
Spell / Seizure
Secondary Organic

Spell/Seizure

Unprovoked Recurrence
(Primary)
Epileptic Seizure

Provoked Recurrence (Secondary)
Non-epileptic organic seizure/other

Other

Secondary Organic

Febrile
- Sepsis
- Encephalitis
- Meningitis

Infection
- Hypoglycemia
- Hyperglycemia
- Hypocalcemia
- Hyponatremia
- Uremia
- Alcohol/drug

Metabolic
- Intracerebral hemorrhage
- Subarachnoid hemorrhage
- Subdural hemorrhage

Vascular
- Dementia

Degenerative
- Congenital abnormality
- Neoplasm
- Arteriovenous malformation

Structural
- Pregnancy
- Eclampsia
Spell / Seizure

Other

Spell/Seizure

Unprovoked Recurrence (Primary)
- Epileptic Seizure

Provoked Recurrence (Secondary)
- Non-epileptic organic seizure/other

Other

Secondary Organic

Neurological
- Migraine/Auras
- Movement disorders (Dystonia, Dyskinesia, Chorea)

Cardiovascular
- Syncope

Psychogenic
- Panic Disorder
- Conversion Disorder
- Pseudoseizures
Stroke

Intracerebral Hemorrhage

- Hypertension
  - Essential Hypertension (Aneurysm)
  - Drugs (Cocaine, Amphetamines)

- Vessel Disease
  - Amyloid Angiopathy
  - Vascular Malformation
  - Aneurysm
  - Vasculitis

- Other
  - Trauma
  - Bleeding diathesis
  - Hemorrhage into tumors
  - Hemorrhage into infarct

Ischemia

Subarachnoid Hemorrhage
Stroke

Ischemia

- Intracerebral Hemorrhage
- Ischemia
- Subarachnoid Hemorrhage

Thrombosis
Atherosclerosis, Arterial Dissection, Fibromuscular Dysplasia

- Large Vessel
- Small Vessel
  - Lacunar

Embolus
- Heart
  - Left Ventricle
  - Left Atrium
  - Valvular
  - Atrial fibrillation
  - Bacterial endocarditis
  - Myocardial infarction
- Ascending Aorta

Systemic Hypoperfusion
- Pump Failure
  - Cardiac arrest
  - Arrhythmias
- Cardiac Output Reduction
  - Myocardial infarction
  - Pulmonary embolus
  - Pericardial effusion
  - Shock
Syncope

Cardiac
- Arrhythmia
  - Tachyarrhythmia
  - Bradyarrhythmia
  - Supraventricular Tachycardia
  - Sick-Sinus Syndrome
  - Second/Third Degree Atrioventricular Block
- Outflow Obstruction
  - Aortic Stenosis
  - Hypertrophic Obstructive Cardiomyopathy
  - Pulmonary Embolus
  - Other

Non-Cardiac
- Vasovagal/Autonomic
  - Dehydration
  - Hypovolemia
  - Medications
- Orthostatic

Central
- Emotional

Peripheral/Situational
- Bladder Emptying
- Pain
- Reduced Effective Arterial Blood Volume
- Carotid Sinus Syncope
- Tussive
- Defecation
Vertigo/Dizziness

True Vertigo
- Illusion of Rotary Movement

Dizziness
- Lightheaded, unsteady, disoriented

Organic Disease
- Presyncope/Vasodepressor Syncope
- Cardiac Arrhythmia
- Orthostatic Hypotension
- Hyperventilation
- Anemia
- Peripheral neuropathy
- Visual Impairment
- Musculoskeletal Problem
- Drugs

Psychiatric Disease
- Depression
- Anxiety
- Panic Disorder
- Phobic Dizziness
- Somatization
Vertigo

Vertigo/Dizziness:
- True Vertigo: Illusion of Rotary Movement
- Dizziness: Lightheaded, unsteady, disoriented

Central Vestibular Dysfunction
- Imbalance, neurologic symptoms/signs, bidirectional nystagmus

Peripheral Vestibular Dysfunction
- Nausea and vomiting, auditory symptoms, unidirectional nystagmus

True Vertigo
- Illusion of Rotary Movement

Dizziness
- Lightheaded, unsteady, disoriented

Central Vestibular Dysfunction
- Infection
  - Meningitis
  - Cerebellar/Brainstem Abscess
- Trauma
  - Cerebellar Contusion
- Space-Occupying Lesion
  - Infratentorial Tumors
  - Cerebellopontine Angle Tumors
  - Glomus Tumors
- Vascular
  - Vertebrobasilar Insufficiency
  - Basilar Artery Migraine
  - Transient Ischemic Attack
  - Cerebellar/Brainstem Infarction
  - Cerebellar Hemorrhage

Peripheral Vestibular Dysfunction
- Benign Paroxysmal Positional Vertigo
- Labyrinthitis/Vestibular Neuronitis
- Menière’s Disease
- Acoustic Neuroma
- Ototoxicity (usually imbalance and oscillopsia)
- Otitis Media
- Temporal Bone Fracture

Infection
- Meningitis
- Cerebellar/Brainstem Abscess

Trauma
- Cerebellar Contusion

Space-Occupying Lesion
- Infratentorial Tumors
- Cerebellopontine Angle Tumors
- Glomus Tumors

Vascular
- Vertebrobasilar Insufficiency
- Basilar Artery Migraine
- Transient Ischemic Attack
- Cerebellar/Brainstem Infarction
- Cerebellar Hemorrhage

Inflammatory
- Multiple sclerosis

Intoxication
- Barbiturates
- Ethanol
Obstetrical & Gynecological

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Intrapartum Abnormal Fetal HR Tracing

Variability & Decelerations

Abnormal Fetal Heart Rate Tracing

- Abnormal Variability
- Baseline Abnormality
- Decelerations

Abnormal Variability
- Minimal/Absent Variability ≤ 5 bpm
  - Fetal sleep
  - Prematurity
  - Medications (analgesia, sedatives)
  - Hypoxic acidemia
  - Congenital anomalies
- Marked Variability ≥ 25 bpm
  - Mild hypoxia
- Sinusoidal Pattern
  - Severe fetal anemia (Hgb < 70)
  - Tissue hypoxia in fetal brain stem
- Absent Accelerations
  - Hypoxic acidemia
  - Fetal abnormality

Early decelerations
- Fetal head compression (mirror contractions)

Variable decelerations
- Cord compression
- Fetal acidemia if complicated variable decelerations

Late decelerations
- Uteroplacental insufficiency
- Maternal hypotension
- Reduced maternal arterial oxygen saturation
- Hypertonic uterus
- Fetal acidemia

Prolonged deceleration
- Hypertonic uterus
- Unresolving umbilical cord compression
- Maternal hypotension
- Maternal seizure
- Rapid fetal descent
Intrapartum Abnormal Fetal HR Tracing

Baseline

Abnormal Fetal Heart Rate Tracing

Abnormal Variability

Baseline Abnormality

Decelerations

Bradycardia

< 110 bpm

Maternal

Fetal

• Hypotension
• Drug response
• Maternal position
• Connective tissue disease with congenital heart block (e.g. SLE)

• Umbilical cord occlusion
• Fetal hypoxia/acidosis
• Vagal stimulation (e.g. chronic head compression)
• Fetal cardiac conduction or structural defect

Tachycardia

> 160 bpm

Maternal

Fetal

• Fever
• Infection
• Dehydration
• Hyperthyroidism
• Endogenous adrenaline or anxiety
• Drug response
• Anemia

• Infection
• Prolonged fetal activity or stimulation
• Chronic hypoxemia
• Cardiac abnormalities
• Congenital anomalies
• Anemia
Abnormal Genital Bleeding

Pregnant

See Bleeding in Pregnancy Scheme

Non Pregnant

Gynecologic

• Medical (e.g. coagulopathy, liver disease, renal disease)
• Drugs

Non-Gynecologic

Uterus

• Anovulatory
• Atrophy
• Fibroid
• Polyp
• Exogenous estrogen
• Neoplasm
• Infection
• Endometrial Hyperplasia

Cervix

• Polyp
• Ectropion
• Dysplasia
• Neoplasm
• Infection
• Trauma

Vagina

• Atrophy
• Vulvovaginitis
• Neoplasm
• Infection
• Trauma

Vulva

• Vulvar dystrophy
• Vulvar Atrophy
• Vulvovaginitis
• Neoplasm
• Infection
• Trauma
Acute Pelvic Pain

**Obstetrical Emergencies**
Chronic Pelvic Pain

> 6 months in duration

**Gynecologic**
- Endometriosis
- Chronic pelvic inflammatory disease
- Dysmenorrhea
- Adenomyosis
- Ovarian cyst
- Adhesions

**Non-Gynecologic**

**Co-morbidities**
- Somatization
- Sexual/physical/psychological abuse
- Depression/anxiety
- Abdominal wall pain

**Gastrointestinal**
- Irritable bowel syndrome
- Inflammatory bowel disease
- Constipation
- Neoplasm

**Genitourinary**
- Interstitial cystitis
- Urinary retention
- Neoplasm

**Musculoskeletal**
- Pelvic floor myalgia
- Myofascial pain (trigger points)
- Injury
Amenorrhea

Primary

- No onset of menarche by age 16 with secondary sexual characteristics
  - Or, No onset of menarche by age 14 without secondary sexual characteristics

Ovarian Etiology
- High FSH
- Low Estrogen
  - 46, XX Gonadal Dysgenesis (e.g. Fragile X, Balanced Translocations, Turner’s mosaic)
  - 46, XY Gonadal Dysgenesis (e.g. Swyer’s Syndrome)
  - 45, XO Turner syndrome
  - Savage syndrome (ovarian resistance)
  - Premature Ovarian Failure (Autoimmune, Iatrogenic)

Receptor Abnormalities and Enzyme Deficiencies
- Androgen insensitivity
- 5-α Reductase deficiency
- 17-α Hydroxylase deficiency
- Vanishing Testes Syndrome
- Absent Testes Determining Factor

Central
- Low FSH
- Low Estrogen

Hypothalamic
- Functional (e.g. eating disorder, weight loss, stress, excessive exercise, illness)
- Congenital GnRH deficiency (Kallmann syndrome)
- Constitutional delay of puberty

Pituitary
- Surgery
- Irradiation
- Tumor, Infiltration
- Hyperprolactinemia
- Hypothyroidism

Secondary

- Absence of menses for 3 cycles or 6 months

Congenital Outflow Tract Anomalies

- Imperforate hymen
- Transverse vaginal septum
- Vaginal agenesis (Mayer-Rokitansky-Küster-Hauser syndrome)
- Cervical stenosis
Amenorrhea

Secondary

Primary
No onset of menarche by age 16

Secondary
Absence of menses for more than 3 cycles or 6 months in women who were previously menstruating

Rule out pregnancy (β-hCG)

Ovarian

Hypothalamic
Negative progesterone challenge, Low FSH, Low estrogen

• Functional (e.g. eating disorder, weight loss, stress, excessive exercise, illness)
• Infiltrative lesions (e.g. lymphoma, Langerhans cell histiocytosis, sarcoidosis)

Normal FSH
• Polycystic ovarian syndrome (positive progesterone challenge, normal prolactin, chaotic menstruation history)

High FSH
• Menopause
• Premature ovarian failure (<35 years old, e.g. autoimmune, chromosomal, iatrogenic)

Pituitary

High Prolactin
• Pituitary Adenoma
• Prolactinoma
• Chest wall irritation
• Hypothalamic-Pituitary Stalk Damage (e.g. Tumors, trauma, compression)
• Hypothyroidism

Outflow Tract Obstruction
• Asherman’s syndrome
• Cervical stenosis

Other
• Sheehan’s Syndrome
• Radiation
• Infection
• Infiltrative Lesions; hemochromatosis
Antenatal Care

At Every Visit
Weight, Blood pressure, Psychosocial screening, Counseling re. Indications to go to hospital

First Trimester (0-12 weeks)
- Detailed history and physical exam
- Estimated date of delivery
- Dating ultrasound
- Prenatal labs (CBC, ABO/Rh type & screen, Antibody screen, HBsAg, Syphilis serology, Rubella IgG, Varicella, HIV)
- Chlamydia/Gonorrhea screen
- Urine culture & sensitivity

Second Trimester (12-28 weeks)
- Fetal heart rate tones (starting at 12 weeks)
- Prenatal genetic screening
  - First trimester screen (nuchal translucency, β-hCG, PAPP-A; 11-14 weeks)
  - Maternal serum screen (AFP, uE3, β-hCG; 15-22 weeks)
- ± Prenatal diagnosis
  - Chorionic villus sampling (11-13 weeks)
  - Amniocentesis (15-17 weeks)
- Detailed 18-20 week Ultrasound (dating, number of fetuses, placental location, anatomic survey)
- Gestational diabetic screen (50g oral glucose challenge; 24-28 weeks)
- Rh antibody screen and Rh immunoglobulin if indicated

Third Trimester (28-40 weeks)
- Fetal surveillance
  - Fetal movement counts (>6 movements in 2 hours)
  - Symphysis fundal height
  - Leopold maneuvers
- Group B Streptococcus screen (35-37 weeks)
- ± Ultrasound for growth, presentation, biophysical profile
- ± Non-stress test

Antenatal Care
Bleeding in Pregnancy

< 20 Weeks

Bleeding in Pregnancy

Hemodynamically Unstable – Do ABCDEs

< 20 Weeks

Second / Third Trimester

Bleeding from the Os

Not Bleeding from the Os

Cervix Open

Passing Tissue and Clots

Not Passing Tissue and Clots

Cervix Closed

IUP on Transvaginal U/S

No IUP on Transvaginal U/S

Ectopic Pregnancy on U/S

No Ectopic Pregnancy on U/S

β-hCG < 1500

β-hCG > 1500

Ectopic likely

β-hCG not doubled in 72h

Ectopic pregnancy or failed pregnancy

β-hCG doubled in 72h

Viable pregnancy – monitor for ectopic or IUP (implantation bleed)

- Cervical polyp/Ectropion
- Cervical/Vaginal neoplasm
- Vaginal laceration
- Infection

- Complete abortion
- Incomplete abortion
- Ectopic pregnancy

- Missed abortion
- Inevitable abortion
- Cervical insufficiency

• Not Bleeding from the Os

- Infection

- Cervical polyph

- Cervical/Vaginal neoplasm

- Vaginal laceration

- Infection

- Cervical open

- Cervical closed

- Passing tissue and clots

- Not passing tissue and clots

- β-hCG < 1500

- β-hCG > 1500

- Ectopic likely

- β-hCG not doubled in 72h

- Ectopic pregnancy or failed pregnancy

- Viable pregnancy – monitor for ectopic or IUP (implantation bleed)
Bleeding in Pregnancy

2nd & 3rd Trimester

Bleeding in Pregnancy

Hemodynamically Unstable – Do ABCDEs

< 20 Weeks

Second / Third Trimester

Do NOT perform digital examination until the placental location is known

Bleeding from the Os

Not Bleeding from the Os

Painful

• Placental abruption
• Uterine rupture
• Labour (bloody show)

Painless

• Placenta previa
• Vasa previa

• Cervical polyp/Ectropion
• Cervical/Vaginal neoplasm
• Vaginal laceration
• Infection
Breast Disorder

Breast Disorders

Breast Infection
- Lactational
  - Mastitis
  - Abscess
- Non Lactational
  - Subareolar abscess
  - Acute mastitis

Breast Mass
- Malignant
- Benign

Gynecomastia
- Physiologic
  - Newborn
  - Adolescence
  - Aging
- Pathologic
  - Drugs
  - Decreased testosterone
  - Increased estrogen
  - Idiopathic

Non-Invasive
- Ductal carcinoma
  - In situ
- Lobular carcinoma
  - In situ

Invasive
- Ductal carcinoma
- Lobular carcinoma
- Tubular carcinoma
- Medullary carcinoma
- Papillary carcinoma
- Mucinous carcinoma

Solid
- Fibroadenoma

Cystic
- Gross cyst
- Galactocele
- Fibrocystic
Growth Discrepancy
Small for Gestational Age / Intrauterine Growth Restriction

- **Large for Gestational Age** (Growth > 90th percentile for GA)
  - Maternal Factors
  - TORCH Infections
  - Placental Ischemia/Infarction
    - Decreased Uteroplacental Flow
    - Maternal Lifestyle
    - Maternal Hypoxemia
- **Small for Gestational Age** (Growth < 10th percentile for GA)
  - Fetal Factors
  - Multiple Gestation
  - Placental Abruption
    - Placental Malformations
    - Confined Placental Mosaicism (Rare)
  - Placental Factors
  - Chromosomal Abnormalities
    - TORCH Infections
    - Multiple Gestation
    - Placental Ischemia/Infarction
    - Placental Abruption
    - Placental Malformations
    - Confined Placental Mosaicism (Rare)
Growth Discrepancy

Large for Gestational Age

Small for Gestational Age

Maternal Factors
- Multiparity
- Previous history of large for gestational age fetus
- Aboriginal, Hispanic, and Caucasian races
- Maternal co-morbidities (e.g. diabetes, obesity)
- Excessive weight gain over course of pregnancy (>40 lbs)

Fetal factors
- Male infant
- Prolonged gestation (>41 weeks)
- Genetic disorder (e.g. Sotos syndrome, Beckwith-Wiedemann syndrome, Weaver’s syndrome)

Fetal Complications
- Shoulder dystocia
- Birth injury (brachial plexus injury, clavicular fracture)
- Cerebral palsy secondary to hypoxia
- Hypoglycemia
- Polycythemia
- Perinatal asphyxia
- Hyperbilirubinemia
Infertility

Failure to conceive following > 1 year of unprotected sexual intercourse

- Male (35%)
- Unexplained (15%)
- Female (50%)

**Uterus**
HSG or SHG or hysteroscopy

- Fibroids/polyps
- Asherman's syndrome
- Congenital anomalies
- Adenomyosis
- Unfavourable cervical mucous
- Cervical stenosis

**Fallopian Tube**
HSG or SHG or laparoscopy

- Pelvic inflammatory disease
- Endometriosis
- Adhesions
- Previous tubal pregnancy
- Congenital Anomalies

**Ovary**
Ovulation confirmation: mid-luteal serum progesterone
Ovarian reserve: Day 3 FSH +/- Estradiol

- Decreased FSH
  - Polycystic ovarian syndrome
  - Obesity

- Normal FSH
  - Hypothalamic
    - Weight loss/malnutrition
    - Excessive exercise
    - Stress/psychosis
    - Systemic disease

- Increased FSH
  - Hypopituitarism
    - Hypothyroidism
    - Hyperprolactinemia
    - Tumors (e.g. Prolactinoma)
  - Hypothalamic
    - Premature ovarian failure
    - Premenopausal changes
    - Turner's syndrome
Infertility (Male)

Failure to conceive following > 1 year of unprotected sexual intercourse

Male (35%)

- Sperm Production
  (Non-obstructive azoospermia)
  Low testosterone
  - Pre-Testicular
    (Hypogonadotrophic hypogonadism)
    Low FSH/LH
    - Kallmann syndrome
    - Suppression of gonadotropins (e.g. hyperprolactinemia, hypothyroidism, drugs, tumor, infection, trauma)
    - Anabolic steroids
  - Sperm Motility
    Abnormal semen analysis
    - Antibodies from infection
  - Sperm Transport
    - Vasectomy
    - Cystic fibrosis gene mutation
    - Post-infectious obstruction
    - Ejaculatory duct cysts (e.g. prostate)
    - Kartagener syndrome

Unexplained (15%)

Female (50%)

- Sperm Production
  (Non-obstructive azoospermia)
  Low testosterone
- Sperm Motility
  Abnormal semen analysis
  - Antibodies from infection
- Sperm Transport
  - Vasectomy
  - Cystic fibrosis gene mutation
  - Post-infectious obstruction
  - Ejaculatory duct cysts (e.g. prostate)
  - Kartagener syndrome

Sexual Dysfunction

- See Sexual Dysfunction Scheme
- Pre-Testicular
  (Hypogonadotrophic hypogonadism)
  Low FSH/LH
  - Kallmann syndrome
  - Suppression of gonadotropins (e.g. hyperprolactinemia, hypothyroidism, drugs, tumor, infection, trauma)
  - Anabolic steroids

- Testicular
  (Sperm production problem)
  High FSH/LH
  - Genetic abnormality (e.g. Klinefelter’s)
  - Cryptorchidism
  - Varicocele
  - Mumps orchitis
  - Radiation, Infection, drugs, trauma, torsion
Intrapartum Factors that May Affect Fetal Oxygenation

Factors affecting fetal oxygenation

Uteroplacental Factors
- Excessive Uterine Activity
  - Hyperstimulation
  - Placental abruption
- Uteroplacental Dysfunction
  - Placental abruption
  - Placental infarction
  - Chorioamnionitis
  - Post-dates pregnancy

Maternal Factors
- Cord Compression
  - Oligohydramnios
  - Cord prolapse
  - Cord entanglement
- Decreased Fetal O₂ Carrying Capacity
  - Fetal anemia
  - Carboxyhemoglobin
  - Intrauterine growth restriction
  - Prematurity
  - Fetal sepsis

Fetal Factors
- Decreased Maternal Arterial O₂ Tension
  - Smoking
  - Hypoventilation
  - Respiratory disease
  - Seizure
  - Trauma
- Decreased Maternal O₂ Carrying Capacity
  - Maternal anemia
  - Carboxyhemoglobin
- Decreased Uterine Blood Flow
  - Hypotension
  - Anesthesia
  - Maternal positioning
- Maternal Medical Conditions
  - Fever
  - Vasculopathy (SLE, Type 1 diabetes mellitus, HTN)
  - Hyperthyroidism
  - Antiphospholipid syndrome
Pelvic Mass

Do Pelvic U/S

Gynecologic

Non-Pregnant

Uterus
- Fibroid
- Adenomyosis
- Neoplasm
- Pyometra
- Hematometra

Fallopian Tube
- Tubo-ovarian abscess
- Paratubal cyst
- Neoplasm
- Pyosalpinx
- Hydrosalpinx

Ovary
- Intrauterine pregnancy

See Ovarian Mass scheme

Non-Gynecologic

Gastrointestinal

- Appendiceal abscess
- Diverticular abscess
- Diverticulosis
- Rectal/Colon cancer

Genitourinary

- Distended bladder
- Bladder cancer
- Pelvic kidney
- Peritoneal Cyst

Pregnant

Uterus
- Tubal ectopic pregnancy

Fallopian Tube
- Ovarian ectopic pregnancy

Ovary
- Ovarian ectopic pregnancy
Ovarian Mass

Benign Neoplasms
- Polycystic ovary
- Endometrioid cyst

Hyperplastic
- Follicular cyst
- Corpus lutein cyst
- Theca lutein cyst

Functional
- Corpus lutein cyst

Malignant Neoplasms

Epithelial
- Serous cystadenoma
- Mucinous cystadenoma

Germ Cell
- Mature teratoma (may be cystic)
- Gonadoblastoma (can become malignant)

Sex Cord Stromal
- Fibroma
- Thecoma
- Granulosa cell tumor

Epithelial
- Serous cystadenocarcinoma
- Mucinous cystadenocarcinoma
- Endometrioid
- Clear Cell

Germ Cell
- Dysergeminoma
- Immature teratoma
- Yolk Sac

Sex Cord Stromal
- Granulosa cell tumor
- Sertoli Cell
- Sertoli - Leydig

Metastases
- Krukenberg tumor (gastrointestinal metastasis)
- Breast
Pelvic Organ Prolapse

Herniation of one or more pelvic organs
Risk factors: genetics, multiparity, operative vaginal delivery, obesity, increasing age, estrogen deficiency, pelvic floor neurogenic damage (i.e. surgical), strenuous activity (i.e. weight bearing)

Uterus
Sensation of object “falling out of vagina,” possible lower back pain
• Uterine prolapse
• Cervical prolapse

Vaginal Apex
Pelvic pressure, urinary retention, stress incontinence
• Vaginal vault prolapse

Bladder
Slow urinary stream, stress incontinence, bladder neck hypermobility
• Cystocele (anterior prolapse)
• Cystourethrocele

Bowel/Rectum
Defecatory symptoms
• Enterocele
• Rectocele (posterior prolapse)
6 W's for causes of PPF

Wind: pneumonia, atelectasis
Water: UTI
"Woobies": mastitis
Womb
Wound: cellulitis, vulvas incision, endomyometritis
Walking: DVT

---

Post Partum Fever (Puerperal)
< 6 Weeks Post-partum

Infectious

Respiratory
- Atelectasis
- PE

Non-Infectious

Uterine

Thrombotic
- DVT
- Septic Pelvic Thrombophlebitis

Respiratory
- Pneumonia

Uterine
- Endometritis
- Retained Products of Conception

Breasts
- Mastitis
- Abcess

Urinary
- UTI
- Pyelonephritis

Wound
- Cesarean Incision
- Vaginal Laceration
- Episiotomy
- Abscess/Hematoma
Post-Partum Hemorrhage

Blood Loss: >500mL post vaginal delivery
OR >1000mL post Caesarean section

Uterine Atony (70%)
- Uterine fatigue (e.g. prolonged/induced labor, rapid labor, grand multiparity)
- Overdistension of uterus (e.g. multiple gestation, polyhydramnios, fetal macrosomia)
- Bladder distension
- Uterine infection (e.g. chorioamnionitis)
- Functional/anatomic distortion of uterus
- Drugs – Uterine relaxants (e.g. nifedipine, magnesium sulfate, NSAIDs)

Trauma (20%)
- Perineal laceration (e.g. episiotomy)
- Vaginal laceration/hematoma
- Cervical laceration (e.g. forceps/vacuum delivery)
- Uterine rupture
- Uterine inversion

Remnant Tissue (10%)
- Retained blood clots
- Retained cotyledon or succenturiate lobe
- Abnormal placentation (placenta accreta, increta, or percreta)

Thrombin (1%)
- Thrombocytopenia
- Idiopathic thrombocytopenic purpura (ITP)
- Thrombotic thrombocytopenic purpura (TTP)
- HELLP syndrome
- Disseminated intravascular coagulation (DIC)
- Anti-coagulation agents (e.g. heparin)
- Pre-existing coagulopathy (e.g. von Willebrand’s disease, Hemophilia A)
Recurrent Pregnancy Loss

Post-Partum Hemorrhage

Blood Loss: >500mL post vaginal delivery
OR >1000mL post Caesarean section

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- Pre-existing coagulopathy (e.g. von Willebrand’s disease, Hemophilia A)
Vaginal Discharge

Infectious

- Sexually Transmitted Infection
  - Chlamydia trachomatis
  - Neisseria gonorrhoeae

Inflammatory

- Toxic Shock Syndrome
  - Chemical irritant
  - Douching
  - Bacterial vaginosis
  - Atrophic vaginitis

- Vulvovaginitis
  - Vulvovaginal candidiasis
  - Bacterial vaginosis
  - Trichomonas vaginalis

Neoplastic

- Systemic
  - Crohn’s disease
  - Collagen vascular disease
  - Dermatologic

- Local
  - Endometrium
  - Cervix
  - Vulva
  - Vagina
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**Faculty Editor**

Dr. Laurie Parsons
Burns

Physical Agents
- Thermal Burn
- Cold Burn
- Electrical Burn
- Sun Burn

Chemical Agents
- Acid
- Alkali
- Oxidants (Bleaches, peroxides, chromates, manganates)
- Vesicants (sulfur and nitrogen, mustards, arsenicals, phosgene oxime)
- Others (white phosphorus, metals, persulfates, sodium azide)

Parkland formula for fluid resuscitation:
4cc x Weight (kg) x %TBSA burn
Dermatoses in Pregnancy

Physiologic Changes

Dermatoses in Pregnancy

Physiologic Skin Changes

Specific Skin Conditions

Pigmented

Other

Vascular

• Striae Distensae (striae gravidarum)
• Distal Onycholysis
• Subungual Keratosis
• Hyperhidrosis
• Miliaria
• Dyshidrotic Eczema
• Hirsutism (face, limbs, and back)

Face

• Melasma

Abdomen

• Linea Nigra

Hormone induced

• Hyperpigmentation of areolae, axillae & genitalia
• Increase in mole size & number (probable)

Skin

• Palmar erythema
• Spider Nevi
• Cherry Hemangioma (Campbell de Morgan spot)
• Pyogenic granuloma

Mucous Membranes

• Chadwick's sign (bluish discoloration of cervix/vagina/vulva)
Dermatoses in Pregnancy

Specific Skin Conditions

Physiologic Skin Changes

- Non-Pruritic
  - Pustular psoriasis of pregnancy
  - Impetigo Herpetiformis

Specific Skin Conditions

- Pruritic
  - Intrahepatic cholestasis of pregnancy (pruritis worse at night, 3rd trimester)

Primary Skin Lesion

- Pemphigoid gestationis
- Pruritic urticarial plaques & papules of pregnancy (PUPPP)
Disorders of Pigmentation

Hyperpigmentation

Disorder of Pigmentation

Hypopigmentation

Hyperpigmentation

Diffuse

• Tanning
• Adverse cutaneous drug eruption
• Addison’s disease
• Hemochromatosis
• Porphyria cutanea tarda

Localized
Discrete Areas

Acquired

• Freckles (ephelides)
• Lentigines
• Melasma
• Tinea versicolor (more commonly hypopigmented)
• Post-Inflammatory hyperpigmentation

Congenital

• Café au lait macules (neurofibromatosis or McCune Albright syndrome)
• Congenital melanocytic nevi
Disorders of Pigmentation

Hypopigmentation

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- **Congenital**
  - Tuberous sclerosis (white “ash leaf” macules)

- **Acquired**
  - Tinea versicolor (can also be hyperpigmented)
  - Pityriasis alba
  - Phenylketonuria
  - Albinism
  - Piebaldism

- **Congenital**
  - Generalized hypopigmentation of hair, eyes, skin

- **Acquired**
  - Vitiligo
  - Post-Inflammatory hypopigmentation
**Genital Lesion**

- **Elevated**
  - **Vesicles**
    - 
    - Infectious
      - Molluscum contagiousum
      - Human papilloma virus warts (condyloma acuminata)
      - Secondary Syphilis (condyloma lata)
      - Reiter’s syndrome (circinate balanitis)
  - Non-Infectious
    - *Herpes simplex*

- **Depressed**
  - **Erosions/Ulcers**
    - Painful
      - Herpes simplex
      - *Haemophilus ducreyi* (chancroid)
      - Behçet’s syndrome
      - Pemphigus vulgaris
      - Lichen Sclerosis
      - Erosive Lichen Planus
    - Painless
      - Primary syphilis (chancre)
      - Granuloma Inguinale
      - Lymphogranuloma venereum

- **Inflammatory**
  - Lichen planus
  - Psoriasis

- **Non-Infectious**
  - Squamous cell carcinoma (can be in situ)
  - Melanoma
Hair Loss (Alopecia)

Diffuse

- Localized (focal)
  - Scarring
    - Irreversible
    - biopsy required
      - Lupus erythematosus
      - Lichen planopilaris
  - Pattern
    - Androgenetic alopecia
  - Anagen Effluvium
    - Chemotherapy
    - Loose anagen syndrome
  - Discrete Patches
    - Alopecia totalis (all scalp and facial hair)
    - Alopecia universalis (all body hair)
- Non-Scarring
  - Reversible
  - Telogen Effluvium
- Endocrine
  - Hypothyroidism
  - Hyperthyroidism
  - Hypopituitarism
  - Post-Partum
- Dietary
  - Iron deficiency
  - Zinc deficiency
  - Copper deficiency
  - Vitamin A Excess
- Drugs
  - Oral contraceptives
  - Hyperthyroid drugs
  - Anticoagulants
  - Lithium
- Stress Related
  - Post-infectious
  - Post-operative
  - Psychological stress
**Hair Loss** (Alopecia)

Localized

- **Localized (focal)**
  - **Scarring**
    - Irreversible - biopsy required
  - **Non-Scarring**
    - Reversible

- **Diffuse**

**Infectious**
- Tinea capitis with kerion
- Folliculitis decalvans

**Secondary to Skin Disease**
- Discoid lupus erythematosus
- Lichen planopilaris
- Pseudopelade of Brocq
- Alopecia Mucinosa
- Keratosis Follicularis
- Aplasia cutis

**Broken Hair Shafts**
- Tinea capitis
- Trichotillomania
- Traction alopecia
- Congenital hair shaft abnormalities

**Hair Shafts Intact or Absent**
- Alopecia areata
- Secondary syphilis
Morphology of Skin Lesions

Primary Skin Lesions

- **Primary Skin Lesion**
  - Initial lesion not altered by trauma, manipulation (rubbing, scratching), complication (infection), or natural regression over time.

  - **Flat**
    - Macule (≤ 1 cm diameter)
    - Patch (> 1 cm diameter)

  - **Solid**
    - No Deep Component
      - Papule (≤ 1 cm diameter)
      - Plaque (> 1 cm diameter)
    - Firm/Edematous

  - **Deep Component**
    - Nodule (1-3 cm diameter)
    - Tumor (> 3 cm diameter)
    - Transient/Itchy

- **Secondary Skin Lesion**
  - Lesion that develops from trauma, manipulation (rubbing, scratching), complication (infection) of initial lesion, or develops naturally over time

  - **Elevated**
    - Fluid-Filled OR Semi-Solid-Filled
      - Cyst
    - Fluid-Filled
      - Purulent
        - Pustule
      - Non-Purulent Fluid
        - Vesicle (≤ 1 cm diameter)
        - Bulla (> 1 cm diameter)

- **Wheals/Hives**
Morphology of Skin Lesions

Secondary Skin Lesions

Primary Skin Lesion
Initial lesion not altered by trauma, manipulation (rubbing, scratching), complication (infection), or natural regression over time.

Elevated
- Crust/Scab (dried serum, blood, or pus overlying the lesion)
- Scale (dry, thin or thick flakes of skin overlying the lesion)
- Lichenification (thickened skin with accentuation of normal skin lines)
- Hypertrophic Scar (within boundary of injury)
- Keloid Scar (extend beyond boundary of injury)

Secondary Skin Lesion
Lesion that develops from trauma, manipulation (rubbing, scratching), complication (infection) of initial lesion, or develops naturally over time

Depressed
- Atrophic Scar (fibrotic replacement of tissue at site of injury)
- Ulcer (complete loss of epidermis extending into dermis or deeper; heals with scar)
- Erosion (partial loss of epidermis only; heals without scar)
- Fissure (linear slit-like cleavage of skin)
- Excoriation/Scratch (linear erosion induced by scratching)
Mucous Membrane Disorder

Oral Cavity

Mucous Membrane Disorder

- Erosions/Ulcers/Blisters
- White Lesions

Primary Dermatologic Diseases
- Aphthous Stomatitis (recurring, punched out ulcers, often preceded by trauma/emotional stress)
- Herpetic gingivostomatitis
- Pemphigus vulgaris
- Bullous pemphigoid
- Erythema multiforme
- Stevens-Johnson Syndrome
- Toxic epidermal necrolysis

Systemic Disease
- Systemic lupus erythematosus
- Inflammatory bowel disease (ulcerative colitis more than Crohn’s disease)
- Behçet’s syndrome

Non-neoplastic
- Candidiasis
  - White/cottage cheese like plaques/scrape off easily

Neoplastic
- Leukoplakia
- Squamous cell carcinoma

- Lichen Planus
  - Reticular (lace-like) white lines & papules
Nail Disorders
Primary Dermatologic Disease

- Discolouration
  - Oil Drop Sign
    - Psoriasis
  - Fungal Culture
    - White/Yellow-Brown
      - Onychomycosis
    - Green
      - Pseudomonas infection
  - Psoriasis
  - Alopecia Areata

- Pitting
  - Psoriasis
  - Onychomycosis
  - Onychogryphosis

- Thickening
  - Psoriasis
  - Onychomycosis
  - Onychogryphosis

- Onycholysis
  - Psoriasis
  - Onychomycosis

- Inflammation
  - Erythema, Swelling, Pain
  - SLE
  - Scleroderma
  - Dermatomyositis

- Telangiectasia
  - Drug-Induced

- Brown/Black Linear Streak
  - Junctional/Melanocytic Nevus
  - Malignant Melanoma Under Nails
  - Drug-Induced

- Proximal & Lateral
  - Acute Trauma/Infection
    - Acute Paronychia
  - Chronic
    - Chronic Paronychia

- Lateral Only
  - Ingrown Nail

- Discolouration
  - Psoriasis
  - Onychomycosis

- White/Yellow-Brown
  - Onychomycosis

- Green
  - Pseudomonas infection

- Oil Drop Sign
  - Psoriasis

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  - Acute Trauma/Infection
    - Acute Paronychia
  - Chronic
    - Chronic Paronychia

- Lateral Only
  - Ingrown Nail
Nail Disorders

Systemic Disease

Nail Disorder

Primary Dermatologic Disease

- Koilonychia
  - Spoon-Shaped
  - Iron deficiency anemia

- Onycholysis
  - Plate Separating from Bed
  - Hyperthyroidism

- Beau’s Lines
  - Horizontal Grooves
  - Any systemic disease severe enough to transiently halt nail growth (e.g., shock, malnutrition)

Systemic Disease

- SLE
- Scleroderma
- Dermatomyositis

Nail Fold Abnormality

- Clubbing

Nail Bed Abnormality

- Blue Discoloration
  - Medications
  - Wilson’s disease
  - Silver poisoning
  - Cyanosis

- White Discoloration
  - Terry’s Nails
    - Proximal 90%
    - Liver cirrhosis
    - Congestive heart failure
    - Diabetes Mellitus
  - Half-and-Half Nails
    - 50%
    - Chronic renal failure
    - Uremia
  - Muehrcke’s Lines
    - Transverse lines
    - Nephrotic syndrome

- Red Discoloration
  - Splinter hemorrhages (dark red, thin lines, usually painful)
  - Bacterial endocarditis
  - Trauma

- Muehrcke’s Lines
  - Transverse lines
  - Nephrotic syndrome
Nail Disorders
Systemic Disease - Clubbing

Nail Disorder

Primary Dermatologic Disease

Nail Plate Abnormality
- Koilonychia
  - Spoon-Shaped

Onycholysis
  - Plate Separating from Bed

Beau’s Lines
  - Horizontal Grooves

Nail Fold Abnormality

Nail Bed Abnormality

Systemic Disease

Clubbing

Bronchopulmonary Disease
- Bronchiectasis
- Chronic Lung Infection
- Lung Cancer
- Asbestosis
- Cystic Fibrosis
- Chronic Hypoxia

Cardiovascular Disease
- Cyanotic Heart Disease

Gastrointestinal Disease
- Inflammatory Bowel Disease (Crohn’s Disease, Ulcerative Colitis)
- Gastrointestinal Cancer

Endocrine Disease
- Hyperthyroidism (Grave’s Disease)

Other
- Human Immunodeficiency Virus
- Congenital Defect
Pruritus
No Primary Skin Lesion

Blood Glucose
- Diabetes Mellitus

Liver Function Tests/Enzymes
- Cholestatic liver disease

Creatinine & BUN
- Chronic renal failure/uremia

TSH & T4
- Hypothyroidism
- Hyperthyroidism

CBC & Differential
- Lymphoma
- Leukemia
- Polycythemia rubra vera
- Essential Thrombocytopenia
- Myelodysplastic syndrome

Psychiatric Disease
- Delusions of parasitosis

Primary Skin Lesion

No Primary skin Lesion

Primary Abnormal Finding
Pruritus

Primary Skin Lesion

- Macules/Papules/Plaques
  - Xerosis (dry skin)
  - Atopic dermatitis
  - Nummular dermatitis
  - Seborrheic dermatitis
  - Stasis dermatitis
  - Psoriasis
  - Lichen Planus
  - Infestations (scabies, lice)
  - Arthropod bites

- Vesicles/Bullae
  - Varicella zoster (chickenpox)
  - Dermatitis herpetiformis
  - Bullous pemphigoid

- Wheals/Hives
  - Urticaria

No Primary skin Lesion
Skin Rash

Eczematous

Age dependent distribution:
Infants: scalp, face, extensor extremities
Children: flexural areas
Adults: flexural areas/hands/face/nipples

Eczematous
Pruritic/Scaly/Erythematous lesions. Usually poorly demarcated

Papulosquamous
Erythematous or violaceous papules & plaques with overlying scale

Vesiculobullous
Blisters containing non-purulent fluid

Pustular
Blisters containing purulent fluid

Reactive
Reactive erythematous with various morphology

Atopic Dermatitis
(Eczema)
Erythematous papules and vesicles (acute) or lichenification (chronic)

Nummular Dermatitis
(Discoid Eczema)
Coin shaped (discoid) erythematous plaques. Usually on lower legs

Seborrheic Dermatitis
Yellowish-red plaques with greasy distinct margins on scalp/face/central chest folds

Stasis Dermatitis
Erythematous eruption on lower legs. Secondary to venous insufficiency. +/- pigmentation, edema, varicose veins, venous ulcers

Dyshidrotic Eczema
(pompholyx)
Deep-Seated tapioca-like vesicles on hands/feet/sides of digits.

Contact Dermatitis
Well-demarcated erythema, papules, vesicles, erosions scaling confined to area of contact

Irritant
Rapid onset, requires high doses of the agent. May occur in anyone

Allergic
Delayed onset (12-72 hrs). Very low concentrations sufficient. Occurs only in those sensitized
Skin Rash

Papulosquamous

Eczematous
Pruritic/Scaly/Erythematous lesions
Usually poorly demarcated

Papulosquamous
Erythematous or violaceous papules & plaques with overlying scale

Vesiculobullous
Blisters containing non-purulent fluid

Pustular
Blisters containing purulent fluid

Reactive
Reactive erythematous with various morphology

Psoriasis
Well demarcated plaques, thick silvery scale on elbows & knees. Auspitz sign
Koebner's phenomenon

Lichen Planus
Purple, pruritic, polygonal, planar (flat-topped) papules on wrists/ankles/genital s (especially penis)
Wickham's striae
Koebner's phenomenon

Pityriasis Rosea
Oval, tannish-pink or salmon-coloured patches, plaques with scaling border in Christmas tree pattern on trunk, begins with a large lesion patch (Herald's patch)

Tinea (Ring Worm)
Annular (Ring-shaped) lesion with elevated scaling, red border, central clearing

Secondary Syphilis
Red brown or copper coloured scaling papules and plaques on palms and soles

Discoid Lupus Erythematosus
Scarring and/or atrophic red/purple plaques with white adherent scales on sun-exposed area
Skin Rash

Pustular

- **Eczematous**
  - Pruritic/Scaly/Erythematous
  - Lesions usually poorly demarcated

- **Papulosquamous**
  - Erythematous or violaceous papules & plaques with overlying scale

- **Vesiculobullous**
  - Blisters containing non-purulent fluid

- **Pustular**
  - Blisters containing purulent fluid

- **Reactive**
  - Reactive erythematous with various morphology

**Acneform**
- Erythematous papules and pustules on face

- **Acne Vulgaris**
  - Comedones +/− nodules, cysts, scars on face & trunk

- **Comedones Absent**
  - Pustules centered around hair follicles

- **Folliculitis**
  - Pustules with overlying thick honey-yellow crusts

**Infectious**

- **Impetigo**
  - “Beefy red” erythematous patches in body folds with satellite pustules at periphery

- **Candidiasis**
  - "Beefy red" erythematous patches in body folds with satellite pustules at periphery

- **Acne Rosacea**
  - Telangiectasia, episodic flushing after sunlight, alcohol, hot or spicy food & drinks

- **Perioral Dermatitis**
  - Perioral, periorbital & nasolabial distribution, sparing vermilion borders of lips
Skin Rash

Reactive

- Eczematous
  - Pruritic/Scaly/Erythematous lesions
  - Usually poorly demarcated

- Papulosquamous
  - Erythematous or violaceous papules & plaques with overlying scale

- Vesiculobullous
  - Blisters containing non-purulent fluid

- Pustular
  - Blisters containing purulent fluid

- Reactive
  - Reactive erythematous with various morphology

- Urticaria
  - Firm/edematous papules & plaques that are transient & itchy.
  - Usually lasts <24hrs

- Erythema Nodosum
  - Tender or painful red nodules on shins

- Erythema Multiforme
  - Target lesions possibly with macules, papules, vesicles &/or bullae on palms soles and mucous membranes
Skin Rash

Vesiculobullous

- Eczematous
  - Pruritic/Scaly/Erythematous
  - Lesions
  - Usually poorly demarcated

- Papulosquamous
  - Erythematous or violaceous papules & plaques with overlying scale

- Vesiculobullous
  - Blister containing non-purulent fluid

- Pustular
  - Blisters containing purulent fluid

- Reactive
  - Reactive erythematous with various morphology

**Vesicles Fragile/Easily Ruptured**
- Intraepidermal blisters, possibly crusts/erosions

- Inflammatory
  - Pemphigus vulgaris
  - Pemphigus foliaceus

- Infectious
  - Varicella zoster (chickenpox)
  - Herpes zoster (shingles)
  - Herpes simplex
  - Bullous impetigo

- Reaction to Agent
  - Contact dermatitis

- Vesicles NOT Fragile/NOT Easily Ruptured
- Subepidermal blisters, tense intact blisters

- Inflammatory
  - Bullous pemphigoid
  - Mucous membrane pemphigoid
  - Dermatitis herpetiformis
  - Bullous systemic lupus erythematosus

- Metabolic
  - Porphyria cutanea tarda
  - Diabetic bullae (bullous diabeticorum)

- Reaction to Agent
  - Phototoxic drug eruption
Skin Ulcer by Etiology

Skin Ulcer

Physical
- Trauma
- Pressure
- Radiation

Vascular
- Arterial Insufficiency
- Venous insufficiency
- Vasculitis

Hematologic
- Squamous cell carcinoma
- Basal cell carcinoma
- Melanoma
- Mycosis fungoides (cutaneous T-cell lymphoma)

Neoplastic
- Diabetic neuropathy
- Tabes dorsalis (syphilis)
- Factitious disorder
- Delusions of parasitosis

Neurological
- Pyoderma gangrenosum
- Diabetic dermopathy
- Necrobiosis lipoidica

Infectious
- Sickle cell anemia
- Thalassemia
- Cryoglobulinemia

Other
- Leishmaniasis
- Herpes simplex

Protozoan
- Chlamydia trachomatis
- Klebsiella granulomatis

Viral
- Tuberculosis
- Syphilis

Fungal
- Histoplasmosis
- Coccidioidomycosis
- Cryptococcus
Skin Ulcer by Location

Genitals

Skin Ulcer

- Oral
- Head/Neck
- Trunk/Sacral Region
- Genitals
- Lower Legs/Feet

Painful
- Herpes simplex
- Haemophilus ducreyi (chancroid)
- Behçet’s syndrome
- Pemphigus vulgaris
- Lichen sclerosis
- Erosive lichen planus

Painless
- Primary syphilis (chancre)
- Granuloma inguinale
- Lymphogranuloma venereum
Skin Ulcer by Location

Head & Neck

Skin Ulcer

- Oral
- Head/Neck
- Trunk/Sacral Region
- Genitals
- Lower Legs/Feet

Neoplastic
- Squamous cell carcinoma
- Basal cell carcinoma
- Melanoma

Metabolic
- Pyoderma gangrenosum

Vascular
- Wegner’s granulomatosis
- Radiation

Other
Skin Ulcer by Location

Lower Legs / Feet

Skin Ulcer

- Oral
- Head/Neck
- Trunk/Sacral Region
- Genitals
- Lower Legs/Feet

Physical
- Pressure
- Trauma
- Radiation

Vascular
- Arterial insufficiency
- Vascular insufficiency
- Vasculitis

Neurological
- Diabetic neuropathy
- Tabes dorsalis (syphilis)

Metabolic
- Pyoderma gangrenosum
- Diabetic dermopathy
- Necrobiosis lipoidica

Neoplastic
- Squamous cell carcinoma
- Basal cell carcinoma
- Melanoma

Other
Skin Ulcer by Location

Oral Ulcers

Skin Ulcer

- Oral
- Head/Neck
- Trunk/Sacral Region
- Genitals
- Lower Legs/Feet

Single Ulcer
- Traumatic ulcer
- Angular ulcer
- Aphthous ulcer
- Herpes simplex

Multiple Acute Ulcers
- Viral stomatitis
- Erythema multiforme
- Acute necrotizing ulcerative gingivitis

Multiple Recurrent Ulcers
- Aphthous stomatitis
- Herpes simplex infection

Multiple Chronic Ulcers
- Pemphigus vulgaris
- Lichen planus
- Lupus erythematosus
- Bullous pemphigoid
Skin Ulcer by Location

Trunk / Sacral Region

Skin Ulcer

- Oral
- Head/Neck
- Trunk/Sacral Region
- Genitals
- Lower Legs/Feet

Neoplastic
- Squamous cell carcinoma
- Basal cell carcinoma
- Melanoma
- Mycosis fungoides (cutaneous t-cell lymphoma)

Physical
- Physical
- Trauma
- Radiation

Other
Dermatologic

VASCULAR LESIONS

Vascular Lesions

Blanches with Pressure
Small, dilated superficial blood vessels

- Telangiectasia

Does not blanche with pressure
Erythematous or violaceous discolorations of skin due to extravasation of RBCs in dermis

Petechiae < 0.2 cm diameter
Purpura 0.2 - 1.0 cm diameter
Ecchymosis > 1 cm diameter

Congenital

- Hemangioma

Acquired

- Vasculitis
Musculoskeletal

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Acute Joint Pain

Vitamin CD

- Vascular - See vascular joint pain
- Infectious - See infectious joint pain
- Trauma - Multiple injury sites, Open Fracture, Infectious joint pain
- Autoimmune - See inflammatory joint pain
- Metabolic - See pathologic fractures
- Iatrogenic - Hx of prior surgery
- Neoplastic - See Tumour
- Congenital - Scoliosis, Talipes Equinovarus, Meta tarsus adductus, Bow leg, Knock-Knee’d
- Degenerative - Degenerative Disc Disease, Osteoarthritis, Osteoporosis
Chronic Joint Pain

Chronic/Degenerative Change

Peri-Articular

Bone
- Stress Fracture
- Charcot Joint

Articular Cartilage
- Osteoarthritis
- Chondromalacia

Joint Capsule
- Baker Cyst
- Ganglion Cyst
- Adhesive Capsulitis

Synovium
- Monoarthritis
- Polyarthritis

Intra-Articular

Bursa
- Aseptic Bursitis

Epiphysitis/Apophysitis
- Slipped Epiphysis
- Apophysitis (Osgood-Schlatter Disease)

Tendon
- Enthesitis
- Tendinopathy
- Tendon Rupture
- Impingement
- Tenosynovitis
- Ganglion Cyst

Bone
- Stress Fracture
- Charcot Joint
- Pathologic Fracture
- Periostitis
- Epicondylitis

Skin/Fascia
- Fascitis (e.g., Myofascial Pain, Iliotibial Band Friction, Plantar Fasciitis

Muscle
- Delayed Onset Muscle Soreness
- Fibromyalgia
- Myositis
- Ossificans
Musculoskeletal

Bone Lesion

Bone Lesion on X-ray

Rule Out Osteomyelitis & Secondary Metastases

Non-aggressive

Exostotic
  - Osteochondroma

Asymptomatic &/or Non-Active Bone Scan
  - Unicameral Bone Cysts
  - Aneurysmal Bone Cysts
  - Non-ossifying Fibroma

Inflammatory Appearance
  - Osteoid Osteoma ("Nidus" appearance)
  - Osteoblastoma (may be malignant or sclerotic in appearance)

Symptomatic &/or Active Bone Scan
  - Symptomatic Appearance

Not Inflammatory Appearance
  - Chondroblastoma
  - Chondromyxoid Fibroma

Broad or Indistinct Margin &/or Soft Tissue Invasion

Benign
  - No Bone Mineralization
  - Enchondroma (can calcify &/or turn malignant)
  - Giant Cell Tumor ("Soap Bubble" appearance)

Malignant
  - Bone Mineralization,
    Constitutional Symptoms,
    Codman’s Triangle, Excessive
    Scalloping & Destruction of
    Cortical Bone
  - Osteosarcoma (Codman’s Triangle)
  - Chondrosarcoma ("Popcorn" appearance)
  - Ewing’s Sarcoma

Aggressive

Multiple Lytic Lesions

- Multiple Myeloma

Multiple Lytic Lesions

- Multiple Myeloma
Deformity / Limp

Always check neurological and vascular status one joint below the injury

Infection
- Septic Arthritis
- Cortical Hypertrophy
- Osteomyelitis

Inflammation
- Rheumatoid Arthritis
- Toxic Synovitis
- Reactive Arthritis

Other Causes
- Osteoarthritis
- Osteomalacia
- Rickets

Hip Joint
- Hip Dysplasia
- Slipped Capital Femoral Epiphysis
- Legg-Calvé-Perthes Disease
- Patellofemoral Syndrome (Chondromalacia Patellae)
- Osgood-Schlatter Disease
- Patella (e.g., Tendon Rupture, Dislocation, Subluxation)

Knee Joint
- Patellofemoral Syndrome (Chondromalacia Patellae)
- Osgood-Schlatter Disease
- Patella (e.g., Tendon Rupture, Dislocation, Subluxation)

Spine/Stature
- Osteoporosis
- Scoliosis/Spinal Curvature
- Dwarfism
Infectious Joint Pain

Fever/Chills/Myalgia
Constant Pain
Increased Heat and Swelling
Signs & Symptoms of Viral Infection (e.g., Rhinitis/Cough)

Polyarticular
- Viral Myalgia
- Viral Arthritis
- Disseminated Gonococcal Infection (Dermatitis, Migratory Arthralgia & Tenosynovitis)
- Secondary Syphilis (Red/Copper Papules & Mucosal Lesions)
- Fifth Disease (Erythema Infectiosum & Symmetrical Rash)
- Rubella (Measles-like rash)
- Primary HIV Infection
- Endocarditis

Monoarticular

Articular

Peri-Articular
- Cellulitis
- Necrotizing Fascitis
- Septic Bursitis
- Abscess
- Osteomyelitis
- Lymphadenitis
- Warts

Acute Onset
- Septic Arthritis

Insidious Onset
- Fungal tuberculosis
- Lyme Disease (Erythema Migrans)
Inflammatory Joint Pain

Monoarticular
- Gout (Podagra, Tophi)
- Pseudogout
- Early Rheumatic Disease
- Reactive (e.g. Genitourinary Infection)

Oligoarticular (1-4 joints)
- Gout
- Psoriatic (Nail Changes, Plaques)
- Enteropathic (e.g. Inflammatory Bowel Disease)
- Reactive
- Rheumatic Fever (recent Pharyngitis, Carditis)
- Lyme Disease (Tick bite, Migratory red Macules)

Polyarticular (>4 joints)

Peripheral Only
- Subacute & Symmetrical
  - Rheumatoid Arthritis
  - Systemic Lupus Erythematosus
  - Sjögren's (a.k.a. Sicca Syndrome)
  - Scleroderma
  - Henoch-Schonlein Purpura
  - Polymyalgia Rheumatica
  - Granulomatosis with polyangiitis (GPA)/microscopic polyangiitis (MPA)

- Insidious Monoarticular
  - Symmetric (Polymyositis/Dermatomyositis)
  - Asymmetric (Psoriatic Arthritis)

- Migratory
  - Rheumatic Fever

Peripheral & Axial
- Acute Onset
  - Reactive
  - Ankylosing Spondylitis
  - Enteropathic (e.g. Inflammatory Bowel Disease)
  - Psoriatic Arthritis
Vascular Joint Pain

Vascular Joint Pain

Constant Pain (Ischemia)
Acute Onset
Increased Pain with Activity (Claudication)
Cold Extremity or Hyperemia

Spasm
- Vasculitis

Occlusion
- Sickle Cell Anemia
- Peripheral Vascular Disease
- Atherosclerosis
- Deep Vein Thrombosis
- Septic Embolism (e.g. Infective Endocarditis)
- Fat Embolism (e.g. fractured long bone)
- Air Embolism
- Vasculitis

Disruption
- Trauma to Vessel (dislocation/fracture)
- Hemarthrosis (Hemophilia or Trauma)
- Peripheral/Mycotic Aneurysm (e.g. Marfan’s Syndrome, Infective Endocarditis, Atherosclerosis)

Compression
- Any structure compressing the blood vessels
- Abscess
- Cyst
- Neoplasm
- Dislocated Bone
Pathologic Fractures

- Low Energy/No Exercise/Repeated Use
- Always Check neurological and vascular status
  one joint below the injury

Tumours
- See Bone Lesions Scheme

Metabolic Bone Disease

Osteoporosis
- Vertebral/Hip/Distal Radius

Primary
- Post-Menopausal
- Elderly

Secondary

- Gastrointestinal Disease
- Bone Marrow Disorder
- Endocrinopathy
- Malignancy
- Drugs (e.g. corticosteroids)
- Rheumatoid Disease
- Renal Disease
- Poor Nutrition
- Immobilization

Paget’s Disease
- Skull/Spine/Pelvis
- Positive Alkaline Phosphatase

Renal Osteodystrophy
- Secondary to Chronic Renal Failure

Osteomalacia/Rickets
- Diffuse Pain/Proximal Muscle Weakness
  - Vitamin D Deficiency
  - Mineralization Defect
  - Phosphate Deficiency

Soft Tissue

Septic
- Septic Bursitis
- Necrotizing Fasciitis
- Septic Tenosynovitis
- Cellulitis

Aseptic

Intra-articular

Ligament
- Sprain
- Dislocation (3rd Degree Sprain)

Articular Cartilage
- Osteochondritis Dissecans
- Bone Contusion
- Chondromalacia

Synovium
- Traumatic Synovitis
- Monoarthritis
- Polyarthritis
- Synovial Osteochondromatosis

Fibrous Cartilage
- Meniscal Injury
- Labral Injury
- SLAP Lesion

Bone
- Fracture
- Spontaneous Osteonecrosis

Septic Bursa
- Aseptic Bursitis

Ligament
- Sprain
- Dislocation (3rd Degree Sprain)

Tendon/Muscle
- Tendon Rupture
- Muscle Strain
- Confusion

Bone
- Fracture

Skin/Fascia
- Laceration
- Contusion
- Fat Pad Contusion
Fracture Healing

Delayed Union (3 – 6 months)
- Tobacco / nicotine
- NSAIDS
- Ca\(^{2+}\) /Vitamin D deficiency

Non-Union (after 6 months)
- Septic (R/O First)
- Aseptic
  - Hypertrophic (adequate blood flow)
    - Mechanical failure
    - Excessive motion
    - Excessive bone gap
  - Atrophic (inadequate blood flow)
    - Tobacco / nicotine
    - NSAIDS
    - Medications
    - Allergies
    - Biologic Failure

Malunion
- Functional
  - Small deviations from normal axis
- Non Functional
  - Inadequate immobilization/reduction
  - Misalignment before casting
  - Premature cast removal

RED FLAGS (life threatening)
- Multi-trauma
- Pelvic Fracture
- Femur Fracture
- High Cervical Spine Fracture

Operative Fractures:
- Open
- Unstable
- Displaced
- Intra-articular

Non-Operative Fractures:
- Closed
- Stable
- Undisplaced
- Extra-articular

Inflammation → Soft Callus → Hard Callus → Remodelling
- Hours- Days
- Days- Weeks
- Weeks- Months
- Years
Osteoporosis

BMD Testing

T-Scores:

Normal $\geq -1$

$-2.49 < \text{Osteopenia} < -1$

$\text{Osteoporosis} \leq -2.5$

Age $> 50$ years

- All men and women $\geq 65$
- Prior fragility fracture
- Prolonged glucocorticoid use
- Rheumatoid Arthritis
- Falls in past 12 months
- Parental Hip Fracture
- Other medications
- Vertebral fracture
- Osteopenia on X ray
- Smoking/ETOH
- Low body weight (<60kg) or major loss (>10% of when 25)

Age $< 50$ years

- Fragility Fracture
- Prolonged Glucocorticoid use
- Use of other high risk medications
  - Aromatase Inhibitors
  - Androgen Deprivation Therapy
- Hypogonadism/Premature Menopause
- Malabsorption Syndrome
- Primary Hyperparathyroidism
- Other disorders strongly associated with rapid bone loss and/or fracture

OSTEOPOROSIS-BMD testing

T-Scores:

Normal $\geq -1$

$-2.49 < \text{Osteopenia} < -1$

$\text{Osteoporosis} \leq -2.5$

2010 Clinical Practice Guidelines for the Diagnosis and Management of Osteoporosis in Canada
Metastatic - Most common tumour in adults
- Breast
- Prostate
- Thyroid
- Lung
- Renal

Benign
- Osteochondroma
- Osteoid osteoma
- Chondroblastoma
- Fibroxanthoma
- Fibrous Dysplasia
- Non-ossifying fibroma
- Chondromyxoid Fibroma
- Periosteal Chondroma

Aggressive, Non-Malignant
- Giant Cell Tumour
- Enchondroma
- Aneurysmal Bone Cyst

Malignant 66% of adult tumours
- Multiple Myeloma - most common
- Osteosarcoma
- Chondrosarcoma
- Ewing’s Sarcoma
- Fibrosarcoma
- Liposarcoma
- Rhabdomyosarcoma
- Leiomyosarcoma
- Malignant Fibrous Histiocytoma
# Myotomes

## Segmental Innervation of Muscles

<table>
<thead>
<tr>
<th>Muscle Group</th>
<th>Action</th>
<th>Myotome</th>
<th>Peripheral Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>Abduction</td>
<td>C5</td>
<td>Axillary Nerve</td>
</tr>
<tr>
<td></td>
<td>Adduction</td>
<td>C6-C8</td>
<td>Thoracodorsal Nerve</td>
</tr>
<tr>
<td>Elbow</td>
<td>Flexion</td>
<td>C5</td>
<td>Musculocutaneous Nerve</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>C7</td>
<td>Radial Nerve</td>
</tr>
<tr>
<td>Wrist</td>
<td>Extension</td>
<td>C6</td>
<td>Radial Nerve</td>
</tr>
<tr>
<td>Fingers</td>
<td>Flexion</td>
<td>C8</td>
<td>Median Nerve</td>
</tr>
<tr>
<td></td>
<td>Abduction</td>
<td>T1</td>
<td>Ulnar Nerve</td>
</tr>
<tr>
<td>Hip</td>
<td>Flexion</td>
<td>L2</td>
<td>Nerve to Psoas</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>S1</td>
<td>Inferior Gluteal Nerve</td>
</tr>
<tr>
<td></td>
<td>Abduction</td>
<td>L5</td>
<td>Superior Gluteal Nerve</td>
</tr>
<tr>
<td>Knee</td>
<td>Flexion</td>
<td>L5</td>
<td>Tibial Nerve</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>L3</td>
<td>Femoral Nerve</td>
</tr>
<tr>
<td>Ankle</td>
<td>Dorsiflexion</td>
<td>L4</td>
<td>Deep Peroneal Nerve</td>
</tr>
<tr>
<td></td>
<td>Plantarflexion</td>
<td>S1</td>
<td>Tibial Nerve</td>
</tr>
</tbody>
</table>

N.B. There is considerable overlap between myotomes for some actions. The myotomes listed are the dominant segments involved.
Guide to Spinal Cord Injury

<table>
<thead>
<tr>
<th>Spinal Root</th>
<th>Sensory</th>
<th>Motor</th>
<th>Reflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4</td>
<td>Acromioclavicular Joint</td>
<td>Respiration</td>
<td>None</td>
</tr>
<tr>
<td>C5</td>
<td>Radial Antecubital Fossa</td>
<td>Elbow Flexion</td>
<td>Biceps Reflex</td>
</tr>
<tr>
<td>C6</td>
<td>Dorsal Thumb</td>
<td>Wrist Extension</td>
<td>Brachioradialis Reflex</td>
</tr>
<tr>
<td>C7</td>
<td>Dorsal Middle Finger</td>
<td>Elbow Extension</td>
<td>Triceps Reflex</td>
</tr>
<tr>
<td>C8</td>
<td>Dorsal Little Finger</td>
<td>Finger Flexion</td>
<td>None</td>
</tr>
<tr>
<td>T1</td>
<td>Ulnar Antecubital Fossa</td>
<td>Finger Abduction</td>
<td>None</td>
</tr>
<tr>
<td>T7-12</td>
<td>See Dermatomes</td>
<td>Abdominal Muscles</td>
<td>Abdominal Reflex</td>
</tr>
<tr>
<td>L2</td>
<td>Anterior Medial Thigh</td>
<td>Hip Flexion</td>
<td>Cremasteric Reflex</td>
</tr>
<tr>
<td>L3</td>
<td>Medial Femoral Condyle</td>
<td>Knee Extension</td>
<td>None</td>
</tr>
<tr>
<td>L4</td>
<td>Medial Malleolus</td>
<td>Ankle Dorsiflexion</td>
<td>Knee Jerk Reflex</td>
</tr>
<tr>
<td>L5</td>
<td>First Web Space (1st/2nd MTP)</td>
<td>Big Toe Extension</td>
<td>Hamstring Reflex</td>
</tr>
<tr>
<td>S1</td>
<td>Lateral Calcaneus</td>
<td>Ankle Plantarflexion</td>
<td>Ankle Jerk Reflex</td>
</tr>
<tr>
<td>S2</td>
<td>Popliteal Fossa</td>
<td>Anal Sphincter</td>
<td>Bulbocavernosus</td>
</tr>
<tr>
<td>S3/S4</td>
<td>Perianal Region</td>
<td>Anal Sphincter</td>
<td>None</td>
</tr>
</tbody>
</table>

N.B. There is considerable variability in spinal cord levels for motor and reflex testing. Always test the level above and below the suspected injury.
Psychiatric

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Anxiety Disorders

Associated with Panic

Excessive Anxiety, Fear, Avoidance, and/or Increased Arousal

Rule out Anxiety Disorder due to General Medical Condition (e.g. hyperthyroidism, anemia, CHF), Another Mental Disorder, or Substance/Medication-Induced Anxiety Disorder

Associated with Panic and/or Physical (Autonomic) Symptoms

- Associated with Specific Situation/Avoidance of the Specific Situation
  
  Specific Trigger (e.g. water, heights, animals, etc.)
  
  **Specific Phobia**

- Separation From Attachment Figure
  
  **Separation Anxiety Disorder**

- Using Public Transportation, Open Spaces, Enclosed Spaces, Being in a Line, Crowd, or Outside the Home
  
  **Agoraphobia**

Associated with Recurrent Anxious Thoughts

- Recurrent, Unexpected Panic Attacks
  
  **Panic Disorder**

- Public Setting Where a Negative Evaluation May Occur
  
  **Social Anxiety Disorder**

Anxiety Disorders
Recurrent Anxious Thoughts

Excessive Anxiety, Fear, Avoidance, and/or Increased Arousal

Rule out Anxiety Disorder due to Another Medical Condition (e.g. hyperthyroidism, anemia, CHF), Another Mental Disorder, or Substance/Medication-Induced Anxiety Disorder

Associated with Panic and/or Physical (Autonomic) Symptoms
- Generalized Worry
  - Worry about Several Events or Activities for >6 months (e.g. Work or School)
  - Generalized Anxiety Disorder

(*) NB: If the symptoms are clinically significant but do not meet the criteria for a specific anxiety disorder, consider Other Specified Anxiety Disorder or Unspecified Anxiety Disorder

Associated with Recurrent Anxious Thoughts
- Specific Worries
  - Setting Where Patient May Sense Difficulty in Escape (e.g. Public transportation, Lines, Crowds etc.)
  - Agoraphobia

  - Intrusive/ Inappropriate/ Distressing Thoughts With Repetitive Behaviour Meant to Neutralize Anxiety
  - Obsessive Compulsive Disorder

  - Excessive Worry or Fear About Social Situations
  - Social Anxiety Disorder (Social Phobia)

* Not considered an anxiety disorder according to DSM-V

Trauma & Stressor

Related Disorders

Involuntary, Intrusive Thoughts, Memories, Images, Dreams or Flashbacks Causing Psychological Distress

Rule out General Medical Condition (e.g. hyperthyroidism, anemia, CHF), Another Mental Disorder, or Substance/Medication-Induced

Associated with a Stressful Event

Rule out Normal Bereavement

Development of Emotional or Behavioural Symptoms Within 3 Months of Event Onset, Symptoms Resolve <6 Months Post Event

Adjustment Disorder

Associated with a Traumatic Event

< 1 Month Post-Event

Acute Stress Disorder

> 1 Month Post-Event

Post-Traumatic Stress Disorder

NB: If the symptoms are clinically significant but do not meet the criteria for a specific Trauma- and Stressor-Related Disorder consider Other Specified Trauma- and Stressor-Related Disorder or Unspecified Trauma- and Stressor-Related Disorder
Obsessive-Compulsive & Related Disorders

Recurrent, Persistent Thoughts, Urges or Images Associated with Repetitive Behaviours

Rule out Obsessive-Compulsive and Related Disorder due to Another Medical Condition (e.g. hyperthyroidism, anemia, CHF), Another Mental Disorder, or Substance/Medication-Induced Obsessive-Compulsive and Related Disorder

Non-Specific Obsessions and/or Compulsions

Intrusive/ Inappropriate/ Distressing Thoughts With Repetitive Behaviour Meant to Neutralize Anxiety

Obsessive Compulsive Disorder

Preoccupation with Perceived Physical Appearance

Body Dysmorphic Disorder

Specific Obsessions or Compulsions Associated with:

Hair Pulling

Trichotillomania

Skin Picking

Excoriatio Disorder

Difficulty Discarding Possessions

Hoarding Disorder

NB: If the symptoms are clinically significant but do not meet the criteria for a specific Obsessive-Compulsive or Related Disorder consider Other Specified Obsessive-Compulsive or Related Disorder or Unspecified Obsessive-Compulsive or Related Disorder

1. American Psychiatric Association (2013). Diagnostic and Statistical Manual of Mental Disorders (5th ed. DSM-V.)
Personality Disorder

- Enduring pattern of experience and behaviour that deviates from cultural expectations, manifest in two or more of the following areas: cognition, affectivity, interpersonal functioning, and impulse control
- The pattern is **inflexible and pervasive** across many social and personal situations
- The pattern leads to **distress or impairment** in important areas of functioning
- The pattern is **stable and of long duration**, with an onset that can be traced back to childhood or adolescence
- The pattern is **not due to another mental illness, a general medical condition, or substance use**

**Cluster A: Odd or Eccentric**
- **Paranoid** - irrational suspicion or mistrust
- **Schizoid** - emotional detachment, lack of interest in social relationships
- **Schizotypal** - Odd beliefs

**Cluster B: Dramatic, Emotional, or Social**
- **Antisocial** - disregard for social norms, the law, and rights of others
- **Borderline** - instability of identity, relationships, and behaviour
- **Histrionic** - attention-seeking, exaggerated emotional expression
- **Narcissistic** - grandiosity, need for admiration, lack of empathy

**Cluster C: Anxious or Fearful**
- **Avoidant** - social inhibition, inadequacy, hypersensitivity
- **Dependent** - psychological dependence on others)
- **Obsessive-Compulsive** - rigid, inflexible conformity to rules, order, and codes

---

Mood Disorders

Depressed Mood

Medical Conditions:
- Neurological: C.V.A, Parkinson’s, MS
- Viral: Mononucleosis, HIV, Hepatitis
- Endocrine: Cushing’s, Hyper/hypothyroid
- Other: Cancer, B12 deficiency

Drugs of Abuse:
- Alcohol
- Cocaine

Medications:
- Corticosteroids
- Antihypertensives
- Antipsychotics
- Oral contraceptives

Depressed or Elevated Mood

Rule out depressed or elevated mood disorder due to substances and/or general medical condition

Elevated Mood

+/-
Depressed Mood

- 2 week period, depressed mood nearly everyday
  - Major Depressive Disorder

Depressed Mood

- Depressed mood more days than not for > 2 years
  - Persistent Depressive Disorder

- Depressed mood in context of specific stressor < 6 months
  - Adjustment Disorder with Depressed Mood

Prevalence = 5%
Hospitalized patients

Prevalence = 3% over lifetime

Depressed Mood Only

Depressed mood in context of personal loss < 2 months

- Bereavement

None of:
1) Suicidal ideation
2) Psychosis (except hallucinations of deceased)
3) Guilt (except deceased)

Suicide = 15% over lifetime

Psychiatric
Mood Disorders

Elevated Mood

Depressed or Elevated Mood

Rule out depressed or elevated mood disorder due to substances and/or general medical condition

Elevated Mood with or without Depressed Mood

Manic Episode (may have hx of ≥ 1 MDE)

- Bipolar I

MANIA: 1 week elevated or irritable mood
PLUS 3 or more:
1) Grandiosity
2) Decreased sleep
3) Pressure of speech
4) Flight of ideas
5) Distractibility
6) Increase in goal directed activity
7) Excessive pleasureable but harmful activities

Suicide = 15% over lifetime

Hypomanic Episode (must have hx of ≥ 1 MDE)

- Bipolar II

HYPOMANIA: No marked impairment, no psychosis, no hospitalization. At least 4 days.
PLUS 3 or more:
1) Grandiosity
2) Decreased sleep
3) Pressure of speech
4) Flight of ideas
5) Distractibility
6) Increase in goal directed activity
7) Excessive pleasureable but harmful activities

Depressed Mood Only

2 Years Hypomanic Episodes and Depressed Mood

- Cyclothymia

Symptoms without clear mood episode

Medical Conditions:
Neurological: C.V.A, Parkinson’s, MS
Viral: Mononucleosis, HIV, Hepatitis
Endocrine: Cushing’s, Hyper/hypo thyroid
Other: Cancer, B12 deficiency

Drugs of Abuse:
Amphetamines
Alcohol
Cocaine

Medications:
Corticosteroids
Antihypertensives
Antipsychotics
Oral contraceptives
Psychotic Disorders

Prominent mood syndrome (major depression, mania) present for significant portion of illness

Psychotic symptoms present exclusively during major mood syndrome

• Mood disorder with psychotic features

Duration of illness ≤ 1 month

• Brief psychotic disorder

1 or more:
1) Delusions
2) Hallucinations
3) Disorganized speech
4) Grossly disorganized or catatonic behaviour

Psychotic symptoms also present outside of mood episodes

• Schizoaffective disorder (bipolar & depressive)

Duration of illness 1-6 months

• Schizophreniform disorder

2 or more (1 must be 1-3):
1) Delusions
2) Hallucinations
3) Disorganized speech
4) Grossly disorganized or catatonic behaviour
5) Negative sx (affective flattening, alogia, avolition)

Mood syndromes absent (or brief relative to duration of psychotic symptoms

Psychotic symptoms not limited to delusions

Duration of illness ≥ 6 months

• Schizophrenia

Non-bizarre delusions ≥ 1 month, no decline in functioning, behaviour is not odd

• Delusional disorder

Delusions developed in context of close relationship with a person with already established similar delusion

• Shared psychotic disorder (Folie a Deux)

Psychosis
Rule out psychotic disorder due to substances and/or general medical condition

Psychotic Disorder

Medical Conditions:
- Para/Neoplastic
  - Brain tumour
  - Stroke
- Parkinson's
  - AIDS
  - syphilis
  - Epilepsy
- Infectious
  - Cushing's
  - MS
  - SLE
- Degenerative
  - Endocrine
  - Vascular

Drugs of Abuse:
- Cocaine
  - Alcohol (rare)
- Cannabis
- Opiates (rare)
- PCP

Hallucinogens

Medications:
- Amphetamines
  - Methylphenidate
  - Steroids
- Dopamine Agonist
  - Anticholinergic
  - L-Dopa

Psychotic symptoms also present outside of mood
Schizoaffective disorder

Criteria: see schizophreniform disorder

Suicide = 10%

Neuroleptic Malignant Syndrome
Side effects of anti-psychotics
Sx: Hyperpyrexia (>38.5°C), muscle rigidity and mental status changes
20% mortality
Somatoform Disorders

Somatoform Disorder

Patient presents with complex medical problem or symptoms that cannot be explained medically

Symptoms Consciously Produced

- Motivation is primary gain (to assume the sick role)
  - Factitious Disorder
- Motivation is secondary gain
  - Malingering

Symptoms Not Consciously Produced

- Focus is the sick role; not accepting reassurance
  - Illness Anxiety Disorder
- Focus is a physical symptom
- Focus is appearance; exhibit significant distress
  - Body Dysmorphic Disorder

Pain; psychological factors important
- Pain Disorder

Multiple symptoms; long history
- Somatization Disorder
  - Criteria
    - 4 pain sx
    - 2 GI sx
    - 1 sexual sx
    - 1 pseudo-neuro sx

Neurologic
- Conversion Disorder
  - Must have symptoms affecting movement or sensation (non-anatomic and unexplainable)

One or more symptoms for at least six months
- Undifferentiated Somatoform Disorder
# Otolaryngologic

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Hearing Loss

Conductive

Hearing Loss

Otoscopy, Tuning Fork, Confirm with Audiogram

Conductive Hearing Loss

Sensorineural Hearing Loss

Normal Otoscopy

Abnormal Otoscopy

Middle Ear

External Ear

Middle Ear

- Otosclerosis
- Congenital (Ossicular Chain Malformation)
- Eustachian Tube Dysfunction

- Cerumen
- Foreign Body
- Otitis Externa
- Inflammation
- Congenital (Atresia)
- Trauma
- Benign Mass (Polyp, Osteoma, Exostosis)
- Tumors (SCC)
- Dermatologic

- Otitis Media
- Tympanic Membrane Perforation
- Cholesteatoma
- Trauma (barotrauma)
- Tumors (Giomus, Adenoma)
- Eustachian Tube Dysfunction
Hearing Loss

Sensorineural

Otoscopic, Tuning Fork, Confirm with Audiogram

Conductive Hearing Loss

Sensorineural Hearing Loss

Symmetric

Asymmetric
- Neoplastic (Vestibular Schwannoma)
- Retrocochlear Tumor
- Iatrogenic (Radiation, Surgery)
- Idiopathic Unilateral Sensorineural Hearing Loss

Congenital
- Hereditary
  - Mondini dysplasia
  - Atresia
- Non-hereditary:
  - Developing Cochlear Insults: CMV, Rubella, Toxoplasmosis, HIV, Syphilis, Hepatitis
  - Teratogenic drugs, Alcohol

Neurogenic (Central)
- Infection (Meningitis)
- Cardiovascular Ischemia
- Multiple Sclerosis

Cochlear (Inner-Ear)
- Presbycusis
- Loud Noise/ Trauma
- Cochleitis
- Ototoxic Drugs (Oral Aminoglycosides, etc.)
- Meniere's Disease
- Autoimmune (Cogan's Syndrome)
Hoarseness

Acute

If Hoarseness persists > 3 months, Refer to ENT

Acute
< 3 weeks

Constant

Infectious
- Viral Laryngitis
- Fungal Laryngitis (Monilia)
- Bacterial Laryngitis
- Bacterial Tracheitis

Inflammatory
- Acute Nonspecific Laryngitis (GERD, Smoking, Allergies, Vocal Abuse)
- Inhaled Steroids

Trauma
- External Laryngeal Trauma
- Iatrogenic
  - Endoscopy
  - Endotracheal intubation

Non-Acute
> 3 weeks

Variable

Inflammatory
- Voice Overuse

Hyperfunction
- Muscle Tension Dysphonia
Hoarseness

If Hoarseness persists > 3 months, Refer to ENT

Acute < 3 weeks

Non-Acute > 3 weeks

Constant

Variable

• Functional

Infectious

• Bacterial Infection
• Fungal Infection (Monilia)

Inflammatory

• Chronic Laryngitis
• GERD
• Smoking

Trauma

• External
• Internal (Surgery, Intubation)

Benign Mucosal Changes

• Nodules
• Polyps
• Granuloma Cysts
• Reinke’s Edema

Neoplastic

• Malignancy: Squamous Cell Carcinoma
• Benign: Papilloma (HPV 6 & 11)
• Dysplasia: Leukoplakia

Neurological

• Vocal Cord Paralysis
• Spasmodic Dysphonia
• Tremor

HOARSENESS: Non-Acute

HOARSENESS: Functional
Neck Mass

Inflammatory
- Bacterial
- Viral
- Granulomatous Disease
  - Tuberculosis
  - Atypical Mycobacterium
  - Actinomycosis
  - Cat-Scratch Disease

Sialadenitis
- Parotid Salivary Gland
- Submandibular Salivary Gland

Congenital
- Thyroglossal Duct Cyst
- Branchial Cleft Anomalies
- Dermoid Cyst
- Teratoma
- Lymphatic Malformation
- Hemangioma

Neoplasms
- Lymphoma
- Thyroid Neoplasm
- Neoplasm of Salivary Glands
- Neurogenic Neoplasm
  - Schwannoma
  - Neuroblastoma
  - Ganglioneuroma
- Paragangliomas
  - Carotid Body Tumors

Primary
- Squamous Cell Carcinoma
- Thyroid (Spread to Cervical Lymph Nodes)
- Melanoma
- Distant site (Stomach, etc.)
Otalgia

Otolaryngologic

Increased Pain With Pinna Manipulation

External Auditory Canal
- Otitis Externa
- Osteomyelitis of Temporal Bone
- Herpes Simplex Zoster (Ramsay Hung Syndrome if Facial Nerve Paralysis)
- Furunculosis

Mastoid
- Mastoiditis

Auricle
- Cellulitis/Perichondritis
- Trauma (Frostbite, Auricular Hematoma)
- Autoimmune (Relapsing Polychondritis)

Abnormal Tympanic Membrane
- Acute Otitis Media
- Barotrauma
- Traumatic Perforation

Ulceration/Abnormal Tissue Growth
- Squamous Cell Carcinoma
- Sarcoma
- Cholesteatoma (Typically Otorrhea)

Referred
- Via Vagus or Glossopharyngeal Nerves
- Nasopharyngeal, Oropharyngeal, Laryngeal, Hypopharyngeal Pain
- Thyroiditis
- Aerodigestive Tract Malignancy
- Post-tonsillectomy

Periauricular
- TMJ Pathology
- Parotiditis

Pain Unchanged With Pinna Manipulation

Otaligia
Smell Dysfunction

ENT History, Physical Exam, Anterior Rhinoscopy
Sensory Testing, CT/MRI to Rule Out Neoplasms, Fractures & Congenital abnormalities

Nasal Obstruction/URTI
- Septal Deviation
- Allergic Rhinitis
- Bacterial/Viral Infection (Influenza)

Trauma
- Foreign Body
- Nasal Surgery
- Base of Skull Fracture
- Nasal Fracture

Endocrine/Metabolic
- Alcoholism
- Diabetes Mellitus
- Adrenal Hypofunction
- Adrenal Hyperfunction
- Vitamin B12 Deficiency
- Zinc Deficiency
- Malnutrition

Neoplastic
- Nasal Polyps
- Juvenile Nasopharyngeal Angiofibroma

Toxins and other Factors
- Smoking
- Drugs
- Radiation
- Toxin Exposure
Tinnitus

Objective

Subjective (90%)

Objective Pulsatile or Rhythmic (10%)

Vascular Potentially Auscultated

Muscular

Arterial
- Atherosclerosis
- Idiopathic Intracranial Hypertension
- Acute Exacerbation of Systemic Hypertension
- Developmental Anomaly
- Blood flow in normal artery near ear
- Persistent Stapedial Artery
- Glomus Tympanicum

Venous
- AV Shunt
- High Jugular Bulb
- Glomus Jugulare
- Hyperthyroidism

- Myoclonus of Stapedius/Tensor Tympani/Palatal Muscles
- Degenerative Disease of the Head and Neck
- Eustachian Tube Dysfunction
Tinnitus

Subjective

Unilateral
On Audiogram
Perform MRI to rule out RC Lesion
- Acoustic Neuroma
- Lesion of Cochlear or Auditory Nerve
- Brainstem Lesion
- Multiple Sclerosis
- Infarction
- Ménière's Disease

Subjective
Heard only by patient (Common)

Bilateral
On Audiogram

Objective
Heard by others (Rare)

No Hearing Loss

Conductive Hearing Loss
- Lesion of External or Middle Ear
- Impacted Cerumen
- Otitis Media
- Otosclerosis

Sensorineural Hearing Loss
- Noise Induced
- Ototoxicity
- Presbycusis
- Drugs (Propranolol, Levodopa, Loop Diuretics)
- Congenital

Somatic
- TMJ
- Bruxism
- Whiplash
- Skull Fracture
- Closed Head Injury

Hearing Loss

Metabolic Causes:
- Thyroid Dysfunction
- Vitamin A, B, Zinc Deficiency
- Psychogenic, Anxiety, Depression
- Drugs (Salicylates, Quinidine, Indomethacin)
- Idiopathic

Somatic Hearing Loss

Subjective
Heard only by patient (Common)

Objective
Heard by others (Rare)
Ophthalmologic

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Cross Section of the Eye & Acronyms

Ophthalmology Acronyms

- **EOM**: Extra ocular movements
- **IOL**: Intraocular Lens
- **IOP**: Intraocular Pressure
- **OD**: Oculus Dexter (right eye)
- **OS**: Oculus Sinister (left eye)
- **OU**: Oculus Uterque (both eyes)
- **PERRLA**: Pupils Equal, Round, Reactive to Light & Accommodation
- **RAPD**: Relative Afferent pupillary defect
- **SLE**: Slit Lamp Exam
- **VA**: Visual Acuity
Approach to an Eye Exam

1. History
2. Obvious Physical Trauma
3. Initial Assessment
   A. Visual Acuity
   B. Pupils
      a. Light Reflex, Accommodation, RAPD
   C. Ocular Movements (CN 3, 4, 6)
   D. Visual Fields by Confrontation
4. Slit Lamp Exam
   A. Lids / Lashes / Lacrimal
   B. Sclera / Conjunctiva
   C. Cornea
   D. Anterior Chamber
   E. Iris
   F. Lens
   G. Vitreous Humor
5. Fundoscopy
   A. Retina
   B. Optic Nerve / Disc / Cup: Disc Ratio
   C. Macula
   D. Fovea
   E. Blood Vessels
**Acute Vision Loss**

*Unilateral*

- Complete/Partial Homonymous Hemianopia
  - Infarct
  - Intracranial Hemorrhage
  - Tumor

*Bilateral*

- Other
  - Migraine
  - Systemic Hypoperfusion

**Clinical Pearl:**
- Patients with bilateral acute vision loss should have a CT.
Acute Vision Loss

Unilateral

Bilateral

Painful

Optic Nerve

* Keratopathy

No Abnormalities of the Optic Nerve

* Acute Angle Closure Glaucoma (fixed dilated pupil)

Abnormalities of the Optic Nerve

* Temporal Arteritis
* Demyelination
* MS
* Idiopathic
* Glaucoma

Painless

Cornea

Retina

* Retinal Detachment
* Retinal Artery Occlusion
* Retinal Vein Occlusion
* Ischemic Optic Neuropathy

Transient Ischemic Attack

Vitreous

Retina Visible

* Visual Cortex Infarction

Retina Not Visible

* Retinal Hemorrhage
* Vitreous Hemorrhage

Clinical Pearls:
- Optic neuritis causes pain with EOM
- Temporal arteritis causes temporalis pain and pain with mastication
- Acute angle closure glaucoma causes high intraocular pressure, unilateral eye pain, mid-dilated pupil and n/v
- Retinal detachment can present as a veil over the vision and with flashes and floaters.
- TIA, vein or artery occlusion requires stroke work-up
# Chronic Vision Loss

## Anatomic

### Clinical Pearls:
- Edema can cause halos in the vision.
- Bilateral disc swelling and any suspected mass require imaging.

### Diagram:

```
Chronic Vision Loss

Perform slit-lamp exam to localize: Left → Right on Scheme

Cornea
- Keratoconus
- Stromal Scaring
- Neovascularization
- Edema
- Pterygium

Lens
- Cataract (Nuclear, Subcapsular, Cortical)

Macula
- Age Related Macular Degeneration (Wet, Dry)

Retina
- Diabetic Retinopathy (Background, Pre-Proliferative, Proliferative)
- Retinitis Pigmentosa (Decreased night vision, loss of peripheral vision)
- Systemic inflammatory conditions

Optic Nerve
- Glaucoma (Open-Angle)

Optic Track
- Optic Nerve Compression
- Pituitary Lesion
- Meningioma
- Craniopharyngioma

Pallor, Papilledema, Irregular Disc Large Cup:Disc

Cotton wool spots, Micro-aneurysms, Hemorrhage and Macular Edema

Visual field defects, decrease in color vision
```
Amblyopia

Deprivational*
Obstruction of Visual Axis
- Ptosis
- Congenital Cataracts
- Congenital Corneal Opacities
- Hemangioma
- Retinal Disease/Damage (undiagnosed not responsive to treatment)

Refractive Error
- Severe Anisometropia (Unequal Refractive Error)
- Hyperopia
- Astigmatism

Strabismic
Abnormal Binocular Interaction

See Strabismus scheme

Clinical Pearl:
- Congenital cataracts and retinoblastoma’s cause leukocoria and a decreased red reflex

* Can cause permanent visual impairment if not treated urgently in infancy
**Diplopia**

Clinical Pearls:
- Diplopia is almost always binocular.
- CN VI palsy is a red flag for intracranial masses.
- Look for ptosis with CN III palsy.
- Examine both eyes to determine which is affected.
- Neurologic symptoms suggest a mass as the cause.
- Myasthenia Gravis is fatiguable.
- Migraine is a diagnosis of exclusion.

**Monocular**
- Refractive Error
- Cataract/Lens Dislocation
- Functional
- Corneal Distortion/Scarring
- Vitreous Abnormalities

**Neuromuscular Junction**
- Myasthenia Gravis

**Strictly Horizontal**
(Cranial Nerve VI problem)
- Ischemia
- Diabetes Mellitus
- Aneurysm
- Tumor
- Trauma

**Binocular**

**Neuronal**
(Non-Comitant)

**Horizontal and/or Vertical**

**Extraocular Muscle Restriction/Entrapment**
- Orbital Inflammation
- Orbital Tumor
- Orbital Floor Fracture

**Cranial Nerve III**
- Eye depressed, abducted, ptosis, large/unreactive pupil

**Cranial Nerve IV**
- Eye cannot depress when looking medially

**Grave's Ophthalmopathy**
- Hyperthyroidism
Pupillary Abnormalities

Isocoria

Pupillary Abnormality

Equal (Isocoria)

Relative Afferent Pupil Defect
- Optic Neuritis
- Ischemic Optic Neuropathies
- Optic Nerve Tumor
- Retinal detachment
- Traumatic/Compressive Optic Neuropathy

Bilateral Impairment

Dilated Pupils (Mydriasis)

Constricted Pupils (Miotic)
- Syphilis (light-near dissociation)
- Pharmacologic (e.g. Opioids, Alcohol)

Dorsal Midbrain (Parinaud’s Syndrome)
- Tumor
- Hemorrhage
- Hydrocephalus

Neuromuscular Junction Dysfunction
- Botulism

Pharmacologic
- Atropine
- LSD
- Cocaine
- Amphetamines
Pupillary Abnormalities

Anisocoria

Clinical Pearl:
- Pupils should be examined in both a light and dark setting to determine whether the big pupil or the small pupil is abnormal.
**Red Eye**

**Atraumatic**

- Lids/Orbit/ Lacrimal System
  - Blepharitis
  - Stye/ Chalazion
  - Dacrocystitis
  - Pre-septal cellulitis
  - Orbital Cellulitis

- Ocular Surface
  - Subconjunctival Hemorrhage
  - Conjunctivitis
  - Corneal Abrasion/ Erosion
  - Keratitis/Corneal Ulcer
  - HSV Keratitis

- Intermediate Layers
  - Episcleritis
  - Scleritis
  - Uveitis
  - Iritis

- Intraocular
  - Acute Angle Closure Glaucoma
  - Endophthalmitis

**Clinical Pearl:**
- Orbital cellulitis can present with pain on EOM and orbital signs of involvement
Red Eye

Traumatic

Surface Injury
- Corneal Abrasion
- Ultraviolet Keratitis
- Chemical (Acid, alkali)

Blunt Trauma
- Hyphema, diplopia, periorbital ecchymosis, subcutaneous emphysema of lid
- Orbital Rim/Mid-facial Fracture
- Orbital Floor Fracture
- Orbital Apex Injury/
  Retrobulbar Fracture**

Globe Penetrating Injury
- Hyphema, history of trauma/high velocity impact, reduced visual acuity

Associated Injury
- Lids: Swelling, Laceration
- Conjunctiva: Subconjunctival hemorrhage
- Cornea: Abrasion
- Iris: Laceration, iritis, iridodialysis
- Pupil: Traumatic mydriasis
- Lens: Cataract, dislocation
- Vitreous hemorrhage
- Retina: Tear, hemorrhage, choroidal rupture
- Glaucoma
- Optic Neuropathy

** Urgent lateral canthotomy

Clinical Pearls:
- With chemical burns, it is important to determine if the burn was caused by acid or worse, alkali.
- With a globe-penetrating injury, call ophthalmology, shield the eye, and do not touch the eye.
Strabismus
Ocular Misalignment

- Clinical Pearl:
  - Strabismus is most often seen in pediatrics.

- Phoria
  - Latent deviation
  - Symmetrical corneal light reflex
  - Negative cover test positive
  - Cover/uncover test
  - Esophoria (eye moves medial $\rightarrow$ centre when uncovered)
  - Exophoria (eye moves lateral $\rightarrow$ centre when uncovered)

- Tropia
  - Manifest deviation
  - Asymmetrical light reflex
  - Positive cover test

- Paretic
  - Non-comitant
  - Angle of misalignment changes with direction of gaze

- Non-Paretic
  - Comitant
  - Angle of misalignment unchanged with direction of gaze

- Horizontal (eso/exotropia)
  - CN VI problem
  - (eye cannot abduct)

- Horizontal and/or vertical
  - (Eso/exotropia, hyper/hypotopia, mixed)
  - CN III Problem (eye is depressed and abducted, ptosis, large/unreactive pupil)
  - CN IV Problem (eye cannot depress when looking medially)

- CN III Problem
  - Eye is depressed and abducted, ptosis, large/unreactive pupil

- CN IV Problem
  - Eye cannot depress when looking medially

- Accommodative Esotropia
  - (onset 2-4yrs, hyperopic)

- Congenital Esotropia
  - (contralateral eye deviates medial $\rightarrow$ straight when ipsilateral covered)

- Exotropia
  - (contralateral eye deviates lateral $\rightarrow$ straight when ipsilateral covered)
Neuro-Ophthalmology

Visual Field Defects

- Optic Nerve Lesion (Monocular vision loss)
- Optic Chiasm Lesion (bitemporal hemianopia)
  - Pituitary/metastatic tumor
  - Craniopharyngioma
  - Meningioma
  - Optic nerve glioma
  - Aneurysm
  - Infection
  - MS
  - Sarcoidosis
- Optic Tract Lesion (Incongruous right homonymous hemianopia)
- Lateral Geniculate Nucleus Lesion (Right homonymous horizontal sectroanopia)
- Meyer’s Loop Lesion (Incongruous superior homonymous quadrantanopia)
- Right Parietal Lobe Lesion (Inferior homonymous hemianopia)
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<td>Elbert Jeffrey Manalo</td>
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<td>Dr. Susan Bannister</td>
<td>Cody Flexhaug</td>
<td>David Cook</td>
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<td>Dr. Kelly Millar</td>
<td>Carmen Fong</td>
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<td>Carly Hagel</td>
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<td>Rebekah Jobling</td>
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<td>Beata Komierowski</td>
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<td>Christopher Skappak</td>
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</tbody>
</table>
Developmental Delay

No Milestones Lost

Ensure Normal Vision and Hearing

Assess Pattern of Delay

Isolated Domain Delay

Reduced Respiratory Drive
- Cognitive Impairment (Mental Retardation, Intellectual Handicap)
- Developmental Language Disorder

Airway Obstruction
- Cerebral Palsy
- Primary Muscle Disorder

Global Developmental Delay

- Syndromic
- Genetic Disorder
- Teratogenic Disorder (e.g. Fetal Alcohol Spectrum Disorder)

Milestones Lost

- Neurodegenerative Disorder
- Metabolic Disorder
- Neoplastic Disorder

Language and Social Impairment

- Autism Spectrum Disorder
- Pervasive Developmental Disorder
- Landau-Kleffner Syndrome
- Selective Mutism
- Mechanical (e.g. dental, cleft palate)
Pediatric School Difficulties

History of Developmental Delay? See Developmental Delay Scheme

Address Underlying Medical Disorders and Vision or Hearing Impairments

Primarily Behaviour Difficulties

- Social Skills Deficit and Atypical Behaviour
  - Consider Autism Spectrum Disorder

Primarily Academic Difficulties

- Academic and Behavioural Difficulties
  - Check Criteria for Attention Deficit Hyperactive Disorder
  - Consider other Comorbidities

Academic and Behavioural Difficulties

- Atypical Behaviour
  - psychiatric Illness
    - Anxiety Disorder
    - Depressive Disorder

- Defiant Behaviour
  - Oppositional Defiant Disorder/ Conduct Disorder

- Isolated to Specific Academic Areas
  - Learning Disability

- All Areas Impacted
  - Cognitive Impairment (Mental Retardation, Intellectual Handicap)

Home Environment

- Neglect
- Abuse
- Trauma
Small for Gestational Age

Birth Weight < 10th Percentile

Constitutionally Small

Maternal
- Chronic Maternal Hypertension
- Gestational Hypertension
- Autoimmune Disease
- Protein-calorie Malnutrition
- Smoking/Alcohol
- Substance Abuse
- Uterine Malformations
- Hemoglobinopathies (Sickle Cell)
- Renal Insufficiency
- Anti-phospholipid Antibodies

Fetal
- Constitutionally Small
- Multiple Gestation
- Intrauterine Infections
- Chromosomal Anomaly
- Genetic Syndromes
- Congenital Malformations

Placental Insufficiency
- Placental/Cord Abnormalities
- Chronic Abruptio
- Placenta Previa
- Abnormal Cord Insertion
Large for Gestational Age

Suspected LGA

Birth Weight > 90\textsuperscript{th} Percentile

Rule Out:
- Wrong Dates,
- Twins,
- Polyhydramnios,
- Fibroids and Pelvic Mass

True LGA

Maternal Factors
- Familial
- Diabetes Mellitus (Macrosomia)
- Maternal Obesity

Fetal
- Syndromes
- Constitutionally Large
**Congenital Anomalies**

- **Malformation**
  - Embryonic development failure or inadequacy (often multifactorial)

- **Deformation**
  - Abnormal mechanical forces distorting otherwise normal structures (e.g. exoligohydramnios)

- **Disruption**
  - Destruction / Breakdown of previously normal tissue (e.g. ischemia)

- **Association of Anomalies (Syndromic)**
  - Chromosomal
  - Single Gene
  - Teratogenic
  - Association (e.g. VACTERL)

**Things to Consider:**
- **History** – Prenatal: maternal health, exposures, screening, ultrasounds; delivery; neonatal
- **Family History** – Three Generations: prior malformations, stillbirths, recurrent miscarriages, consanguinity
- **Physical Exam** – Variants, minor anomalies, major malformation
- **Diagnostic Procedures** – Chromosomes, molecular/DNA, radiology, photography, metabolic
- **Diagnostic Evaluations** – Prognosis, recurrence, prenatal diagnosis, surveillance, treatment
Preterm Infant Complications

Respiratory
- Transient Tachypnea of the Newborn (TTN)
- Respiratory Distress Syndrome (RDS)
- Chronic Lung Disease (CLD)
- Bronchopulmonary Dysplasia (BPD)
- Apnea of Prematurity (AOP)

Hemodynamics
- Persistent Ductus Arteriosis (PDA)

Gastrointestinal
- Necrotizing Enterocolitis (NEC)

Neurologic
- Intraventricular Hemorrhage (IVH)
- Neurodevelopmental Impairments (NDI)

Ophthalmology
- Retinopathy of Prematurity (ROP)
Failure to Thrive
Adequate Calorie Consumption

Inadequate Calorie Consumption

Increased Losses
- Vomiting
- Gastroesophageal Reflux
- Renal Tubular Acidosis

Malabsorption
- Pancreatic Insufficiency (Cystic Fibrosis)
- Celiac Disease
- Liver Disease

Increased Demands
- Congestive Heart Failure
- Chronic Respiratory Failure

Failure to Utilize
- Metabolic Disorders
- Syndromes
Failure to Thrive

Inadequate Calorie Consumption

- Organic Illness
  - Chronic Renal Failure
  - Esophagitis
  - Congenital Heart Defect
  - Structural Dystrophies

- Protein-Energy Malnutrition
  - Kwashiokor (inadequate protein intake)
  - Marasmus (inadequate protein and energy intake)

- Psychosocial Illness
  - Oral Aversion
  - Neglect
  - Poverty
  - Disturbed Parent-Child Relationship
Hypotonic Infant (Floppy Newborn)

Hypotonic Infant

Decreased LOC, Axial Weakness, Normal Strength, Normal Reflexes

Central Nervous System

Brain
- Hypoxic-Ischemic Encephalopathy*
- Trisomy 21*
- Intracranial Hemorrhage
- CNS Infection
- Metabolic Diseases
- Prader-Willi
- Intracranial Mass/lesion
- Other Congenital Syndromes

Spinal Cord
- Spinal Muscular Atrophy
- Trauma
- Hematoma
- Abscess
- Arteriovenous Fistula
- Infantile Neuropathic Axonal Degeneration
- Poliomyelitis

Alert, Responding to Surroundings, Profound Peripheral Weakness

Peripheral Nervous System

Nerves
- Congenital Hypomyelinating Neuropathy
- Infantile Neuroaxonal Degeneration

Neuromuscular Junction
- Congenital and Transient Myasthenia Gravis
- Infantile Botulism
- Magnesium Toxicity
- Aminoglycoside Toxicity

Muscle
- Congenital Myotonic Dystrophies
- Metabolic Myopathies
- Central Core Disease
- Other Congenital Myopathies

* Indicates most common causes of hypotonia
Acute Abdominal Pain

Focal

- Epigastric
  - Gastritis
  - Peptic Ulcer Disease
  - Pancreatitis
  - Gastroesophageal Reflux Disease

- Right Upper Quadrant
  - Hepatitis
  - Cholelithiasis
  - Cholecystitis
  - Pyelonephritis
  - Right Lower Lobe Pneumonia

- Left Upper Quadrant
  - Viral Illness with Splenic Enlargement/Rupture
  - Pyelonephritis
  - Left Lower Lobe Pneumonia

Generalized/Migratory

- Intussusception
- Gastroenteritis
- Viral Illness
- Diabetic Ketoacidosis
- Bowel Obstruction
- Henoch-Schonlein Purpura
- Malrotation/Volvulus
- Urinary Tract Infection
- Peritonitis
- Somatization
- Sickle Cell Crisis
- Ileus
- Infantile Colic

- Appendicitis
- Ovarian Cyst
- Ovarian Torsion
- Ectopic Pregnancy
- Pelvic Inflammatory Disease
- Nephrolithiasis
- Dysmenorrhea

- Right Lower Quadrant
- Left Lower Quadrant

- Right Lower Lobe Pneumonia
- Ovarian Cyst
- Ovarian Torsion
- Ectopic Pregnancy
- Pelvic Inflammatory Disease
- Nephrolithiasis
- Dysmenorrhea
Pediatric Vomiting
Gastrointestinal Causes

- Gastrointestinal Disease
  - Upper Gastrointestinal
  - Acute
    - Infectious Gastroenteritis
    - Gastric/Duodenal Obstruction
    - Pyloric Stenosis
    - Intussusception
    - Gastric Volvulus
    - Necrotizing Enterocolitis
  - Chronic
    - Gastroesophageal Reflux Disease
    - Peptic Ulcer Disease
    - Gastroparesis
    - Gastritis
  - Lower Gastrointestinal
  - Acute
    - Infectious Gastroenteritis
    - Small/Large Bowel Obstruction
    - Intussusception
    - Acute Appendicitis
    - Incarcerated Hernia
  - Chronic
    - Intestinal Atresia
    - Midgut malrotation
- Other Systemic Disease
  - Hepatobiliary
    - Acute Hepatitis
    - Acute Pancreatitis
Pediatric Vomiting

System Causes

Vomiting

Gastrointestinal Disease

Endocrine/Metabolic
- Pregnancy
- Diabetes/ DKA
- Uremia
- Hypercalcemia
- Addison’s Disease
- Thyroid Disease

Other
- Sepsis (e.g. Pyelonephritis, Pneumonia)
- Radiation Sickness
- Poisoning
- Food Allergy
- Urinary Tract Infection

Drugs/Toxins
- Chemotherapy
- Antibiotics
- Carbon Monoxide

Central Nervous System
- Chemotherapy
- Antibiotics
- Carbon Monoxide

High Intracranial Pressure
- Hemorrhage
- Meningitis
- Head Trauma
- Brain Tumour
- Hydrocephalus

Vestibular (Inner Ear)
- Ear Infection (Otitis Media)
- Motion Sickness
- Vestibular Migraine
- Ménière’s Disease
- Labrynthitis

Psychiatric
- Self-Induced (Bulimia)
- Cyclic Vomiting
- Psychogenic
Neonatal Jaundice

< 1 Week Old

Pre-Hepatic

Measure TSB or TcB

Physiologic

Increased Production

RBC Intrinsic

> 1 Week Old

Hepatic

Pathologic
(Jaundice before 24 hours of age, rapid elevation of serum bilirubin greater than 80uM and peak bilirubin greater than 350 uM)

Decreased Metabolism

RBC Extrinsic

Post-Hepatic

Measure TSB and Conjugated Bilirubin

Increased Re-Absorption

RBC Intrinsic
Pediatric Diarrhea

- Infectious
  - Viral
  - Bacterial
  - Parasitic

- Malabsorption
  - Lactase Deficiency
  - Cystic Fibrosis
  - Celiac Disease
  - Primary Immuno-Deficiency
  - Dissacharidase Deficiency

- Other
  - Toddler’s Diarrhea
  - Constipation/Overflow Diarrhea
  - Drugs
  - Laxative Abuse
  - Inflammatory Bowel Disease
  - Overfeeding
  - Short Bowel Syndrome
  - Food Poisoning
  - Irritable Bowel Syndrome
**Constipation (Pediatric)**

**Infrequent Bowel Movements? Hard, Small stools? Painful evacuation? Encopresis?**

**Neonate/Infant**
- Dietary/Functional
  - Insufficient Volume/ Bulk
- Neurologic
  - Hirschsprung’s Disease
  - Imperforate Anus
  - Anal Atresia
  - Intestinal Stenosis
  - Intestinal Atresia
  - Cystic Fibrosis

**Older Child**
- Dietary/Functional
  - Insufficient Bulk/Fluid
  - Withholding
  - Painful (e.g. Fissures)
  - Drugs (Narcotics, Psychotropics)
- Anatomic
  - Bowel Obstruction
  - Pseudo-obstruction
- Neurologic
  - Hirschsprung’s Disease
  - Spinal Cord Lesions
  - Myotonia Congenita
  - Guillain-Barré Syndrome
  - Muscular Dystrophy
  - Sexual Abuse
Mouth Disorder (Pediatric)

Mouth Disorders

Teeth
- Teething

Painful

Gastrointestinal
- Crohn’s Disease
- Ulcerative Colitis

Other
- Gum Disease (e.g. Gingivitis)
- Hand, Foot and Mouth Disease (Coxsackie Virus)
- Streptococcal Throat Infection
- Canker Sore
- Herpes Simplex Virus
- Inflamed Papillae (e.g. Burn)

Mucous Membranes

Non-Painful

Non-Inflammatory
- Impetigo
- Mucocele
- Candidiasis

Inflammation
- Allergic Reaction
Depressed / Lethargic Newborn

**Child Related**
- Birth Injury
- Congenital Malformation
- TORCH Infection
- Congenital Heart Defect

**Respiratory**
- Respiratory Distress Syndrome
- Birth Asphyxia
- Pneumothorax
- Meconium Aspiration
- Sepsis

**Maternal Related**
- Drugs (Ex. SSRI)
- Diabetes Mellitus
- Gestational Hypertension

**Other**
- Anemia
- Shock
- Hypothermia
- Hypoglycemia
Cyanosis in the Newborn

Non-Respiratory

Central and Peripheral

Cardiovascular

- Congenital
- Acquired
- Sulphhemoglobin

Left-to-Right Shunt

- Patent Ductus Arteriosus
- Ventricular Septal Defect
- Atrioventricular Septal Defect
- Truncus Arteriosus
- Atrial Septal Defect
- Total Anomalous Pulmonary Venous Return

Hemoglobinopathy

- Congenital
- Acquired
- Sulphhemoglobin

Right-to-Left Shunt

- Transposition of the Great Arteries
- Tetralogy of Fallot
- Obstructive/Hypoplastic Lesions
- Aortic Atresia/Stenosis
- Interruption of the Aortic Arch
- Aortic Coarctation

Peripheral Only

- Poor Perfusion
- Acrocyanosis

Respiratory
Cyanosis in the Newborn

Respiratory

Central and/or Peripheral

Peripheral Only

Cyanosis

• Poor Perfusion
• Acrocyanosis

Cardiovascular

Hemoglobinopathy

Respiratory

Reduced Respiratory Drive

• CNS Malformations
• Seizures
• CNS Hemorrhage
• CNS Infections
• Asphyxia
• Metabolic Disease
• Narcotics/Sedatives
• Sepsis

Airway Obstruction

• Atresia
• Laryngomalacia
• Tracheomalacia
• Extrinsic Compression
• Anatomic Compression
• Meconium Aspiration

Lung Parenchyma

• Bronchopulmonary Dyspnea
• Pulmonary Edema
• Pneumothorax
• Malformation with Infection
• Aspiration

Other

• Persistent Pulmonary Hypoplasia of the Newborn
• Transient Tachypnea of the Newborn
• Diaphragmatic Hernia
• Infection (RSV)
Pediatric Dyspnea

- Stridor
  - Croup
  - Foreign Body
  - Tracheitis
  - Epiglottitis
  - Laryngospasm

- Wheeze
  - Asthma
  - Bronchiolitis
  - Foreign Body
  - Viral Induced Wheeze

- Crackles
  - Pneumonia
  - Congestive Heart Failure
  - Bronchiolitis
  - Foreign Body

- Decreased Air Entry
  - Pneumonia
  - Asthma
  - Bronchiolitis
  - Foreign Body
  - Pleural Effusion
  - Atelectasis
  - Pneumothorax

- Normal Breath Sounds
  - Pneumonia
  - Foreign Body
  - Heart Disease
  - Diabetic Ketoacidosis
  - Pulmonary Embolism
Noisy Breathing

Pediatric Wheezing

Wheezing in a Child

CXR Non Specific
- Relief With Beta-Agonist
  - Asthma*
- Positive Sweat Chloride
  - Cystic Fibrosis
- Wheeze With Feeding
  - Aspiration
  - GE Reflux
  - H-Type Esophageal Fistula

CXR Abnormal
- Pulmonary Sequestration
- Congenital Adenoid Cystic Malformation
- Bronchogenic Cyst
- Neuroblastoma
- Teratoma
- Mediastinal Mass

R/O Endobronchial Disease
- Vascular Compression Syndrome
- Foreign Body Aspiration*
- Endobronchitis
- Structural Anomaly

* Denotes acutely life-threatening causes
Noisy Breathing

Pediatric Stridor

**Stridor in a Child**

- **Present Since Infancy**
  - **No Respiratory Distress**
    - Laryngomalacia
  - **Respiratory Distress**
    - Laryngomalacia
    - Laryngeal Web
    - Hemangioma
    - Vocal Cord Dysfunction
    - Subglottic Stenosis

- **Not Present Since Infancy**
  - **Non-Acute Onset**
    - Hemangioma
    - Vocal Cord Dysfunction
    - Subglottic Stenosis
    - Laryngeal Papillomatosis
  - **Acute Onset**

**Febrile**

- Peritonsillar/Retropharyngeal Abscess*
- Epiglottitis*
- Mononucleosis
- Bacterial Tracheitis*
- Croup

**Afebrile**

- **Barking Cough**
  - Croup
  - Atypical Croup
- **Partially-Treated Bacterial Tracheitis**
- **Foreign Body**

* Denotes acutely life-threatening causes
Pediatric Cough

Acute

Acute Cough in Children
( < 3 wks )

No Fever, No Tachypnea

URTI Symptoms

No URTI Symptoms

Normal Chest Auscultation

Wheeze and/or Crackles

Fever, Tachypnea

Normal CXR

CXR Shows Consolidation

CXR Shows Diffuse Changes

• History or suspicion of foreign body?

• Foreign body aspiration*
• Bronchitis/Bronchiolitis

• Bacterial pneumonia

• Asthma*
• Bronchiolitis/Bronchiolitis

• Atypical or viral pneumonia

* Denotes acutely life-threatening causes
Pediatric Cough

Chronic

Chronic Cough In Children ( > 3 wks )

- Poor Growth
  - Sweat Chloride Test to R/O Cystic Fibrosis
    - Abnormal CXR
      - CT Scan
        - Structural Abnormality
        - Tumor
    - Non-Specific CXR
      - Immunodeficiency
      - Chronic Aspiration
      - Environmental Exposure
      - Poorly Controlled Asthma
      - Infection
  - Exacerbated by Exertion/URTI
    - Abnormal CXR
      - CT Scan
        - Tumors
        - Congenital Anomaly
    - Normal CXR
      - Asthma
      - Chronic Sinusitis
      - Post Nasal Drip
      - GERD +/- Aspiration
      - Habit Cough
      - Environmental Exposure

- Normal Growth
Respiratory Distress in the Newborn

Respiratory Distress In The Newborn

- Premature
- Not Premature

Premature
- Normal CXR
  - Apnea of Prematurity
  - Sepsis*
  - Intraventricular Hemorrhage*
  - Hypoglycemia*
  - Hypothermia*
  - Narcosis
- Abnormal CXR
  - Respiratory Distress Syndrome (RDS)*
  - Transient Tachypnea of the Newborn (TTNB)
  - Pneumonia
  - Pneumothorax*
  - Congenital Abnormality

Not Premature
- Meconium Aspiration
  - Meconium in Amniotic Fluid
- Infectious
  - Sepsis*
  - Pneumonia
- Non-Infectious
  - Respiratory Distress Syndrome (RDS)*
  - Transient Tachypnea of the Newborn (TTNB)
  - Pneumothorax*
  - Congenital Abnormality

* Denotes acutely life-threatening causes
Sudden Unexpected Death in Infancy

**Congenital Anomaly/Disorder**
- Cardiac Anomaly
- Cardiac Arrhythmia
- Neurologic Anomaly
- Pulmonary Anomaly
- Metabolic Disorders

**Infection**
- Severe Pneumonia
- Sepsis
- Gastrointestinal infection

**Injury**
- Deliberate (abuse)
- Accidental*

**Other**
- Acute Illness

**Sudden Infant Death Syndrome (SIDS)**
- Autopsy negative
- 80% of SUDI
- Risk Factors:
  - Prone Sleeping position
  - Tobacco exposure
  - Sharing a Sleeping Surface
  - Prematurity

---

* SUDI with negative investigations and infant found in prone position or in bed with parent may be called either SIDS or injury (new ideas evolving)
Enuresis

Rule in/out age-appropriate enuresis

<table>
<thead>
<tr>
<th>Age</th>
<th>Dry during day</th>
<th>Dry during night</th>
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<tbody>
<tr>
<td>2</td>
<td>25%</td>
<td>10%</td>
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<tr>
<td>2.5</td>
<td>85%</td>
<td>48%</td>
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<tr>
<td>3</td>
<td>98%</td>
<td>78%</td>
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Nocturnal Enuresis

Diurnal Enuresis

Primary
(Urinary Control Never Achieved)
• Delayed Maturation (Familial)
• Idiopathic
• Sleep Disorders (Obstructive Sleep Apnea)
• Anatomic Abnormality

Secondary (Red Flag)
(> 6 Month Continence Prior)
• Urinary Tract Infection
• Idiopathic
• Behavioural/Psychogenic (Child Abuse)
• Cystitis
• Diabetes Mellitus
• Other (Diabetes Insipidus, Urethral Obstruction, Cerebral Palsy, Neurogenic Bladder, Seizure Disorder)

• Pediatric Unstable Bladder
• Infrequent Voiding (Urinary Tract Infection)
• Cystitis
• Behavioural/Psychogenic
• Idiopathic
• Non-neurogenic (Hinman Syndrome)
• Vaginal Voiding (Labial Adhesion)
Acute Life Threatening Event

Apparent Life Threatening Event

Based on History from Parent
(Extent of investigations based on initial examination)

Acute Illness
Witnessed Choking Spell
Injury
Apnea

Cardiac
Metabolic
Neurologic
Respiratory
Infectious
Gastrointestinal

- Congenital Heart Disease
- Arrhythmia
- Cardiomyopathy
- Myocarditis

- Inborn Errors of Metabolism
- Reye's Syndrome
- Electrolyte Disturbances

- Seizure
- Malignancy
- Neuromuscular Disorders
- Central Apnea

- Anatomical Foreign Body Aspiration
- Breath-holding spell (age-dependent)

- Pneumonia
- Sepsis
- Upper Respiratory Tract Infection
- Empyema
- Urinary Tract Infection

- Gastroesophageal Reflux
- Volvulus
- Gastroenteritis
- Incarcerated Hernia

- Non-Accidental
- Unnoticed
- Factitious by Proxy

- Periodic Breathing
- Apnea of Infancy
Pediatric Fractures

Non-Accidental Trauma (indication of child abuse)

- Distal Radius
  - Torus (junction of metaphysis)
  - Green stick (bone bent at convex side)
  - Complete (spiral, oblique, transverse)

- Scapular # Without Traumatize Hx

- Femur # < 1 y.o.

Accidental Trauma

- Tibia Fibular Fracture
  - Supra condylar
  - Lateral supracondylar

- Elbow

- Toddlers Fracture
  - < 2 y.o.

- Transverse Fractures <3 y.o.
  - Femur
  - Humerus
  - Tibia
  - Ribs
  - Radius
  - Skull
  - Spine
  - Ulna
  - Fibula
## Salter Harris Physeal Injury Classification

<table>
<thead>
<tr>
<th>Type</th>
<th>Population</th>
<th>Features</th>
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<tbody>
<tr>
<td>I</td>
<td>Younger Children</td>
<td>Separation through the physis</td>
</tr>
<tr>
<td>II</td>
<td>Older Children (75%)</td>
<td>Fracture through a portion of the physis that extends through the metaphyses</td>
</tr>
<tr>
<td>III</td>
<td>Older Children (75%)</td>
<td>Fracture line goes below the physis through the epiphysis, and into the joint</td>
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<tr>
<td>IV</td>
<td></td>
<td>Fracture Line through the metaphysis, physis and epiphysis</td>
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<tr>
<td>V</td>
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<td>Compression fracture of the growth plate</td>
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- S: Straight through
- A: Above
- L: Lower
- T: Through
- R: Crush

[https://www.jaaos.org/content/10/5/345/F1.large.jpg](https://www.jaaos.org/content/10/5/345/F1.large.jpg)
Pediatric Seizure

Unprovoked

Seizure

- Unprovoked
- Provoked “DIMS”
- Spells

Infantile
- Benign Focal Epilepsy of Infancy
- West Syndrome
- Dravet Syndrome

Childhood

Generalized Epilepsies
- Childhood Absence Epilepsy
- Myoclonic Absence Epilepsy
- Juvenile Absence Epilepsy
- Juvenile Myoclonic Epilepsy
- Lennox Gastaut Syndrome

Focal Epilepsies
- Rolandic Epilepsy
- Panayiotopoulos Syndrome
- Landau-Kleffner Syndrome
Pediatric Seizure

Provoked

Seizure

Unprovoked

Provoked “DIMS”

Spells

Drugs
- Drug overdose
- Alcohol Withdrawal
- Poisoning

Infection
- Febrile Seizures
- Sepsis
- Meningitis
- Encephalitis

Metabolic
- Hypoglycemia
- Hyperglycemia
- Hypocalcemia
- Hyponatremia

Structural
- Head Injury
- Stroke
- Tumours
- Congenital Abnormality
- Tuberous Sclerosis
- Sturge-Weber Syndrome
Pediatric Seizure

Spells

Seizure

Unprovoked

- Neonates and Infants
  - Benign Sleep Myoclonus
  - Shuddering attacks
  - Infantile Colic
  - Sandifer Syndrome

- Older Infants and Toddlers
  - Breath-holding spells
  - Benign Paroxysmal Vertigo
  - Benign Paroxysmal Torticollis
  - Night Terrors

Provoked “DIMS”

- Childhood and Adolescents
  - Daydreaming
  - Syncope
  - Migraine-variants
  - Panic Attack
  - Transient Ischemic Attack
  - Narcolepsy
  - Cataplexy
Pediatric Mood & Anxiety Disorder

Mood or Anxiety Disorder

Mood
- Major Depressive Disorder
- Persistent Depressive Disorder
- Disruptive Mood Dysregulation Disorder*

Bipolar
- Panic Disorder and Agoraphobia
- Specific Phobia
- Social Phobia
- Generalized Anxiety Disorder
- Selective Mutism*
- Separation Anxiety Disorder*

Anxiety

*More commonly or exclusively found in pediatric populations
General Presentations

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Historical Editors
Dr. Heather Baxter
Dr. Harvey Rabin
Dr. Ian Wishart
Brittany Weaver
Geoff Lampard
Harinee Surendra
Kathy Truong

Student Editors
Adrianna Woolsey
Fatima Pirani

Senior Editor
Dr. Monique Munro

Faculty Editor
Dr. Sylvain Coderre
Fatigue

Exclude Sleep Disturbance/Lifestyle Issues/Pregnancy

Organic Etiologies

Endocrine/Metabolic
  - Anemia
  - Malignancy

Neoplastic/Hematologic
  - Endocarditis
  - Tuberculosis
  - Epstein-Barr Virus
  - Hepatitis
  - HIV

Infectious
  - Anemia
  - Malignancy

Chronic Disease
  - Hypnotics
  - Anti-hypertensives
  - Anti-Depressants
  - Drug Abuse (e.g., Alcohol)
  - Drug Withdrawal

Pharmacologic
  - Anxiety
  - Somatization Disorder
  - Malnutrition/Drug Addiction

Psychogenic
  - Chronic Fatigue Syndrome

Idiopathic

Endocrine
  - Hypo/Hyper-thyroidism
  - Diabetes
  - Pituitary Insufficiency
  - Adrenal Insufficiency

Metabolic
  - Renal Failure
  - Liver Failure
  - Hypercalcemia

Autoimmune/Inflammatory
  - Rheumatoid Arthritis
  - Celiac Disease
  - SLE
  - Polymyalgia Rheumatica

Cardio-pulmonary
  - Congestive Heart Failure
  - Chronic Obstructive Pulmonary Disease

Neurologic
  - Depression
  - Multiple Sclerosis
  - Stroke
  - Parkinson’s
  - Myasthenia Gravis
Acute Fever

Fever (acute onset)

Infectious

Viral
- Rhinovirus
- Influenza Virus
- Parainfluenza Virus
- Adenovirus
- Enterovirus
- Coronavirus
- HIV

Bacterial
- Fungal
- Protozoa (e.g., malaria)
- Other parasites

Other

Inflammatory
- PE
- Thrombophlebitis
- DVT
- Pancreatitis

Iatrogenic
- Transfusion reaction
- Malignant Hyperthermia
- Neuroleptic malignant syndrome

Endocrine
- Thyroid storm
- Acute Adrenal Insufficiency

Other
- Heat stroke
- Sickle Cell disease
- Drug fever
- MI

Bacteremia
- Intermittent Bacteremia
- Continuous Bacteremia

Septic Shock

Acute Organ Specific Infection
- Upper Respiratory Tract Infection
- Urinary Tract Infection
- Pneumonia
- Pyelonephritis
- Meningitis
- Skin Infection

Abscess
- Head and neck
- Thoracic
- Abdominal
- Pelvic
- Extremity
Fever of Unknown Origin / Chronic Fever

Fever of unknown origin/chronic fever

- Infection
  - Bacterial
    - Organ Specific Infection
      - Infectious endocarditis
      - Osteomyelitis
      - Occult abscess
      - Sinusitis
      - Cholangitis
      - UTI
      - Meningitis
    - Non-organ specific
      - Brucellosis
      - Q-fever
      - Salmonella
      - Yersinia
      - Tuleremia
      - Septic Phlebitis
      - Rheumatic fever
      - Lyme disease
      - TB
      - Whipple’s disease
  - Viral
    - HIV
    - EBV
    - CMV
    - Viral hepatitis
    - Enterovirus

- Neoplasm
  - NHL
  - Hodgkin's lymphoma
  - Leukemia
  - Solid tumors

- Autoimmune
  - SLE
  - RA
  - Polyarteritis nodosum
  - Giant cell arteritis
  - Sarcoidosis

- Other
  - Drug fever
  - Factitious fever
  - Trauma Non-infectious hepatitis
  - Recurrent PE
  - Fungal
  - Protozoa (e.g. malaria)
  - other parasites
Hypothermia

- Environmental
  - Immersion
  - Non-Immersion

- Acute Illness

- Body Heat Loss
  - Drugs/Toxins
  - Iatrogenic
  - Burns

- Lack of Body Heat Generation
  - Hypothyroidism
  - Adrenal Insufficiency
  - Hypoglycemia
  - Malnutrition

- Improper Thermoregulation
  - Cerebrovascular Accident
  - Central Nervous System Trauma
  - Multiple Sclerosis
  - Drugs/Toxins

- Other
  - Trauma
  - Sepsis
  - Vascular Insufficiency
  - Uremia
Sore Throat / Rhinorrhea

Common viral pathogens:
- Rhinovirus, Coronavirus, Influenza virus, Parainfluenza Virus, Adenovirus, Herpes Simplex Virus,
- Enterovirus (Coxsackie, Echo), Epstein Barr Virus, Cytomegalovirus, HIV
Most common bacterial pathogen:
- Group A Beta Hemolytic Streptococcus pyogenes (GABHS)

Predominantly Rhinorrhea

Acute
- Acute Viral Sinusitis
- Acute Bacterial Sinusitis
- Acute Head Cold Syndrome

Chronic
- Allergic/Vasomotor/Drug Rhinitis
- Nasal Polyposis
- Chronic Sinusitis
- Nasopharyngeal Cancer

Predominantly Sore Throat

Acute
- GERD
- Environmental
- Trauma
- Foreign Body
- Neoplasm

Chronic
- Streptococcal Tonsillopharyngitis
- Peritonsillar Abscess
- Ludwig’s Angina

Viral
- Acute viral Pharyngitis
- Acute Influenza
- Acute Viral Laryngotracheitis
- Acute Viral Tracheobronchitis
- Acute Infectious Mononucleosis
- Herpangina
Historical Executive Student Editors

2016-2017  Joshua Nicholas, Peter Rogers & Scott Belyea
2015-2016  Jared McCormick & Hai (Carlos) Yu
2014-2015  Jared McCormick & Hai (Carlos) Yu
2013-2014  Yang (Steven) Liu & Brian Glezerson
2012-2013  Neha Sarna & Sarah Sy
2011-2012  Katrina Kelly & Harinee Surendra
2010-2011  Jonathan Dykeman & Kathy Truong
2009-2010  Lucas Gursky & Ting Li
2008-2009  Linnea Duke & Mustafa Hirji
2007-2008  Brett Poulin (Founder of the Calgary Black Book Project)
Scheme Creators

Students
M. Abouassaly
A. Aristarkhova
M. Broniewska
P. Chen
M. Chow
R. Cormack
P. Davis
L. Duke
J. Evinu
A. Geist
F. Girgis
A. Hicks
J. Hodges
G. Ibrahim
C. Johannes
D. Joo
S. Khan
L. Kimmel
M. Klassen
J. Lawrence
J. Laxton
K. Leifso
J. McCormick

Faculty
K. Burak
D. Burbank
K. Busche
S. Casha
M. Clark
S. Coderre
M. Doran
P. Federico
K. Fraser
S. Furtado
N. Hagen
J. Huang
N. Jette
A. Jones
G. Klein
S. Kraft
A. Mahalingham
H. Mandin
J. Mannerfeldt
K. McLaughlin
D. Miller
L. Parsons
D. Patry

A. Peets
G. Pineo
M-C. Poon
H. Rabin
T. Remington
B. Ruether
A. Smithee
O. Suchowersky
P. Veale
B. Walley
L. Welikovitch
R.C. Woodman
L. Zanussi

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If you are the creator of a scheme currently used in the Blackbook and believe you have not been credited appropriately, please contact us at blackbk@ucalgary.ca
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AAA</td>
<td>Abdominal Aortic Aneurysm</td>
</tr>
<tr>
<td>ACE</td>
<td>Angiotensin-Converting Enzyme</td>
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<tr>
<td>ACTH</td>
<td>Adrenocorticotropic Hormone</td>
</tr>
<tr>
<td>ADPKD</td>
<td>Autosomal Dominant Polycystic Kidney Disease</td>
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<tr>
<td>ADH</td>
<td>Antidiuretic Hormone</td>
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<tr>
<td>AIN</td>
<td>Acute Interstitial Nephritis</td>
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<tr>
<td>ALS</td>
<td>Amyotrophic Lateral Sclerosis</td>
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<td>ARB</td>
<td>Angiotensin Receptor Blocker</td>
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<td>ARF</td>
<td>Acute Renal Failure</td>
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<tr>
<td>ARPKD</td>
<td>Autosomal Recessive Polycystic Kidney Disease</td>
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<td>BPH</td>
<td>Benign Prostatic Hypertrophy</td>
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<tr>
<td>CCD</td>
<td>Cortical Collecting Duct</td>
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<tr>
<td>CHF</td>
<td>Congestive Heart Failure</td>
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<tr>
<td>CIN</td>
<td>Chronic Interstitial Nephritis</td>
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<tr>
<td>CLL</td>
<td>Chronic Lymphocytic Leukemia</td>
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<tr>
<td>CNS</td>
<td>Central Nervous System</td>
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<td>COPD</td>
<td>Chronic Obstructive Pulmonary Disease</td>
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<tr>
<td>CRF</td>
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<tr>
<td>CRH</td>
<td>Corticotrophic Releasing Hormone</td>
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<tr>
<td>CT</td>
<td>Computed Tomography</td>
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<tr>
<td>DCIS</td>
<td>Ductal Carcinoma In Situ</td>
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<tr>
<td>DHEA</td>
<td>Dehydroepiandrosterone</td>
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<tr>
<td>DHEA-S</td>
<td>Dehydroepiandrosterone Sulfate</td>
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<td>Disseminated Intravascular Coagulation</td>
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<td>DKA</td>
<td>Diabetic Ketoacidosis</td>
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<td>DRE</td>
<td>Digital Rectal Exam</td>
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<td>Deep Vein Thrombosis</td>
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<td>EABV</td>
<td>Effective Arterial Blood Volume</td>
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<td>ECF</td>
<td>Extracellular Fluid</td>
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<tr>
<td>ENaC</td>
<td>Epithelial Sodium Channel</td>
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<tr>
<td>FEV1</td>
<td>Forced Expiratory Volume in One Second</td>
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<tr>
<td>FJN</td>
<td>Familial Juvenile Nephronophthisis</td>
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<tr>
<td>FSGS</td>
<td>Focal Segmental Glomerulosclerosis</td>
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<td>FSH</td>
<td>Follicle Stimulating Hormone</td>
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<tr>
<td>FVC</td>
<td>Forced Vital Capacity</td>
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<tr>
<td>GBM</td>
<td>Glomerular Basement Membrane</td>
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<tr>
<td>GERD</td>
<td>Gastrointestinal Esophageal Reflux Disease</td>
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<tr>
<td>GFR</td>
<td>Glomerular Filtration Rate</td>
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<td>Growth Hormone Releasing Hormone</td>
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<tr>
<td>GH</td>
<td>Growth Hormone</td>
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<tr>
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<tr>
<td>GN</td>
<td>Glomerulonephritis</td>
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<tr>
<td>GnRH</td>
<td>Gonadotropin Releasing Hormone</td>
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<td>GPA</td>
<td>Granulomatosis with Polyangiitis</td>
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<tr>
<td>GRA</td>
<td>Glucocorticoid</td>
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<tr>
<td>GTN</td>
<td>Gestational Trophoblastic Neoplasm</td>
</tr>
<tr>
<td>H+</td>
<td>Hydrogen</td>
</tr>
<tr>
<td>HCG</td>
<td>Human Chorionic Gonadatropin</td>
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<tr>
<td>Abbreviation</td>
<td>Term</td>
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<td>---------------</td>
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<tr>
<td>HDL</td>
<td>High Density Lipoprotein</td>
</tr>
<tr>
<td>HELLP</td>
<td>Hemolysis, Elevated Liver Enzymes, Low Platelets</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<tr>
<td>HPL-1a</td>
<td>Human Peripheral Lung Epithelial Cell Line 1a</td>
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<td>HRT</td>
<td>Hormone Replacement Therapy</td>
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<td>HSP</td>
<td>Henoch-Schönlein Purpura</td>
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<tr>
<td>HSV</td>
<td>Herpes Simplex Virus</td>
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<tr>
<td>HUS</td>
<td>Hemolytic-Uremic Syndrome</td>
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<tr>
<td>IBD</td>
<td>Irritable Bowel Disease</td>
</tr>
<tr>
<td>IBS</td>
<td>Irritable Bowel Syndrome</td>
</tr>
<tr>
<td>ICP</td>
<td>Increased Intracranial Pressure</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
</tr>
<tr>
<td>IGF</td>
<td>Insulin-like Growth Factor</td>
</tr>
<tr>
<td>INR</td>
<td>International Normalized Ratio</td>
</tr>
<tr>
<td>ITP</td>
<td>Idiopathic Thrombocytopenic Purpura</td>
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<tr>
<td>IUGR</td>
<td>Intrauterine Growth Restriction</td>
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<tr>
<td>IV</td>
<td>Intravenous</td>
</tr>
<tr>
<td>IVP</td>
<td>Intravenous Pyelogram</td>
</tr>
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<td>JVP</td>
<td>Jugular Venous Pyelogram</td>
</tr>
<tr>
<td>K+</td>
<td>Potassium</td>
</tr>
<tr>
<td>KUB</td>
<td>Kidney, Ureter, Bladder</td>
</tr>
<tr>
<td>LCIS</td>
<td>Lobular Carcinoma In Situ</td>
</tr>
<tr>
<td>LDL</td>
<td>Low Density Lipoprotein</td>
</tr>
<tr>
<td>LGA</td>
<td>Large for Gestational Age</td>
</tr>
<tr>
<td>LH</td>
<td>Luteinizing Hormone</td>
</tr>
<tr>
<td>LLN</td>
<td>Lower Limit of Normal</td>
</tr>
<tr>
<td>LOC</td>
<td>Level of Consciousness</td>
</tr>
<tr>
<td>LPL</td>
<td>Lipoprotein Lipase</td>
</tr>
<tr>
<td>MCD</td>
<td>Minimal Change Disease</td>
</tr>
<tr>
<td>MCH</td>
<td>Mean Corpuscular Hemoglobin</td>
</tr>
<tr>
<td>MCHC</td>
<td>Mean Corpuscular Hemoglobin Concentration</td>
</tr>
<tr>
<td>MCV</td>
<td>Mean Corpuscular Volume</td>
</tr>
<tr>
<td>MEN</td>
<td>Multiple Endocrine Neoplasia</td>
</tr>
<tr>
<td>MI</td>
<td>Myocardial Infarction</td>
</tr>
<tr>
<td>MPA</td>
<td>Microscopic Polyangiitis</td>
</tr>
<tr>
<td>MPGN</td>
<td>Membranoproliferative Glomerulonephritis</td>
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<tr>
<td>MS</td>
<td>Multiple Sclerosis</td>
</tr>
<tr>
<td>MSK</td>
<td>Musculoskeletal</td>
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<tr>
<td>Na+</td>
<td>Sodium</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>Non-Steroidal Anti-Inflammatories</td>
</tr>
<tr>
<td>OCP</td>
<td>Oral Contraceptive Pill</td>
</tr>
<tr>
<td>OSM</td>
<td>Osmolality</td>
</tr>
<tr>
<td>PE</td>
<td>Pulmonary Embolism</td>
</tr>
<tr>
<td>PID</td>
<td>Pelvic Inflammatory Disease</td>
</tr>
<tr>
<td>PMN</td>
<td>Polymorphic Neutrophils</td>
</tr>
<tr>
<td>POSM</td>
<td>Plasma Osmolality</td>
</tr>
<tr>
<td>PPROM</td>
<td>Preterm Premature Rupture of Membranes</td>
</tr>
<tr>
<td>PROM</td>
<td>Premature Rupture of Membranes</td>
</tr>
<tr>
<td>PT</td>
<td>Prothrombin Time</td>
</tr>
<tr>
<td>PTH</td>
<td>Parathyroid Hormone</td>
</tr>
<tr>
<td>PTT</td>
<td>Partial Thromboplastin Time</td>
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<tr>
<td>PUD</td>
<td>Peptic Ulcer Disease</td>
</tr>
<tr>
<td>PUJ</td>
<td>Pelviureteric Junction</td>
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<tr>
<td>RAPD</td>
<td>Right Afferent Pupillary Defect</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>--------------</td>
<td>-------------</td>
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<tr>
<td>RAS</td>
<td>Renal Artery Stenosis</td>
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<td>RBC</td>
<td>Red Blood Cell</td>
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<tr>
<td>RTA</td>
<td>Renal Tubular Acidosis</td>
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<tr>
<td>SGA</td>
<td>Small for Gestational Age</td>
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<tr>
<td>SLE</td>
<td>Systemic Lupus Erythematosus</td>
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<tr>
<td>TORCH</td>
<td>Toxoplasmosis, Other (Hepatitis B, Syphilis, Varicella-Zoster virus, HIV, Parvovirus B19), Rubella, Cytomegalovirus, Herpes Simplex Virus</td>
</tr>
<tr>
<td>TSH</td>
<td>Thyroid Stimulating Hormone</td>
</tr>
<tr>
<td>TSHR</td>
<td>Thyroid Stimulating Hormone Receptor</td>
</tr>
<tr>
<td>TTKG</td>
<td>Transtubular Potassium Gradient</td>
</tr>
<tr>
<td>TTP</td>
<td>Thrombotic Thrombocytopenic Purpura</td>
</tr>
<tr>
<td>UTI</td>
<td>Urinary Tract Infection</td>
</tr>
<tr>
<td>US</td>
<td>Ultrasound</td>
</tr>
<tr>
<td>VACTERL</td>
<td>Vertebral Anomalies, Anal Atresia, Cardiovascular Anomalies, Tracheoesophageal Fistula, Esophageal Atresia, Renal Anomalies, Limb Anomalies</td>
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<tr>
<td>VSD</td>
<td>Ventricular Septal Defect</td>
</tr>
<tr>
<td>VUJ</td>
<td>Vesicoureteral Junction</td>
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</tbody>
</table>
Superficially resembling flowcharts, schemes are a way to ease the memorization of differential diagnoses by breaking large lists into sets of smaller, conceptually-intuitive information packets. Using the Medical Council of Canada’s Clinical Presentation List, Blackbook organizes the most common medical presentations of patients into diagnostic schemes. As a tool for medical students, residents, allied health trainees, and health care educators, medical presentation schemes will ease the learning of the volume of medical diagnoses, and will facilitate recall when needed.

Based on the medical presentation schemes used in the University of Calgary Medical curriculum, Blackbook is a joint production of the students and the Cumming School of Medicine at the University of Calgary.