The Calgary Black Book: Approaches to Medical Presentations

Disclaimer

This material is for educational purposes only. It is not to be used to make medical decisions. Medical decisions should be made only with the guidance of a licensed medical professional.

While efforts have been made to ensure the accuracy of the content within, the accuracy is not guaranteed.
Message from the Editors

Welcome to the Eighth Edition of The Calgary Black Book! This ongoing project is the result of the hard work and dedication of medical students and faculty at the University of Calgary. We are proud that healthcare practitioners and trainees across Canada find the Black Book to be a useful tool.

In an effort to increase its potential as a learning tool, we have directed our efforts towards developing a case based online tool to help learners work through the Black Book schemes. We hope that working through cases with the schemes will add some clinical context and another dimension to the Black Book as a learning tool. We hope to make this more broadly available as the database grows with future generations of Black Book editors. We are always interested in feedback or suggestions to improve the Black Book; please direct any such communications to: blackbk@ucalgary.ca

Thank you,

Jared McCormick & Hai Chuan (Carlos) Yu
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 in the development of 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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ABNORMAL RHYTHM 1

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

Tachyarrhythmia (>100 bpm)
- Premature atrial contraction
- Premature ventricular contraction

Abnormal Beats

Narrow QRS (<120 msec)
SVT
- 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

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

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

Non-Cardiac

Psychiatric
- Panic Attack
- Generalized Anxiety Disorder
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
  - 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

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

- Pulmonary/Mediastinal
  - Costochondritis
  - Muscular Injury
  - Trauma

- Musculoskeletal
  - 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.

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

Mislabelled
- Repeatedly normal blood pressure when taken at home, work or when using an ambulatory monitor.

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 >95th), 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
**Adverse Conditions:**
(SOGC, 2008)

- Persistent or new/unusual headache
- Visual disturbances
- Persistent abdominal/RUQ pain
- Severe nausea or vomiting
- Chest pain/dyspnea
- Severe hypertension

**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**
    - Gestational Hypertension
  - **Proteinuria (≥0.3g/24hr urine) OR one or more Adverse Conditions***
    - Gestational Hypertension with Pre-Eclampsia

**Pre-Eclampsia + Seizures/Coma**
- Eclampsia

**Clinical Pearl:** BP should always be measured in a sitting position for a pregnant patient.

**Maternal**
- Persistent or new/unusual headache
- Visual disturbances
- Persistent abdominal/RUQ pain
- Severe nausea or vomiting
- Chest pain/dyspnea
- Severe hypertension
- 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
LEFT-SIDED HEART FAILURE

Valvular Disease (Preserved Diastolic/Systolic Function)
- Mitral Stenosis
- Mitral Regurgitation
- Aortic Stenosis
- Aortic Regurgitation

Ejection Fraction = \( \frac{SV}{EDV} = \frac{EDV - ESV}{EDV} \)

Myocardial

Systolic Dysfunction (Reduced Ejection Fraction)

Impaired Contractility

Increased Afterload
- Uncontrolled Severe Hypertension
- Aortic Stenosis (Severe)

Diastolic Dysfunction (Preserved Ejection Fraction)

Impaired Diastolic Filling
- Transient Myocardial Ischemia
- Left Ventricular Hypertrophy
- Restrictive Cardiomyopathy
- Pericardial Constriction

Coronary Artery Disease
- Myocardial Infarction
- Transient Myocardial Ischemia

Chronic Volume Overload
- Mitral Regurgitation
- Aortic Regurgitation

Dilated Cardiomyopathies
- Infiltrative
- Infectious
- Toxic (alcohol, cocaine)
- Genetic

SV = Stroke Volume
EDV = End-Diastolic Volume
ESV = End-Systolic Volume
ISOLATED RIGHT-SIDED HEART FAILURE

Isolated Right-Sided Heart Failure

Cardiac

Rule out Left-Sided Heart Failure (Most Common)

Myocardium
- 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

Parenchyma

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

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)
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 >20mmHg
- 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, thyrotoxicosis, )
SHOCK

Shock

Warm Extremities

Compensated 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

Cold Extremities

High JVP

Low JVP
SYNCOPE

Syndrome

Neurocardiogenic

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

Cardiac

- Pulmonary Embolism
- Hypoxia
- Hypercapnia

Respiratory

- Hypoglycemia
- Anemia
- Medications (CCB, βB, Nitrates, Diuretics)
- TIA
- Psychiatric
- Intoxication
- Migraine

Other

- MI
- DCM
- Mitral/Aortic Stenosis
- HCM (LVOT)
- Blood Loss/Hypotension
- Mitral Stenosis
- Cardiac Tamponade
- Constrictive Pericarditis

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

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

CO = SV x HR

Rule out Seizure
SYSTOLIC MURMUR: Benign & Stenotic

- **Benign/Flow/Hyperdynamic**
  - Pregnancy
  - Fever
  - Anemia

- **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*

* indicates congenital heart disease.
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 Tendinae
  - 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
  - Rheumatic Fever
  - Ebstein’s Anomaly
  - Carcinoid

- Mitral Regurgitation/Tricuspid Regurgitation
- Mitral Valve Prolapse (OS – opening snap)
Diastolic Murmur

- 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)
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PULMONARY DISORDERS: Spirometry

Pulmonary Disorders

Obstructive Pattern (Airways)
- Asthma
- COPD
- Bronchiectasis
- Cystic Fibrosis
- Emphysema

Restrictive Pattern (Interstitium)
- Interstitial Lung Disease
- Chest Wall (Obesity, Pleural Effusion, Scoliosis)

Vascular Pattern (Vasculature)
- Pulmonary Embolism*
- Primary Pulmonary Hypertension

* Denotes acutely life-threatening causes
ACID-BASE DISORDER

Acid-Base Disorder

- pH < 7.35
  - Acidemia
  - Metabolic Acidosis
    - High Anion Gap
      - Methanol
      - Uremia
      - DKA
      - Paraldehyde
      - Isoniazid
      - Lactic Acid
      - Ethylene Glycol
      - Salicylates
    - Normal Anion Gap
      - Diarrhea
      - RTA
      - Interstitial Nephritis
  - Respiratory Acidosis
    - Chronic
      - COPD
      - Interstitial Disease
  - Respiratory Alkalosis
    - Acute
      - Asthma*
      - Neuromuscular
      - Obstruction

- pH 7.35-7.45
  - Normal pH
  - Metabolic Alkalosis
    - Chronic
      - Pregnancy
      - Psychogenic
    - Acute
      - Hypoxia
      - Salicylates
      - Sepsis
      - Pulmonary Embolism*

- pH < 7.45
  - Alkalemia
  - Respiratory Alkalosis
    - Acute
      - Hypoxia
      - Salicylates
      - Sepsis
      - Pulmonary Embolism*

Metabolic Acidosis – Mixed Metabolic Disorder:
- Anion Gap Normal
  - Normal AG Acidosis Alone
- ΔAnion Gap = ΔHCO$_3^-$
  - High AG Acidosis Alone
- ΔAnion Gap < ΔHCO$_3^-$
  - Mixed AG Acidosis + Normal AG
- ΔAnion Gap > ΔHCO$_3^-$
  - Mixed High AG Acidosis + Metabolic Alkalosis

Appropriate Compensation:
- Metabolic Acidosis: 12:10
- Metabolic Alkalosis: 7:10
- Acute Respiratory Acidosis: 10:2
- Chronic Respiratory Acidosis: 10:4
- Acute Respiratory Alkalosis: 10:1
- Chronic Respiratory Alkalosis: 10:3

* Denotes acutely life-threatening causes
CHEST DISCOMFORT: Cardiovascular

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

* Denotes acutely life-threatening causes
CHEST DISCOMFORT: Pulmonary/Mediastinal

- Cardiovascular
- Pulmonary/Mediastinal
- Other

- Vascular
  - Pulmonary Embolism*
  - Pulmonary Hypertension

- Pleural
  - Pneumothorax* (Tension*)
  - Pleural Effusion
  - Pleuritis/Serositis

- Parenchymal
  - Pneumonia with Pleurisy*
  - Tuberculosis*
  - Neoplasm*
  - Sarcoidosis

* Denotes acutely life-threatening causes
CHEST DISCOMFORT: Other

Chest Discomfort

- Cardiovascular
  - Gastrointestinal
    - GERD
    - Biliary Disease
    - Peptic Ulcer Disease
    - Pancreatitis*
    - Esophageal Spasm
    - Esophageal Perforation*
- Pulmonary/Mediastinal
  - Musculoskeletal
    - Costochondritis
    - Muscular Injury
    - Trauma
- Other
  - Neurologic/Psychiatric
    - Anxiety/Panic
    - Herpes Simplex Virus/Post-Herpetic Neuralgia
    - Somatoform Disorder
    - Spinal Radiculopathy
CHEST TRAUMA

Chest Trauma

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

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

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

* Denotes acutely life-threatening causes
COUGH: Chronic

Cough

Chronic Cough ( > 3 wks )

Normal Chest X-Ray

Normal Spirometry

Obstructive Disease (FEV1/FVC <75%)

• Asthma
• COPD

Upper Airway

• Post-Nasal Drip / Rhinosinusitis
• Neuromuscular Swallowing Disorder
• Thyroiditis
• Mediastinal Mass
• Elongated Uvula

Lower Airway

• Asthma
• GERD
• Post-Infectious
• Smoker’s Cough
• Non-Asthmatic Eosinophilic Bronchitis
• Foreign Body

Other

• ACE Inhibitor

Cough & Dyspnea & Fever

Abnormal Chest X-Ray

• COPD
• Chronic Infection (Eg. Fungal, Tuberculosis)
• Neoplasm
• CHF
• Interstitial Disease
• Foreign Body
COUGH: Dyspnea & Fever

Cough

Chronic Cough ( > 3 wks )

Normal CXR
- Acute Bronchitis
- AECOPD

Non-Infectious
- Pulmonary Embolism*
- Cryptogenic Organizing Pneumonia
- Wegener’s Granulomatosis

Pneumonia in the Immunocompetent Host

Hospital-Acquired
- Aerobic Gram-Negative Bacilli
- Gram-Positive Cocci

Community-Acquired
- S. pneumoniae
- H. influenzae
- Viral (E.g. Influenza)
- M. pneumoniae
- C. pneumoniae

Tuberculosis

Peripheral Stigmata of Subacute Endocarditis
- Left-Sided Endocarditis

New/Changed Murmur

Intravenous Drug User
- Right-Sided Endocarditis with Septic Emboli

Cough & Dyspnea & Fever

Abnormal CXR
- Bacterial (often non-pathogenic with immune competence)
- Fungal (e.g. Pneumocystic jirovecii)
- Viral

* Denotes acutely life-threatening causes
DYSPNEA: Acute

Dyspnea

Acute
Presents in minutes to hours

Chronic

Cardiovascular
- Myocardial Infarction*
- Cardiac Tamponade*
- CHF

Pleural
- Pneumothorax (Tension*)

Parenchymal
- Pneumonia

Vascular
- Pulmonary Embolism*

Lower Airway
(Wheeze)
- Aspiration*
- Anaphylaxis*

Upper Airway
(Stridor)
- Asthma*
- AECOPD
- CHF

* Denotes acutely life-threatening causes
DYSPNEA: Chronic – Cardiac

Dyspnea

Acute
Presents in minutes to hours

Chronic

Cardiac

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

Pulmonary

Other

* Denotes acutely life-threatening causes
DYSPNEA: Chronic – Pulmonary/Other

Dyspnea

Acute
Presents in minutes to hours

Chronic

Cardiac

Pulmonary

Other

Airways

• Asthma
• COPD

Parenchyma
(abnormal chest X-ray)

Interstitium

• Interstitial Pulmonary Fibrosis
• Hypersensitivity Pneumonitis
• CHF

Vessels

• Pulmonary Embolism*
• Pulmonary Hypertension

Pump

• Chest Wall
• Neuromuscular
• Pleura

Alveoli

• Pneumonia
• ARDS

• Anemia
• Anxiety
• Deconditioning
• Hyperthyroidism
• Metabolic Acidosis
EXCESSIVE DAYTIME SLEEPINESS

Excessive Daytime Sleepiness

R/O Other Causes Of Fatigue

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

Sleep Disorders
- Obstructive/Central Sleep Apnea
- Alveolar Hypoventilation
- Jet Lag
- Restless Legs Syndrome
- Periodic Limb Movement Disorder
- Narcolepsy
- Idiopathic Hypersomnolence

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

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

Hypoxemia

Low PO₂, Low O₂, Cyanosis

High AA Gradient

Right-to-Left Shunt

Parenchymal
- Severe Pneumonia
- Atelectasis

Intracardiac
- Ventricular Septal Defect
- Atrial Septal Defect

Pulmonary
- Arteriovenous Malformation

Ventilation/Perfusion Mismatch

Airway Disease (Asthma, COPD)
- Vascular (PE*)
- Parenchymal Disease (+/- Diffusion Defect)

Normal AA Gradient

Low Inspired PO₂

Central
- High Altitude
- Drugs*
- Coma
- Hypothyroidism

Hypoventilation
Increased PCO₂

Peripheral

Damaged Lung Structure
- Status Asthmaticus*
- Advanced COPD

Chest Wall
- Obesity
- Neuromuscular
- Kyphosis

* Denotes acutely life-threatening causes

Alveolar-Arterial Gradient = PAO₂ – Pao₂

PAO₂ = FiO₂ (PB-PH₂O)-(Paco₂/0.8)

*In Calgary, PB = 660mmHg, Sea level PB = 760mmHg
LUNG NODULE

Lung Nodule

Single Round Lesion < 3cm In Diameter

New Nodule

Multiple Nodules

Solitary Nodule

Nodule on CXR > 2 Years Without a Change in Size

- Scar
- Granuloma
- Arteriovenous Malformation

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
- Wegener’s Granulomatosis
- Sarcoidosis
- Pneumoconiosis

Vascular

- Pulmonary Embolism*
- Arteriovenous Malformation
- Hereditary Hemorrhagic Telangiectasia

* Denotes acutely life-threatening causes
MEDIASTINAL MASS

Mediastinal Mass

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

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

Posterior
- Neurogenic Tumour
- Esophageal Lesion
- Diaphragmatic Hernia
PLEURAL EFFUSION

If > 1 cm on Lateral Decubitus X-Ray, Perform Diagnostic Thoracocentesis

Exudate
Use 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 Upper Limit of Normal

* Denotes acutely life-threatening causes

Transudate

Heart Failure
- Systolic
- Diastolic
- Valvular Disease

Liver Failure
- Cirrhosis

Kidney Failure
- Nephrotic Syndrome

Gastrointestinal
- Ruptured Esophagus*
- Pancreatitis

Pulmonary
- Infectious
- Neoplastic
- Inflammatory (RA, SLE)
- Pulmonary Embolus*
- Chylothorax
- Hemothorax

Light’s Criteria

* Denotes acutely life-threatening causes
PULMONARY HYPERTENSION

- Pulmonary Arterial Hypertension
  - Idiopathic
  - Connective Tissue Disease
  - Portal Hypertension
  - Congenital Heart Disease
- Left-Sided Heart Dysfunction
  - Systolic
  - Diastolic
  - Valvular
- Lung Disease and/or Hypoxemia
  - COPD
  - Interstitial Lung Disease
  - Sleep Apnea
- Chronic Thromboembolic Disease
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OVERALL APPROACH TO ANEMIA

Anemia

Blood Loss

• Acute Bleed

• Chronic Bleed

Increased RBC Destruction

Increased Reticulocytes, Increased Unconjugated Bilirubin, Spherocytes on Smear

Decreased RBC Production

Normal/Decreased Reticulocytes

• Iron Deficiency
• B12/Folate Deficiency
• Aplastic Anemia
• Anemia of Chronic Disease
• Marrow Infiltration

Any combination of:
Decreased Reticulocytes, MCV, MCH, MCHC, Serum Iron, Ferritin

Increased TIBC, Hypochromic RBCs

Congenital

• Hemoglobinopathy
• Thalassemia
• RBC Membrane Disorder
• RBC Metabolism Disorder

Acquired

• Immune
• Non-Immune

Normocytic/Normochromic RBCs on Smear

• Chronic Bleed
APPROACH TO ANEMIA: Mean Corpuscular Volume

- 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

Anemia with elevated Mean Corpuscular Volume (MCV)

Rule out Reticulocytosis

- Normal Blood Smear
  - Drugs
  - • Pernicious Anemia
  - • Small Bowel Disorder
  - • Pancreatic Disease
  - • Parasites
  - • Pernicious Anemia

- Oval Macrocytes
  - Hypersegmented Neutrophils
  - • Multiple Myeloma
  - • Myelodysplastic Syndromes

- RBCs in Rouleaux Formation

- Dysplastic
  - • Rule out B12 and Folate Deficiency
  - • Liver Disease

- Macrocytosis Target Cells
  - Normal WBCs

- 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

Abnormal Liver Function Tests

Normal Liver Function Tests
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 Macrocytes, Normal RBCs
      - Acute Bleed
      - Hemolysis
    - Polychromatic Macrocytes, 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 NNInflammation

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

- Other

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

Increased HgbH, HgbH inclusions in RBC

- e.g. HgbE, HgbC, etc.
APPROACH TO BLEEDING/BRUISING:
Platelets & Vascular System

- **Platelets**
  - Thrombocytopenia
    - Quantitative Defect
      - Decreased Production
      - Increased Destruction
      - Abnormal Sequestration
      - (See thrombocytopenia scheme)
  - Disordered Platelet Function
    - Qualitative Defect

- **Vascular System**
  - Connective Tissue Disorders
  - Hereditary II Telangiectasia

- **Coagulation Proteins**
  - Congenital
    - Rare
    - Connective Tissue Disorders
    - Hereditary II Telangiectasia
  - Acquired
    - Steroids
    - Vasculitis
    - Drugs (e.g. ASA)
    - Renal Disease
APPROACH TO BLEEDING/BRUIISING: Coagulation Proteins

Bleeding/Brusing

Platelets

Vascular System

Coagulation Proteins

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

- Acquired

Inhibitor

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

Vit K Deficiency
(decreases levels of Factors II, VII, IX, X, and Protein C+S)

Vitamin K Problem

Liver Disease

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
  - Vitamin K Antagonist
    - Coumadin (Warfarin) use

- Child/Adult
  - Antibiotics and Poor Nutrition
  - Fat Malabsorption

- Newborn
  - Hemorrhagic Disease of the Newborn
PROLONGED PTT, NORMAL PT (INR): Bleeding Tendency

Long PTT/Normal PT

Bleeding Tendency

- Factor VIII Deficiency (Hemophilia A)
- Factor IX Deficiency (Hemophilia B)

No Bleeding Tendency

Acquired

- Autoantibodies
  - Factor VIII Inhibitor
  - Other Factors (rare)

- Drugs
  - Heparin

Congenital

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

Autosomal Recessive Disorder
- Factor XI Deficiency

Autosomal Dominant Disorder
- von Willebrand’s Disease with a low Factor VIII
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
- Lupus-type Inhibitor
APPREHACH TO SPLENOMEGALY

Splenomegaly

Evidence of portal hypertension or coagulopathy?

Infectious
  • Bacterial
  • Viral (EBV)
  • Parasitic
  • Fungal

Infiltrative

Inflammatory
  • Systemic Lupus Erythematosus
  • Sarcoidosis
  • Felty’s Disease
  • Serum Sickness

Hemolytic Disease
  • Sickle Cell Disease (children)
  • Thalassemia
  • Congenital Spherocytosis
  • Acquired causes

Non-Malignant
  • Amyloidosis
  • Gaucher’s Disease
  • Glycogen Storage Disease

Malignant
  • Lymphoma
  • Leukemia
  • Myeloproliferative disorders (eg. polycythemia vera, essential thrombocytosis, myelofibrosis)

Blood smear abnormalities?
FEVER IN THE IMMUNOCOMPROMISED HOST

Fever in the Immunocompromised Host

Cellular Defect
- Cell Mediated Immunity
  - T-Cells Affected
  - Pneumonia
  - *Aspergillus*
  - *Candida*
  - *Pneumocystis jirovecii*
  - CNS Infection
- Neutropenia or Neutrophil Dysfunction
  - Aphthous Ulceration
  - Perirectal Infection
  - Abscess Formation
  - Soft Tissue and Visceral Infection
  - Periodontal Disease

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

Protein Defect
- Complement Deficiency
  - Encapsulated Bacteriemia
    - *Streptococcus pneumoniae*
    - *Haemophilus influenzae*
    - *Neisseria spp.*
- Hypogammaglobulinemia
  - Recurrent Sinusitis
  - Pneumonia
  - Bronchitis
  - Chronic Diarrhea
    - *Giardia Infection*
LYMPHADENOPATHY: Diffuse

Diffuse Lymphadenopathy

Reactive

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

Infectious
- EBV
- CMV
- HIV
- Tuberculosis
- Hepatitis

Other
- Acne
- Allergy
- Insect Bites
- Young age

Neoplastic

Leukemia
- Acute Lymphoblastic Leukemia (Pancytopenia, WBC differential includes Blasts)

Monoclonal Lymphocytes on Biopsy
- Non-Hodgkin’s Lymphoma

Reed-Sternberg Cells on Biopsy
- Hodgkin’s Lymphoma

History of Bleeding, Infection, Fatigue
- Chronic Lymphocytic Leukemia (CBC with Lymphocytes)

Asymptomatic, Age > 50
- Chronic Lymphocytic Leukemia (CBC with Lymphocytes)
LYMPHADENOPATHY: Localized

**Localized Lymphadenopathy**

**Reactive**
- Inflammatory
  - Allergy
  - Acne
  - Insect bites
- Infectious
  - Bacterial (e.g. Pharyngitis, Cellulitis, Lymphadenitis)

**Neoplastic**
- Stage I-II Lymphoma
  - Non-Hodgkin's Lymphoma
  - Hodgkin's Lymphoma
- Metastatic Carcinoma
  - Nasopharyngeal
  - Head/Neck
  - Thyroid
  - Breast
  - GI Tract
  - Melanoma

**Cervical**
- Anterior
  - Infection (e.g. Mononucleosis, Toxoplasmosis)
  - Posterior
  - TB
  - Lymphoma
  - Kikuchi Disease
  - Head/Neck Malignancy

**Supraventricular**
- Thoracic Malignancy (Breast, Mediastinum, Lungs, Esophagus)
  - Abdominal Malignancy (Virchow’s Node)

**Axillary**
- Infection (Arm, Thoracic Wall, Breast)
  - Cancer (In absence of infection in upper extremity)

**Epitrochlear**
- Infection (Forearm/Hand)
  - Lymphoma
  - Sarcoidosis
  - Tularemia
  - Secondary Syphilis

**Inguinal**
- Leg Infection
  - Sexually Transmitted Infection
  - Cancer
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

Neutropenia

Isolated Neutrophil Decrease

Congenital

Decreased Marrow Production

Idiopathic Chronic

Increased Consumption Septicemia

Medications

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

Viral Infection

- Epstein-Barr Virus
- Cytomegalovirus
- Childhood viruses
- HIV
- Influenza

Bicytopenia/Pancytopenia (Neutrophils and Other Cell Lines Decreased)

Decreased Marrow Production

- Systemic Lupus Erythematosus
- Rheumatoid Arthritis
NEUTROPENIA: Bicytopenia/Pancytopenia

Neutropenia

Isolated Neutrophil Decrease

Decreased Production

Marrow Infiltration
  - Hematologic and non-hematologic malignancies
  - Infection

Bicytopenia/Pancytopenia (Neutrophils and Other Cell Lines Decreased)

Sequestration
  - Splenomegaly

Increased Production

Stem cell damage or suppression
  - Chemotherapy
  - Radiation
  - Drugs
  - Toxins

Nutritional deficiency
  - B12/folate/combined deficiencies
Polycythemia (Erythrocytosis)

Relative
Normal RBC Mass/ Decreased Plasma Volume

- Burns
- Diarrhea
- Dehydration
- Idiopathic

JAK-2 Negative
Elevated Erythropoietin
Reactive

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

- Congenital Hemoglobinopathy
- Familial Polycythemia
- Carboxyhemoglobin

Hypoxia
O2 saturation ≤ 90%

Heart Murmur, Cyanosis without Pulmonary Disease

- Cyanotic Heart Disease

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

Erythropoietin Secreting Tumor
O2 O₂ Saturation ≥ 90%
Abnormal Abdominal Ultrasound

- Polycythemia Vera

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

- Sleep Apnea
- Chronic Pulmonary Disease

• Burns
• Diarrhea
• Dehydration
• Idiopathic

True
Elevated RBC Mass

• Polycythemia Vera

• Congenital Hemoglobinopathy
• Familial Polycythemia
• Carboxyhemoglobin

• Cyanotic Heart Disease
• Sleep Apnea
• Chronic Pulmonary Disease
Suspected DVT

Calculate Clinical Probability Score

Low: ≤ 2 Points

- Negative D-Dimer
  - Negative Leg U/S
    - STOP
  - Positive Leg U/S
    - TREAT

- Positive D-Dimer
  - STOP

High: > 2 Points

- Negative Leg U/S
  - Negative Leg U/S at 1 Week
    - STOP
  - Positive Leg U/S at 1 Week
    - TREAT

- Positive Leg U/S
  - TREAT

Well’s Criteria for DVT

Active Cancer  (1)
Paralysis, paresis, recent immobilization of lower extremity  (1)
Recently bedridden for >3 days, or major surgery in last 4 weeks  (1)
Localized tenderness along distribution of the deep venous system  (1)
Entire leg swollen  (1)
Calf swelling by >3 cm compared to asymptomatic leg  (1)
Pitting edema (greater in symptomatic leg)  (1)
Collateral, nonvaricose superficial veins  (1)
Alternative diagnosis as or more likely than DVT  (-2)

**SUSPECTED PULMONARY EMBOLISM (PE)**

**Suspected PE**

Calculate Clinical Probability Score

**Low: ≤ 4 Points**

- **Negative D-Dimer**
  - STOP
  - Negative CT-PE
    - STOP
  - Non-Diagnostic
    - Non-Diagnostic
- **Positive D-Dimer**
  - TREAT
  - Positive CT-PE
    - Do Pulmonary Angiography
      - Negative CT-PE
        - TREAT
      - Repeat U/S in 1 Week

**High: > 4 Points**

- **Negative CT-PE**
  - Non-Diagnostic
    - Non-Diagnostic
  - TREAT
- **Positive CT-PE**
  - OR
  - Negative CT-PE
    - Do Pulmonary Angiography
      - Positive CT-PE
        - TREAT
      - 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 >100 bpm (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)
  - Ineffective Megakaryopoiesis
    - B12 Deficiency
    - Folate Deficiency
    - Folate Antagonist (methotrexate)
    - Drugs

- Increased Sequestration
  - Splenomegaly

- Increased Destruction
  - Immune
    - HELLP Syndrome
    - TTP/HUS
    - DIC
    - Vasculitis
    - Infection
    - Foreign Surface (e.g. Prosthetic Heart Valve)
  - Non-Immune
    - Drug
    - Quinidine
    - Others

- Autoimmune
  - ITP
  - SLE
  - CLL

- Alloimmune
  - anti-HLA antibodies

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THROMBOCYTOSIS

**Thrombocytosis**

- **Reactive**
  - Artifact (redo CBC)

- **Spurious**
  - Essential thrombocytosis
  - Polycythemia Vera
  - Chronic Myelogenous Leukemia
  - Primary Myelofibrosis

- **Autonomous**
  - Infectious
    - Acute or Chronic
  - Inflammatory
    - IBD
    - Rheumatic disorders
    - Celiac disease
  - Tissue Damage
    - Post-op surgery
    - Trauma
    - Burns
  - Non malignant hematologic conditions
    - Rebound effect following treatment of ITP
    - Rebound effect following ETOH induced thrombocytopenia
  - Other
    - Post-splenectomy or hyposplenic states
    - Non-hematologic malignancy
    - Iron deficiency anemia
Gastrointestinal Presentations

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ABDOMINAL DISTENTION: Abdominal Distention

Abdominal Distention

Ascites

Bowel Dilatation

Other Causes

Mechanical obstruction

• Adhesions 60%
• Volvulus 3%
• Malignancy 20%
• Herniation 10%

Acute Colonic

Paralytic Ileus

• Peritonitis
• Post-surgical
• Hypothyroidism

Ogilvie's Syndrome

Toxic Megacolon

• Inflammatory
• Infectious
• Ischemic

Myopathic

• Scleroderma
• Familial Myopathy

Neuropathic

• Enteric (e.g. Amyloidosis, Paraneoplastic, Narcotics)
• Extrinsic (e.g. Multiple Sclerosis, Spinal Injury, Stroke)
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

Abdominal Distention

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

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

- Other Causes
  - Pelvic Mass
  - Feces/Flatus
    - Fetus
    - Fetus
    - Fibroids and benign masses
    - Fatal tumor
  - Organomegaly
    - Hepatomegaly
    - Splenomegaly
    - Hydronephrosis
    - Renal Cysts
    - Aortic Aneurysm

6 Fs of Abdominal Distention
- Fluid
- Feces
- Flatus
- Fetus
- Fibroids and benign masses
- Fatal tumor
ABDOMINAL MASS

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

Pulsatile
- Vascular (Abdominal Aortic Aneurysm)

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: R/O Cardiac, Pulmonary, Renal, Musculoskeletal Causes
- Lower Quadrant: R/O Genitourinary Causes

Localized
- Upper Quadrant: R/O Cardiac, Pulmonary, Renal, Musculoskeletal Causes
- Lower Quadrant: R/O Genitourinary Causes

Upper Quadrant
- Non-Peritoneal
  - Right Upper Quadrant: Biliary Colic, Hepatitis, Hepatic Abscess, Bowel Obstruction, Pyelonephritis
  - Epigastric: Peptic Ulcer Disease, Gastritis, Esophageal Rupture, Biliary Colic
  - Left Upper Quadrant: Splenic Infarct, Splenic Abscess, Splenic Rupture

- Peritoneal
  - Cholecystitis, Perforated Ulcer, Pancreatitis, Splenic Rupture

Lower Quadrant
- Non-Peritoneal
  - Bowel: Appendicitis, Diverticulitis, Incarcerated Hernia
  - Pelvic/Adrenal: Ectopic Pregnancy, Ovarian Torsion, Pelvic Inflammatory Disease, Salpingitis

- Peritoneal
  - Irritable Bowel Syndrome, Psoas Abscess, Urinary Tract Infection, Ureteric Colic
ABDOMINAL PAIN (ADULT): Chronic - Constant

Chronic Abdominal Pain

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

Constant

Crumpy/Fleeting

Post-Prandial

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

Lower Quadrant

• Crohn’s Disease
• Gynecologic (e.g. Tumor, Endometriosis)

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

Crampy/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

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

Crampy/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

Any Location/Diffuse
• Bowel Obstruction (e.g. Adhesions, Crohn’s, Volvulus, Neoplasm, Hernia)
• Mesenteric Angina
ANORECTAL PAIN

Anorectal Pain

Exclude: Poor Hygiene, Dietary, Anal Trauma

Internal Lesion

- Proctitis
  - Inflammation
  - Infection (Including Sexually Transmitted)

Diagnosis of Exclusion

- Proctalgia

- Other
  - Malignancy
  - Solitary Rectal Ulcer

External Lesion

- Dermatologic
  - Dermatitis
  - Psoriasis

- Anorectal Disease
  - Fissure
  - Fistula/Abscess (Crohn’s)
  - Hemorrhoid
The image is a flowchart of the causes and presentations of acute diarrhea. Here's the text extracted from the image:

**ACUTE DIARRHEA**

**Acute Diarrhea**

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

**Categories**

- **Infectious**
  - Diarrhea Predominant
    - Watery/Large Volume (Small Bowel)
      - Viral
      - Bacterial (e.g. *C. perfringens*, *V. cholerae*, *E. coli*, *Salmonella*, *Yersinia*)
      - Parasitic (e.g. *Giardia*)
      - Drugs (Antibiotics, Laxatives, Antacids)
      - Toxins
    - Bloody/Pain/Small Volume/Urgency (Large Bowel)
      - Bacterial (e.g. *E. coli*, *C. difficile*, *Salmonella*, *Campylobacter*, *Shigella*)
      - Parasitic (e.g. *E. histolytica*)
  - Nausea/Vomiting Predominant
    - *Bacillus cereus*
    - *Staphylococcus aureus*

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

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

- **Dietary**

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

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

Secretory

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

Osmotic
• Magnesium, Phosphate, Sulfate
• Carbohydrate Malabsorption
• Lactose Intolerance

Neoplastic
• Adenocarcinoma
• Lymphoma
CHRONIC DIARRHEA: Steatorrhea & Large 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

Maldigestive
• Pancreatic Insufficiency

Malabsorptive

Motility
• Irritable Bowel Syndrome
• Hyperthyroid

Inflammatory
• Inflammatory Bowel Disease
• Radiation Colitis
• Ischemic Colitis

Secretory
• Villous Adenoma
• Colon Cancer
• Microscopic Colitis

Primary Malabsorption
• Celiac Disease
• Mucosal Disease
• Ileal Crohn’s Disease

Secondary Malabsorption
• Bacterial Overgrowth
• Liver Cholestasis
• Mesenteric Ischemia
• Short Bowel/ Resection
CONSTIPATION (ADULT): Altered Bowel Function & Idiopathic

- 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)
  - Colonic Inertia
  - Outlet Delay
    - Pelvic Floor Dyssynergia

- Severe Idiopathic
  - Secondary Causes

- Irritable Bowel
CONSTIPATION (ADULT): Secondary Causes

Constipation

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

Altered Bowel Function

Severe Idiopathic

Secondary Causes

Altered Bowel Function

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)

Constipation

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

Neonate/Infant

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

Neurologic
- Insufficient Bulk/Fluid
- Withholding
- Painful (e.g. Fissures)

Older Child

Dietary/Functional
- Hirschsprung’s Disease
- Imperforate Anus
- Anal Atresia
- Intestinal Stenosis

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

Progressive Symptoms
• Reflux Stricture
• Esophageal Cancer
ELEVATED LIVER ENZYMES

**Elevated Liver Enzymes**

**Hepatocellular**
- ALT or AST > ALP

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

**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

**US – Normal Bile Ducts**
- PBC
- PSC
- Alcoholic hepatitis
- Drugs
- TPN
- Sepsis
- Infiltrative
  - Sarcoid
  - Amyloid
  - Malignancy
  - Infection
  - Cirrhosis (any)

**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**
HEPATOMEGALY

Hepatomegaly

Rule out concurrent splenomegaly and jaundice

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

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

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

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

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

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

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

Histiocytosis X
- Primary Sclerosing Cholangitis
- Primary Biliary Cirrhosis

Fatty Liver
- Cysts
- Hemochromatosis
- Wilson’s Disease
- Amyloidosis
- Myelofibrosis
LIVER MASS

Liver Mass

Cystic
- Benign
  - Cystadenoma
  - Polycystic/Simple
  - Hydatid Cyst
- Malignant
  - Cystadenocarcinoma
  - Proliferative
    - Hemangioma
    - Focal Nodular Hyperplasia
    - Adenoma
- Infectious
  - Abscess
- Primary Malignancy
  - Hepatocellular Carcinoma
  - Cholangiocarcinoma
- Secondary Malignancy
  - Metastases (e.g. Lung, Colon, Breast)
MOUTH DISORDERS: Adult and Elderly

Consider oral manifestations of systemic disease

Mouth Disorders

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

Mucous Membrane
- Non-Ulcerating
- Ulcerating

Gastrointestinal
- Crohn’s Disease
- Ulcerative Colitis
- NSAIDs

Other
- Canker Sore
- Cold Sore
- Anemia
- Langerhan’s Cell Histiocytosis
- Wegener’s Disease
- Sarcoidosis
- Drug Induced
- Sexually Transmitted Infection

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

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

No Colour Change
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NAUSEA AND VOMITING: Gastrointestinal Disease

Nausea and Vomiting

Gastrointestinal Disease

Upper Gastrointestinal

• Acute Hepatitis
• Acute Cholecystitis
• Cholelithiasis
• Choledocholithiasis
• Acute Pancreatitis

Hepatobiliary

• Infectious Gastroenteritis
• Peptic Ulcer Disease
• Gastroparesis

Lower Gastrointestinal

• Acute Appendicitis
• Acute Diverticulitis

Other Systemic Disease

Acute Hepatitis

Acute Cholecystitis

Cholelithiasis

Choledocholithiasis

Acute Pancreatitis

Gastroesophageal Reflux Disease

Peptic Ulcer Disease

Gastroparesis

Infectious Gastroenteritis

Small/Large Bowel Obstruction

Inflammatory Bowel Disease

Colonic Neoplasm

Gastric/Duodenal Obstruction

Gastric Volvulus

Peptic Ulcer Disease

Gastroparesis

Mesenteric Ischemia

Acute Appendicitis

Acute Diverticulitis

Inflammatory Bowel Disease

Colonic Neoplasm
NAUSEA AND VOMITING: Other Systemic Disease

Nausea and Vomiting

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

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

Other Systemic Disease

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

Central Nervous System

Vestibular
- Ear Infection
- Motion Sickness
- Vestibular Migraine
- Ménière’s Disease

Psychiatric
- Self-Induced (Bulimia)
- Cyclic Vomiting
- Psychogenic
STOOL INCONTINENCE

Stool Incontinence

Intact Pelvic Floor

Affected Pelvic Floor

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

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

UPPER GASTROINTESTINAL 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

Peptic Ulcer Disease

Portal Hypertension

Other

· Gastro-esophageal varices

Gastric Acid Hypersecretion

Non-Steroidal Anti-Inflammatory Drugs

Stress (ICU Setting)

Helicobacter Pylori

Retching?

Mallory Weiss Tear

Tumors

Esophagitis/Gastritis

· Benign
· Malignancy

· Zollinger-Ellison Syndrome
LOWER GASTROINTESTINAL BLEED

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

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

Weight Loss

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

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

Increased Expenditure
- 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 Presentations

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ACUTE KIDNEY INJURY

Acute Kidney Injury

Acute increase in creatinine by at least 50%

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

Renal Hypoperfusion

Systemic Hypotension

• Hepatorenal syndromes
• Drugs
• Emboli

Shock

Tubular

Acute Tubular Necrosis
(Epithelial cell casts)

• Ischemia (severe hypotension)
• Toxins (contrast, aminoglycosides, chemotherapy)
• Pigments

Tubular Obstruction

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

Renal
(FeNa > 2%)

Vascular
(Thrombocytopenia and schistocytosis on CBC)

TTP/HUS

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

Glomerular
(RBC casts, dysmorphic RBCs)

• Anti-GBM antibodies
• Immune-complex deposition (IgA, post-strep, lupus)
• Pauci-immune (Wegener's)

Interstitial
(Sterile pyuria, eosinophiluria)

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

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

• Benign Prostatic Hyperplasia
• Constipation
• Prostate Cancer
• Urolithiasis

Rapidly Progressive Glomerulonephritis

• Drugs

Acute Interstitial Nephritis

• Malignancy

Renal (FeNa > 2%)

Urinalysis and CBC

• Sterile pyuria, eosinophiluria

Renal Hypoperfusion

Systemic Hypotension

• Thrombocytopenia and schistocytosis on CBC

Glomerular

• RBC casts,
• dysmorphic RBCs

Interstitial

• Drugs (NSAIDs, Abx, allopurinol, PPI)

• Infections (CMV, strep, legionella)

• Immune (lupus, sarcoid, Sjögren)

Renal

• FeNa > 2%

Hepatorenal syndromes

Drugs

Emboli

Hypotension

Acute Tubular Necrosis

Tubular Obstruction

TTP/HUS

Rapidly Progressive Glomerulonephritis

Acute Interstitial Nephritis

Drugs
**CHRONIC KIDNEY DISEASE**

**Chronic Kidney Disease**

Decreased kidney function (eGFR < 60ml/min/1.73m²)
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

Dysuria

Pyuria
Leukocytes on Dipstick/Microscopy

No Pyuria
No Leukocytes on Dipstick/Microscopy

Bacteriuria & Hematuria
Dipstick positive for nitrites (if infected with enterobacteria).

No Bacteriuria & No Hematuria
Dipstick negative for nitrites.

Urethritis
• Gonococcal
• Non-Gonococcal (e.g. Chlamydia, Trichomonas)

Vaginitis
• Candida
• Gardnerella
• Neoplasm

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

Upper Urinary Tract Infection/Pyelonephritis
WBC Casts

Lower Urinary Tract Infection/Cystitis
WBC Clumps
GENERALIZED EDEMA

Generalized Edema

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

Underfill
(Urine Na < 20meq/L)

Altered Startling Forces
(Absolute decrease in EABV)

Congestive Heart Failure
“forward failure”
(Relative decrease in EABV)

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

Increased blood pressure

Low serum albumin due to loss or impaired synthesis

Severely ill (e.g. in ICU)
HEMATURIA

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)

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

Glomerular
(Dysmorphic RBCs and/or RBC casts)

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 (Wegener's)

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: Transcellular Shift

Hyperkalemia

Serum Potassium > 5.5 mmol/L

Exclude pseudohyperkalemia
Leukocytosis, thrombocytosis, hemolysis

Reduced Excretion

Increased Intake
(IV potassium with reduced excretion)

Transcellular Shift
Appropriate renal excretion
(GFR, TTKG, distal flow adequate)

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

High Renin
High Aldosterone

• ENaC blockers
• AIN/CIN
• Obstruction

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

• Low EABV (e.g., CHF, cirrhosis, hypotension)

High Renin
Low Aldosterone

• ACEi/ARB
• Adrenal insufficiency
• Heparin

Low Renin
Low Aldosterone

• Diabetic nephropathy
• β2 antagonism
• NSAIDs

Decreased Glomerular Filtration Rate
Increased Creatinine

• Chronic renal failure
• AKI

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

**Hypokalemia**

Serum Potassium <3.5 mmol/L

**Increased Loss**

Renal Loss
Urine loss >20mmol/d

High distal [K]
TTKG > 4

EABV contracted
- Loop diuretics/
  Bartter’s syndrome
- Thiazide diuretics/
  Gittelman’s syndrome
- Magnesium depletion

Volume Status Assessment

**Decreased intake**
(rare cause in isolation)

**Transcellular shift**

GI loss
Urine loss <20mmol/d

• Diarrhea
• Vomiting
• NG suction
• Laxatives

**Low renin**
High aldosterone
- Renal artery stenosis

**Low renin**
High aldosterone
- Hyperaldosteronism

**Low renin**
Low aldosterone
- Licorice intake
- Liddle’s syndrome

**Normal or expanded EABV**

High distal flow
TTKG < 4

• Polyuria

**High renin**
High aldosterone

**Low renin**
Low aldosterone

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

**Decreased intake**

• Gittelman’s syndrome
• Thiazide diuretics/
• Bartter’s syndrome

**High renin**
Low aldosterone

HYPOKALEMIA
HYPERNATREMIA

Hypernatremia
Excess free water loss

Serum Sodium > 145 mmol/L

High Urine Volume
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

• Diabetes Insipidus

Low Urine Volume

Non-renal losses

• Decreased level of consciousness
• No access to water

Hypodipsia
Decreased intake of water

GI loss
• Watery Diarrhea

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

Serum Sodium <135 mmol/L

Artifactual

Normal Posm
280-295 mmol/kg
- Hypertriglyceridemia
- Paraproteinemia

High Posm
>295 mmol/kg
- Hyperglycemia
- Mannitol

Hypo-osmolar plasma
Posm < 280 mmol/kg

Hyper-osmolar urine
Uosm > 300 mmol/kg
Impaired H2O excretion ability

Hypo-osmolar urine
Uosm < 300 mmol/kg
Intact H2O Excretion ability
- Primary polydipsia
- Low osmole intake/ beer potomania

Syndrome of Inappropriate ADH
Euvolemic; no physiologic stimulus to ADH, thus SIADH; diagnosis of exclusion
- Pain/Post-op
- Neurologic trauma
- Drugs
- Pulmonary pathology
- Malignancy

Reduced EABV

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
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)

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
- Unilateral RAS

Systemic Vascular Resistance
(Vasoconstrictive)

Anatomic Causes
- Aortic coarctation
- Unilateral RAS

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

Metabolic Causes
- Hyperthyroidism
- Hypercalcemia
- Pheochromocytoma
Increased Urinary Frequency

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

Intrinsic to Urinary Tract

Extrinsic to Urinary Tract

- Vulvovaginitis
- Bladder compression/Pregnancy

Urinary Tract Infection

Urinary Obstruction

Small volume bladder

Detrusor Hyperactivity

(See Dysuria scheme)

- Benign prostatic hyperplasia
- Prostatitis
- Prostate cancer
- Nephrolithiasis

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

Radio-opaque
Calcium-containing
90% of stones

Radio-lucent
Non-calcium
10% of stones

Hard Stones
Calcium oxalate/phosphate
80% of stones

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

Hypercalciuria
• Increased PTH
• High salt intake
• 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
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

Hypertonic Urine Following Water Deprivation Test
- Primary polydipsia
Persistent Proteinuria

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

Tubular Proteinuria
(Negative urine dip = no albuminuria)

- Overflow
  - Multiple Myeloma
  - MGUS

- Poor reabsorption
  - RTA
  - Fanconi’s syndrome
  - Drugs

Glomerular Proteinuria
(Positive urine dip = albuminuria)

- Glomerular Proteinuria
  - Urine Protein Electrophoresis
    - Monoclonal protein
    - Negative

- Active urine sediment
  - WBC/RBC casts
    - IgA nephropathy
    - Membranoproliferative GN
    - Mesangial proliferative
    - Anti-GBM antibodies
    - Wegener’s
    - SLE
    - HSP
    - Post-infectious GN

- Bland urine sediment
  - FSGS
  - Minimal change disease
  - Membranous nephropathy
  - HTN
  - Diabetes
  - Protein deposition (eg. Amyloidosis)

Orthostatic Proteinuria
- Tall adolescents

Transient Proteinuria
- Exercise
- Fever
- UTI

Excluded on history/with repeat testing
RENAL MASS: Solid

- **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

Renal Mass

Solid

Cystic

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

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

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

Carcinoma
No signs of infection

- Renal Cell Carcinoma

Abscess
Fever and leukocytosis
Positive Gallium scan
Scrotal Mass

Painful

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

Gradual Onset
If with Dysuria see *Dysuria* scheme
- Acute Epididymitis
- Epididymo-orchitis

Trans-illuminates

Painless

Does Not Trans-illuminate

Epididymal
- Epididymal Cyst
- Spermatocele

Spermatic Cord
- Communicating hydrocele
- 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
  - Leydig, Sertoli

111
Suspected Acid-Base Disturbance

Suspected Acid-Base Disorder

Acidemia
(pH < 7.35)

- Methanol
- Uremia
- Diabetic Ketoacidosis
- Propylene Glycol
- Isoniazid
- Lactic Acidosis
- Ethylene Glycol
- Acetylsalicylic Acid

Normal pH

- Normal Arterial Blood Gas
- Mixed Acid-Base Disorder

Alkalemia
(pH > 7.45)

- Respiratory Alkalosis
  (pCO₂ < 35 mmHg)

Metabolic Alkalosis
(HCO₃⁻ > 28 mmol/L)

HCO₃⁻ : CO₂
12:10

Metabolic Acidosis
(HCO₃⁻ < 24 mmol/L)

HCO₃⁻ : CO₂
10:10

Respiratory Acidosis
(pCO₂ > 40 mmHg)

Acute
HCO₃⁻ : CO₂
1:10

Chronic
HCO₃⁻ : CO₂
3:10

Anion Gap

Non-Anion Gap

Renal

Gastrointestinal (diarrhea)

Diagnosis of Mixed Metabolic Disorders in Patients with Metabolic Acidosis:

- Anion Gap Not Increased  Non-Anion Gap Acidosis Alone
- ΔAnion Gap = ΔHCO₃⁻  Anion Gap 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

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)
(Gain of H+)

Excess acid addition

Decreased NH₄ production and anion secretion
• AKI/CKD

Positive serum salicylate level
Salicylate poisoning
• Shock
• Drugs
• Inborn errors

Elevated serum creatinine

Elevated serum lactate
Lactic acidosis

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

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

Normal Anion Gap (≤14)
(loss of HCO₃⁻)

• AKI/CKD

Other ingestion
• Paraldehyde, Iron, Isoniazid, Toluene, Cyanide
METABOLIC ACIDOSIS: Normal Anion Gap

Metabolic Acidosis

Elevated Anion Gap (>14) (Acid Gain)

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

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

Renal Loss

Direct Loss
Negative U net charge
High $FE_{HCO_3}$
- 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 = $(K_{Urine} \times Osm_{Serum})/(K_{Serum} \times Osm_{Urine})$
Urine net charge = $U_{Na} + U_{K} - U_{Cl}$

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

History of diarrhea?
METABOLIC ALKALOSIS

Sustained Metabolic Alkalosis

Volume Status Assessment

Expanded Effective Arterial Blood Volume
No signs of volume depletion

Contracted Effective Arterial Blood Volume
Signs of volume depletion

Gastrointestinal Loss
Low U Cl⁻

Gastric
• Vomiting
• NG suction

Lower Bowel
• Villous adenoma
• Laxative abuse
• Chloridorrhea

Renal Loss
High U Cl⁻

Non-reabsorbed anions
• Penicillins

Impaired tubular transport
• Diuretics (loop/thiazide)
• Hypomagnesemia
• Bartter’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

Transient
• IV Bicarbonate
• Acute correction of hypercapnia

Renal Failure with Ingestion
• Milk-Alkali syndrome
• Bicarbonate ingestion
URINARY INCONTINENCE

Urinary Incontinence

Transient
Easily reversible cause

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

Established
Not easily reversible cause

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

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

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

Bladder Outlet Obstruction
URINARY TRACT OBSTRUCTION

Urinary Tract Obstruction

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

  - CT KUB

  - Intraluminal
    - Retroperitoneal Fibrosis
    - Cancer

  - Extraluminal
    - Ureteropelvic junction obstruction

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

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

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

  - Outflow Tract

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

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

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ABNORMAL LIPID PROFILE: Combined & Decreased HDL

**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
  - Secondary Causes
- **Increased Cholesterol and 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)

**Physical signs:**
Hypertriglyceridemia: eruptive xanthoma, lipemia retinalis
Increased IDL: palmar crease xanthoma, tuberous xanthoma
Increased LDL: tendon xanthomata on Achilles tendon, knuckles
ABNORMAL SERUM TSH

**Decreased TSH**
- Decreased Free T4
  - Hypopituitarism

**Increased TSH**
- Increased Free T4
  - Thyrotoxicosis
- Decreased Free T4
  - Hypothyroidism
  - Sub-clinical Hypothyroidism
  - Recovery from Non-Thyroid Illness

**Normal Free T4**
- Normal Free T3
  - Sub-Clinical Thyrotoxicosis

**Increased Free T3**
- T3 Toxicosis

*refer to hyperthyroidism scheme pg 142

*refer to hypothyroidism scheme pg 143
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
  - Congenital Adrenal Hyperplasia
  - ACTH Dependent
  - ACTH Independent
  - Macronodular Hyperplasia

Estrogen Excess
- Feminization, Early Puberty, Heavy Menses
  - Estrogen Releasing Adenoma (High Plasma E₂ + Clinical Picture)

Glucocorticoid Excess
- Cushingoid Features
  - Glucocorticoid Releasing Adenoma (Positive Dexamethasone Suppression Test)

Aldosterone Excess
- Hypertension +/- Hypokalemia/Aldososteronism
  - Aldosterone Releasing Adenoma (High Aldosterone: Renin Ratio)

Positive 24-Hour Metanephrines + Nor-Metanephrines
- Pheochromocytoma
  - Paroxysmal Hypertension, Headache, Diaphoresis, Palpitations, Anxiety

Silent/Non-Functioning Mass

High DHEAS
- Androgen Releasing Adenoma

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

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
- Non-functioning Adenoma
- Lipoma
- Myelolipoma
- Ganglioneuroma

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

Estrogen Excess
- Feminization, Early Puberty, Heavy Menses
- Normal DHEAS
  - Other Source (e.g. Polycystic Ovarian Syndrome, Congenital Adrenal Hyperplasia)

Glucocorticoid Excess
- Cushingoid Features
- •Glucocorticoid Releasing Carcinoma (Positive Dexamethasone Suppression Test)

Aldosterone Excess
- Hypertension +/- Hypokalemia/Alkalosis
- •Aldosterone Releasing Carcinoma (High Aldosterone: Renin Ratio)

Positive 24-Hour Metanephrines + Nor-Metanephrines
- •Pheochromocytoma (Paroxysmal Hypertension, Headache, Diaphoresis, Palpitations, Anxiety)

Silent/Non-Functioning Mass
- •Lymphoma Metastases (Often Bilateral) Adrenal Carcinoma

No Signs of Hormone Excess

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

Amenorrhea

Rule Out Pregnancy

Low/Normal FSH

Bleed With Progestin Challenge
- Polycystic Ovarian Syndrome

Hypothalamic-Pituitary Axis

No Bleed With Progestin Challenge
- Hypothyroidism
- Hyperthyroidism
- Diabetes Mellitus
- Exogenous Androgen Use
- Congenital Structural Abnormalities

Organic Cause
- Congenital GnRH Deficiency
- Infiltrative or Inflammatory Lesion
- Tumors
- Infarction
- Empty Sella Syndrome
- Apoplexy

Failed Progestin Challenge
- 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

125
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

Normal TSH/
Prolactin

Autonomous
Production
- Renal Cancer or Failure
- Lactotroph Adenoma
- Bronchogenic Tumor
- Contraceptive Pill/Patch/Ring

Other Breast
Discharge

- Neoplasm (usually blood)
- Other Internal Breast Discharge

High Prolactin +
High TSH
- Primary Hypothyroidism
GYNECOMASTIA: Increased Estrogen & Increased HCG

Gynecomastia

True Gynecomastia

• Idiopathic

Pseudogynecomastia
Fat Deposition Only

Physiologic

• Newborns
• Pubescent/Adolescent
• Elderly

Normal Blood Work
• Idiopathic

Increased Estrogen

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

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

Increased HCG

No Testicular Mass on Ultrasound
• Extragonadal Germ Cell Tumor
• HCG Secreting Non-Trophoblastic Neoplasm

Testicular Mass on Ultrasound
• Testicular Germ Cell Tumor

Increased LH

 Decreased Testosterone & Normal/Low LH
GYNECOMASTIA: Increased LH & Decreased Testosterone

**True Gynecomastia**
- Increased Estrogen
  - Increased HCG
    - Increased Testosterone
      - Testicular Germ Cell Tumor
    - Increased T4, Decreased TSH
      - Hyperthyroidism
  - Normal T4 and TSH
    - Androgen Resistance

**Pseudogynecomastia**
- Fat Deposition Only

**Physiologic**
- Normal Blood Work
- Increased Estrogen
- Increased HCG
- Increased LH
  - Hypogonadism
  - Klinefelter’s Syndrome
  - Kallman’s Syndrome
  - Testicular Torsion
  - Testicular Trauma
  - Congenital Anorchia
  - Viral Orchitis
  - Prolactin Secreting Tumor
- Normal Prolactin
  - Non-Tumor Secondary Hypogonadism
HIRSUTISM

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
HIRSUTISM & VIRILIZATION: Androgen Excess

Androgen Excess
Normally With Menstrual Irregularity

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

Hypertrichosis
Non-Androgen Distribution
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: Normal/High PTH

Hypercalcemia
Total > 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

Primary Hyperparathyroidism
• Adenoma
• Hyperplasia
• MEN 1 and 2A

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

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)

Normal Creatinine

High Phosphate

High PTH
- Secondary Hyperparathyroidism
- Rhabdomyolysis
- Phosphate Poisoning

Low PTH
- Hypoparathyroidism with Chronic Kidney Disease

High Creatinine

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

Hypocalcemia
Total Corrected Serum Calcium < 2.10 mmol/L

Low Phosphate

Low/Normal PTH
• Severe Malnutrition with Hypomagnesemia

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

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
(<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

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
(< 0.8 mmol/L)

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

Increased Excretion

Renal
$F_{PO4} > 5\%$
• Hyperparathyroidism
• Vitamin D Deficiency/Resistance
• Hypophosphatemic Rickets
• Oncogenic Osteomalacia
• Fanconi Syndrome
• Osmotic Diuresis
• Acute Volume Expansion
• Acetazolamide and Thiazide Diuretics

GI
• Small bowel diarrhea
• Enteric Fistula

Dietary deficiency
• Anorexia
• Chronic Alcoholism

Malabsorption
• Aluminum/Magnesium Containing Antacids
• Inflammatory Bowel Disease
• Steatorrhea
• Chronic Diarrhea

Decreased Intake
Hyperthyroidism

High/Normal Radioiodine Uptake

Autoimmune Thyroid Disease
- Grave’s Disease
- Positive anti-TSH 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

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)

Desire Reduced/Absent

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)

Pharmacological
- Anti-depressants
- Narcotics
- Anti-psychotics
- Anti-androgens
- Alcohol
- Benzodiazepines
- Hallucinogens

Physiological
- Hypo-testosteronism
- Prolactinemia
- Hyper-estrogenism
- Hypothyroidism
- Hyperthyroidism
- Chronic Pain

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

Other
- Hypertension
- Dyspareunia
- Dialysis

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

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

Physiological
- Hypo-testosteronism
- Prolactinemia
- Hypothyroidism
- Hyperthyroidism

Other
- Hypertension
- Dyspareunia
- Dialysis

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

Other
- Hypertension
- Dyspareunia
- Dialysis

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)
SELLAR/PITUITARY MASS

- **Adenoma**
  - Primarily Anterior Pituitary
  - Secreting
    - Prolactin
    - GH
    - ACTH
    - TSH
    - LH/FSH
    - Mixed
  - Non-Functioning
    - Oncocytoma
    - Null Cell Adenoma

- **Hyperplasia**
  - Physiological (e.g., Pregnancy)
  - Compensation (e.g., Hypothyroidism)
  - Stimulatory (e.g., Ectopic GNRH, CRH)

- **Non-Adenomatous**

- **Inflammatory**
  - Infectious
  - Autoimmune
  - Giant Cell Granuloma
  - Langerhan’s Cell
  - Histiocytosis
  - Sarcoidosis

- **Vascular**
  - Aneurysm
  - Infarction

- **Hamartoma**

- **Neoplasm**
  - Craniopharyngioma
  - Meningioma
  - Cyst
  - Glioma
  - Ependymoma

- **Metastatic**
SELLAR/PITUITARY MASS: Size

- **Small** (<1cm)
  - Hypersecretion

- **Large** (>1cm)
  - Hypersecretion
  - Hyposcretion

- **Other**
**SHORT STATURE**

**Short Stature**

- **<3<sup>rd</sup> 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

- **No Dysmorphic Features**

**Normal Variant**

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

**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
- Hematologic

**Other**

- Intrauterine Growth Retardation
- Bulimia Nervosa
- Anorexia Nervosa
- CNS Tumors (e.g. Craniopharyngioma)
TALL STATURE

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

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

  Constitutional
  - Constitutional Tall Stature (Early Bloomer)

Accelerated Growth (BA>CA)

- Obese BMI
  - Exogenous Obesity

  Normal Puberty Onset
  - GH Excess
  - Hyperthyroidism

Disproportionate

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

Other Obvious Abnormalities/Stigmata

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

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WEIGHT GAIN/OBESITY

Weight Gain/Obesity

Energy Related (Primary)

Increased Intake
- Sedentary Lifestyle
- Smoking Cessation

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

Secondary

Dietary
- Progressive
- Polyphagia
- High-Fat Diet

Social/Behavioural
- Socioeconomic
- Ethnicity
- Psychological

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

Iatrogenic
- Drugs/Hormones
- Tube Feeding
- Hypothalamic Surgery

Progressive Polyphagia
- High-Fat Diet

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Neurologic Presentations

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Neurologic Presentations

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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
  - Coma
  - Other
    - Locked-in Syndrome
    - Stupor
    - Persistent Vegetative State

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

Intact Repetition

Impaired Comprehension
- Wernicke’s Aphasia

Intact Comprehension
- Conduction Aphasia

Impaired Comprehension
- Transcortical Sensory Aphasia

Intact Comprehension
- Anomic Aphasia
**aphasia: non-fluent**

**aphasia**

- **fluent**
  - grammatically correct, but nonsensical, tangential.
  - phonemic & semantic paraphasias

- **non-fluent**
  - agrammatic, hesitant, but substantive communication

- **impaired repetition**
  - impaired comprehension
    - global aphasia
  - intact comprehension
    - broca’s aphasia

- **intact repetition**
  - impaired comprehension
    - mixed transcortical aphasia
  - intact comprehension
    - transcortical motor aphasia

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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 anesthesia, constitutional symptoms, parasthesia, age >50, <18, IV drug use, neuromotor deficits, nocturnal pain, high energy trauma, past history of neoplasm
COGNITIVE IMPAIRMENT

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
- Affecting Multiple Domains
  - Depression
  - Delirium
  - Amnestic Mild Cognitive Impairment
  - Non-Amnestic Mild Cognitive Impairment
- Decline in Instrumental Activities of Daily Living
  - Normal Pressure Hydrocephalus
  - Chronic Meningitis
  - Chronic Drug Abuse
  - Tumor
  - Subdural Hematoma
  - B12 deficiency
  - Hypothyroidism
  - Hypoglycemia

- Cortical Dementia
  - Early Extrapyramidal Features
    - Dementia with Lewy Bodies

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DYSARTHRIA

Dysarthria

Lower Motor Neuron
- Slow, Low Volume, Breathy Speech
- Tongue and Facial Atrophy
- Fasciculations
- Motor Neuron Disease
- Lesions of Cranial Nerves VII, IX, X, XII
- Myasthenia Gravis
- Muscular Dystrophy

Upper Motor Neuron
- Slow, strangulated, harsh voice
- Positive jaw jerk, hyperactive gag reflex. Emotional lability
- Bilateral Lacunar Internal Capsule Strokes
- Multiple Sclerosis
- Amyotrophic Lateral Sclerosis

Ataxic (Cerebellar)
- Irregular Rhythm and Pitch
- Spinal-Cerebellar Ataxia
- Multiple Sclerosis
- Alcohol
- Tumour
- Paraneoplastic Disorder

Extra-Pyramidal
- Rapid, Low Volume, Monotone Speech
- Parkinson’s Disease
FALLS IN THE ELDERLY

Fall

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

Musculo-skeletal
- Arthritis

Extrinsic Factors

Drugs
- Polypharmacy
  - esp. >4 medications
- Psychotropics

Environment
- Rugs
- Stairs
- Lighting
GAIT DISTURBANCE

Gait Disturbance

Movement Disorder

See Movement Disorder schemes

Hereditary

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

Sporadic

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

Sensory Ataxia

- Vestibular
- Visual
- Proprioceptive

Cerebellar Ataxia

Progressive/Degenerative

Catalytic Deficiency (Childhood)

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

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HEADACHE: Primary

Headache

Primary
Usually episodic

- No pattern

Secondary
Usually constant

- In Clusters
  - Autonomic Cephalgias
    - Last for minutes to hours.
    - Separated by hours.
    - Sudden onset.
    - Cluster Headache
      - Orbital, Sharp, Autonomic Dysfunction
    - Hemicranial Continua

Primary
- Unilateral
  - Migraine
    - Throbbing/Pulsating

- Bilateral
  - Tension/Stress Headache
    - Tightening, Band-Like, Dull

Other

- Other
  - Primary Cough Headache
  - Primary Exertional Headache
  - Primary Stabbing Headache

Other

- In Clusters
  - Trigeminal Neuralgia
    - Shooting, stabbing

- Other
  - Last for seconds, separated by minutes to hours

- Migraine
  - Throbbing/Pulsating

- Tension/Stress Headache
  - Tightening, Band-Like, Dull
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
HEADACHE: Secondary, with Red Flag Symptoms

Headache

Primary
Usually episodic

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

Secondary
Usually constant

No Red Flag Symptoms

Infection
• Meningitis
• Encephalitis

Vascular
• Ischemic Stroke
• Intracranial Hemorrhage
• AVM
• Aneurysm
• Sinus Thrombosis

Trauma
• Subarachnoid Hemorrhage (Thunderclap Headache)

Autoimmune
• Temporal Arteritis

Metabolic
• Pseudotumor Cerebri

Neoplasm/Mass

Cerebrospinal Fluid
• Hydrocephalus
• Cerebrospinal fluid leak
HEMIPLEGIA

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
- Astereognosia
- 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)
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

Sympathetic

• Post-Herpetic Neuralgia
• Neuroma
• Neuropathy

• Phantom Limb
• Post-stroke
• Spinal injury

• Complex regional pain syndrome
MOVEMENT DISORDER: Hyperkinetic

Hyperkinetic
Examples listed not exhaustive for all causes

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

Tics

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

Stereotypies

Myoclonus
- Epilepsy
- Toxic/metabolic

Chorea
- Huntington’s Disease

Bradykinetic

Tremor

Athetosis

Ballism
MOVEMENT DISORDER: Tremor

Movement Disorder

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)
MOVEMENT DISORDER: Bradykinetic

Movement Disorder

Hyperkinetic

Tremor

Bradykinetic

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

Drug-Induced Parkinsonism
- Neuroleptics
- Haloperidol
- Metoclopramide
- Prochlorperazine
- 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: 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

Mononeuritis Multiplex
- Vasculitis
- Diabetes

Plexopathy
- Brachial neuritis
- Diabetes
- Tumor

Poly-Radiculopathy
- Spondylosis
- Chronic Inflammatory Demyelinating Polyneuropathy
- Neoplasm
- Infection

No Sensory Changes

Does Not Follow Distribution
SPELL/SEIZURE: Epileptic Seizure

Spell/Seizure

Unprovoked Recurrence
  Epileptic Seizure

  Focal Seizure

    Non-Dyscognitive
      Features of
      • Aura
      • Motor
      • Autonomic

    Dyscognitive

  Unclassified

  Evolving to Bilateral Convulsive Seizure

  Generalized

    Non-Convulsive
      • Absence
      • Atonic

    Convulsive
      • Myoclonic
      • Clonic
      • Tonic
      • Tonic-Clonic

Provoked Recurrence
  Non-epileptic organic seizure/other

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 withdrawal
- Drug overdose
- Liver Failure

Metabolic
- Intracerebral hemorrhage
- Subarachnoid hemorrhage
- Subdural hemorrhage
- Epidural hemorrhage
- Ischemic stroke
- Vasculitides

Vascular
- Dementia

Degenerative
- Congenital abnormality
- Neoplasm
- Arteriovenous malformation

Structural
- Eclampsia

Pregnancy
SPELL/SEIZURE: Other

Unprovoked Recurrence (Primary)
Epileptic Seizure

Unprovoked Recurrence (Primary)
Epileptic Seizure

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

Other

Other

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

Cardiovascular
- Syncope

Psychogenic
- Panic Disorder
- Conversion Disorder
- Pseudoseizures
STROKE: Ischemia

- Intracerebral Hemorrhage
- Ischemia
- Subarachnoid Hemorrhage

Thrombosis
- Atherosclerosis, Arterial
- Dissection, Fibromuscular
- Dysplasia

Large Vessel
- Lacunar

Small Vessel

Unknown

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

Ascending Aorta

Systemic Hypoperfusion
- Pump Failure
- Cardiac Output Reduction
- Cardiac arrest
- Arrhythmias
- Myocardial infarction
- Pulmonary embolus
- Pericardial effusion
- Shock
STROKE: Subarachnoid Hemorrhage

**Stroke**

- Intracerebral Hemorrhage
- Ischemia
- Subarachnoid Hemorrhage

**Vessel Disease**
- Aneurysm
- Vascular Malformation

**Other**
- Bleeding Diathesis
- Trauma
- Drug Use
SYNCOPE

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: 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

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

Intoxication
• Multiple sclerosis

• Barbiturates
• Ethanol

• Benign Paroxysmal Positional Vertigo
• Labrynthitis/Vestibular Neuronitis
• Menière’s Disease
• Acoustic Neuroma
• Ototoxicity (usually imbalance and oscillopsia)
• Otitis Media
• Temporal Bone Fracture
Obstetrical & Gynecological Presentations

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INTRAPARTUM ABNORMAL FETAL HEART RATE TRACING: Variability & Decelerations

Abnormal Fetal Heart Rate Tracing

Abnormal Variability
- Minimal/Absent Variability ≤ 5 bpm
  - Fetal sleep
  - Prematurity
  - Medications (analgesia, sedatives)
  - Hypoxic acidemia
  - Congenital anomalies

Baseline Abnormality
- Marked Variability ≥ 25 bpm
  - Mild hypoxia

Decelerations
- 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
Abnormal Fetal Heart Rate Tracing

- Abnormal Variability
- Baseline Abnormality
- Decelerations

Abnormal Variability

- Bradycardia: < 110 bpm
  - Maternal:
    - Hypotension
    - Drug response
    - Maternal position
    - Connective tissue disease with congenital heart block (e.g. SLE)
  - Fetal:
    - Umbilical cord occlusion
    - Fetal hypoxia/acidosis
    - Vagal stimulation (e.g. chronic head compression)
    - Fetal cardiac conduction or structural defect

- Tachycardia: > 160 bpm
  - Maternal:
    - Fever
    - Infection
    - Dehydration
    - Hyperthyroidism
    - Endogenous adrenaline or anxiety
    - Drug response
    - Anemia
  - Fetal:
    - Infection
    - Prolonged fetal activity or stimulation
    - Chronic hypoxemia
    - Cardiac abnormalities
    - Congenital anomalies
    - Anemia
ABNORMAL GENITAL BLEEDING

Abnormal Genital Bleeding

Pregnant

Non Pregnant

See Bleeding in Pregnancy Scheme

Gynecologic

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

Acute Pelvic Pain

Gynecologic

Non-Gynecologic

Pregnant

• Ectopic pregnancy**
• Placental abruption**
• Spontaneous abortion
• Labour
• Molar pregnancy

• Fibroid
• Endometriosis
• Adenomyosis
• Pyometrium
• Hematometra
• Congenital Anomaly
• Dysmenorrhea

• Tubo-ovarian abscess**
• Torsion**
• Ovarian cyst
• Endometriosis
• Ovulation pain

Non-Pregnant

• Genitourinary (Infection, Stone)
• Gastrointestinal (Appendicitis, Gastroenteritis, Diverticulitis, IBD)
• Musculoskeletal

Extrauterine

• Placental abruption**
• Spontaneous abortion
• Labour
• Molar pregnancy

Intrauterine

• Ectopic pregnancy**
• Placental abruption**
• Spontaneous abortion
• Labour
• Molar pregnancy

Uterus

• Fibroid
• Endometriosis
• Adenomyosis
• Pyometrium
• Hematometra
• Congenital Anomaly
• Dysmenorrhea

Ovary

• Tubo-ovarian abscess**
• Torsion**
• Ovarian cyst
• Endometriosis
• Ovulation pain

Fallopian Tube

• Tubo-ovarian abscess**
• Pelvic inflammatory disease
• Torsion
• Endometriosis
• Hydrosalpinx

**Obstetrical Emergencies
CHRONIC PELVIC PAIN

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

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

Secondary
Absence of menses for 3 cycles or 6 months

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

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**
- 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)

**Hypothalamic**
- Low FSH, Low estrogen
- Functional (e.g. eating disorder, weight loss, stress, excessive exercise, illness)
- Infiltrative lesions (e.g. lymphoma, Langerhans cell histiocytosis, sarcoidosis)

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

- **High Prolactin**
- Sheehan’s Syndrome
- Radiation
- Infection
- Infiltrative Lesions; hemochromatosis

**Outflow Tract Obstruction**
- Asherman’s syndrome
- Cervical stenosis
ANTENATAL CARE

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 (28 weeks)

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

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
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  - Symphysis fundal height
  - Leopold maneuvers
- Group B Streptococcus screen (35-37 weeks)
- ± Ultrasound for growth, presentation, biophysical profile
- ± Non-stress test
BLEEDING IN PREGNANCY: <20 Weeks

Bleeding in Pregnancy

Hemodynamically Unstable – Do ABCDEs

< 20 Weeks

Bleeding from the Os

Second / Third Trimester

Not Bleeding from the Os

Cervix Open

Passing Tissue and Clots

• Complete abortion
• Incomplete abortion
• Ectopic pregnancy

Not Passing Tissue and Clots

• Missed abortion
• Inevitable abortion
• Cervical insufficiency

Cervix Closed

IUP on Transvaginal U/S

Ectopic Pregnancy on U/S

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

No IUP on Transvaginal U/S

No Ectopic Pregnancy on U/S

β-hCG < 1500

• β-hCG doubled in 72h
  Viable pregnancy – monitor for ectopic or IUP (implantation bleed)

β-hCG not doubled in 72h
  Ectopic pregnancy or failed pregnancy

β-hCG > 1500

Ectopic likely
BLEEDING IN PREGNANCY: 2nd and 3rd Trimesters

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

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

Painful

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

Painless

• Placenta previa
• Vasa previa
GROWTH DISCREPANCY: Small For Gestational Age/Intrauterine Growth Restriction

Growth Discrepancy

Large for Gestational Age
(Growth > 90th percentile for GA)

- Placenta previa
- Chronic insufficiency

Small for Gestational Age
(Growth < 10th percentile for GA)

- TORCH Infections
- Multiple Gestation

Fetal Factors

- Placental Ischemia/Infarction
  - Placenta previa
  - Chronic insufficiency
- Placental Abruption
- Placental Malformations
  - Vasa previa

Placental Factors

Maternal Factors

- Decreased Uteroplacental Flow
  - Gestational hypertension/pre-eclampsia
  - Renal insufficiency
  - Diabetes mellitus
  - Autoimmune disorders
- Maternal Lifestyle
  - Malnutrition
  - Smoking
  - Alcohol
  - Drugs
- Maternal Hypoxemia
  - Pulmonary diseases
  - Chronic anemia
  - High altitude

- Iatrogenic
  - Folic acid antagonists
  - Anticonvulsants

- Chromosomal Abnormalities
  - Trisomy 13, 18, 21
  - Turner syndrome, 45X

Confined Placental Mosaicism (Rare)
GROWTH DISCREPANCY: Large for Gestational Age

Growth Discrepancy

Large for Gestational Age (Growth > 90th percentile for GA)

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)

MATERNAL COMPLICATIONS
- Prolonged labour
- Operative vaginal delivery
- Caesarean section
- Genital tract lacerations
- Post-partum hemorrhage
- Uterine rupture

Small for Gestational Age (Growth < 10th percentile for GA)

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: Female

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

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

Normal FSH

Hypopituitarism
- Hypothyroidism
- Hyperprolactinemia
- Tumors (e.g. Prolactinoma)

Increased FSH
- Premature ovarian failure
- Premenopausal changes
- Turner’s syndrome
INFERTILITY: Male

- Infertility
  - Failure to conceive following > 1 year of unprotected sexual intercourse

- Male (35%)
  - Sperm Production
    - (Non-obstructive azoospermia)
      - Low testosterone
  - Sperm Motility
    - Abnormal semen analysis
  - Sperm Transport
    - Vasectomy
    - Cystic fibrosis gene mutation
    - Post-infectious obstruction
    - Ejaculatory duct cysts (e.g. prostate)
    - Kartagener syndrome
  - 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

- Unexplained (15%)

- Female (50%)

See Sexual Dysfunction Scheme

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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
- Decreased Maternal Arterial O₂ Tension
  - Smoking
  - Hypoventilation
  - Respiratory disease
  - Seizure
  - Trauma
- Decreased Maternal O₂ Carrying Capacity
  - Maternal anemia
  - Carboxyhemoglobin

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

Maternal Medical Conditions
- Hypotension
- Anesthesia
- Maternal positioning
- Fever
- Vasculopathy (SLE, Type 1 diabetes mellitus, HTN)
- Hyperthyroidism
- Antiphospholipid syndrome
PELVIC MASS

Pelvic Mass

Do Pelvic U/S

Gynecologic

Non-Gynecologic

Gastrointestinal

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

Genitourinary

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

Non-Pregnant

Uterus
• Fibroid
• Adenomyosis
• Neoplasm
• Pyometra
• Hematometra

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

Ovary
See Ovarian Mass scheme

Pregnant

Uterus
• Intrauterine pregnancy

Fallopian Tube
• Tubal ectopic pregnancy

Ovary
• Ovarian ectopic pregnancy
OVARIAN MASS

Ovarian Mass

Benign Neoplasms
- Polycystic ovary
- Endometrioid cyst

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

Functional
- Fibroma
- Thecoma
- Granulosa cell tumor

Malignant Neoplasms
- Serous cystadenocarcinoma
- Mucinous cystadenocarcinoma
- Endometrioid
- Clear Cell

Epithelial
- Serous cystadenoma
- Mucinous cystadenoma

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

Sex Cord Stromal
- Dysgerminoma
- Immature teratoma
- Yolk Sac
- 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
• Enterocoele
• Rectocoele (posterior prolapse)
POST-PARTUM HEMORRHAGE

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

≥ 3 consecutive spontaneous abortions

Maternal

Fetal

• Genetic abnormalities

Environmental

• Toxin (organic solvents, mercury, lead)
• Smoking
• Alcohol
• Drugs
• Ionizing radiation

Medical

• Diabetes mellitus
• Hypo/hyperthyroidism
• PCOS
• Luteal phase deficiency

Anatomic

• Cervix
  • Cervical insufficiency
• Fibroids
• Congenital anomaly
• Polyps
• Asherman’s syndrome

Other

• Maternal infection
• Thrombophilia

Autoimmune

• Antiphospholipid syndrome
• Lupus anticoagulant

Endocrine

• Maternal age
• Maternal/paternal chromosomal abnormality

Genetic
VAGINAL DISCHARGE

Vaginal Discharge

Infectious

Inflammatory

Neoplastic

- Endometrium
- Cervix
- Vulva
- Vagina

Systemic

- Crohn’s disease
- Collagen vascular disease
- Dermatologic

Local

- Chemical irritant
- Douching
- Atrophic vaginitis
- Foreign body
- Lichen planus

Sexually Transmitted Infection

- Chlamydia trachomatis
- Neisseria gonorrhoeae

Toxic Shock Syndrome

- Vulvovaginal candidiasis
- Bacterial vaginosis
- Trichomonas vaginalis

Vulvovaginitis
Dermatologic Presentations

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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)
DERMATOSES IN PREGNANCY: Physiologic Changes

Dermatoses in Pregnancy

Physiologic Skin Changes

- Pigmented
  - Face
    - Melasma
  - Abdomen
    - Linea Nigra
  - Hormone induced
    - Hyperpigmentation of areolae, axillae & genitalia
    - Increase in mole size & number (probable)

Specific Skin Conditions

- Other
  - Distal Onycholysis
  - Subungual Keratosis
  - Hyperhidrosis
  - Miliaria
  - Dyshidrotic Eczema
  - Hirsutism (face, limbs, and back)

- Vascular
  - Striae Distensae (striae gravidarum)
  - Palmar erythema
  - Spider Nevi
  - Cherry Hemangioma (Campbell de Morgan spot)
  - Pyogenic granuloma
  - 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

Non-Primary Skin Lesion
- Intrahepatic cholestasis of pregnancy
  (pruritis worse at night, 3rd trimester)

Specific Skin Conditions

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

Primary Skin Lesion
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

Disorder of Pigmentation

Hypopigmentation

Localized

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

Acquired

Scale
- Tinea versicolor (can also be hyperpigmented)
- Pityriasis alba

Hyperpigmentation

Diffuse

Congenital
- Generalized hypopigmentation of hair, eyes, skin

Acquired
- Phenylketonuria
- Albinism
- Piebaldism
- Vitiligo

Acquired
- Vitiligo
- Post-Inflammatory hypopigmentation
GENITAL LESION

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
      - • Haemophilus ducreyi (chancroid)
      - • Behçet's syndrome
      - • Pemphigus vulgaris
      - • Lichen Sclerosis
      - • Erosive Lichen Planus
  - Papules/Plaques
    - Non-Infectious
      - • Lichen planus
      - • Psoriasis

- 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
  - Excoriations
    - • Scabies
    - • Pubic lice
HAIR LOSS (ALOPECIA): Diffuse

Hair Loss

Localized (focal)

- Scarring
  - Irreversible
    - biopsy required

  - Lupus erythematosus
  - Lichen planopilaris

Diffuse

Non-Scarring

- Reversible

Pattern

- Androgenetic alopecia

Anagen Effluvium

- Chemotherapy
- Loose anagen syndrome

Discrete Patches

- Alopecia totalis (all scalp and facial hair)
- Alopecia universalis (all body hair)

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

Hair Loss

- Localized (focal)
  - Scarring
    - Irreversible - biopsy required
  - Secondary to Skin Disease
- Diffuse
  - Non-Scarring
    - Reversible
  - Broken Hair Shafts
  - Hair Shafts Intact or Absent

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.

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

Skin Lesion

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

Flat

- 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

- 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.

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

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

Erosions/Ulcers/Blisters

Primary Dermatologic Diseases
- Aphthous Stomatitis (recurrent, 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

White Lesions

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

Primary Dermatologic Disease

Nail Plate Abnormality

Discolouration
- Psoriasis
- Alopecia Areata

Pitting
- Psoriasis
- Onychomycosis
- Onychogryphosis

Thickening
- Psoriasis

Onycholysis
- Psoriasis
- Onychomycosis

Oil Drop Sign
- Psoriasis

Fungal Culture
- White/Yellow-Brown
  - Onychomycosis
- Green
  - Pseudomonas infection

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

Inflammation
- Erythema, Swelling, Pain

Proximal & Lateral
- Acute Trauma/Infection
- Acute Paronychia

Telangiectasia
- SLE
- Scleroderma
- Dermatomyositis

Chronic
- Chronic Paronychia

Nail Fold Abnormality

Systemic Disease

Psoriasis
- Alopecia Areata
- Psoriasis
- Onychomycosis
- Onychogryphosis

• Psoriasis
• Alopecia Areata

• Psoriasis
• Onychomycosis
• Onychogryphosis

• Psoriasis
• Onychomycosis

• Psoriasis
• Onychomycosis

• Psoriasis
• Onychomycosis

• SLE
• Scleroderma
• Dermatomyositis

• Ingrown Nail

• Chronic Paronychia

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NAIL DISORDERS: Systemic Disease

Nail Disorder

Primary Dermatologic Disease

Nail Plate Abnormality

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)

Nail Fold Abnormality

Nail Bed Abnormality

Clubbing

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

Nail Fold Abnormality

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

White Discoloration
- Half-and-Half Nails
  50%
  - Chronic renal failure
  - Uremia

Terry’s Nails
Proximal 90%
- Liver cirrhosis
- Congestive heart failure
- Diabetes Mellitus

Muehrcke’s Lines
Transverse lines
- Nephrotic syndrome

Any systemic disease severe enough to transiently halt nail growth (e.g., shock, malnutrition)

Medications
- Wilson’s disease
- Silver poisoning
- Cyanosis

Iron deficiency anemia

Liver cirrhosis

Congestive heart failure

 Diabetes Mellitus

Chronic renal failure

Uremia

Nephrotic syndrome

SLE

Scleroderma

Dermatomyositis
NAIL DISORDERS: Systemic Disease - Clubbing

Nail Disorder

Primary Dermatologic Disease

Nail Plate Abnormality
- Koilonychia (Spoon-Shaped)

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

Systemic Disease

Nail Fold Abnormality
- Onycholysis (Plate Separating from Bed)

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

Endocrine Disease
- Hyperthyroidism (Grave’s Disease)

Other
- Human Immunodeficiency Virus
- Congenital Defect

Nail Bed Abnormality
- Beau’s Lines (Horizontal Grooves)

Clubbing

Other
PRURITUS: No Primary Skin Lesion

Pruritus

Primary Skin Lesion

No Primary skin Lesion

Primary Abnormal Finding

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 Thrombocythemia
- Myelodysplastic syndrome

Psychiatric Disease
- Delusions of parasitosis

• Delusions of parasitosis
PRURITUS: Primary Skin Lesion

- 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
  
  - No Primary skin Lesion
    - Wheals/Hives
      - Urticaria
SKIN RASH: Eczematous

**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

---

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

**Skin Rash**

- **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

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

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

- **Comedones Absent**

- **Folliculitis**
  - Pustules centered around hair follicles

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

**Infectious**

- **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

Skin Rash

- 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

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

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

Inflammatory
- Pemphigus vulgaris
- Pemphigus foliaceus

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

Reaction to Agent
- Contact dermatitis

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

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

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

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

Infectious
- Pyoderma gangrenosum
- Diabetic dermopathy
- Necrobiosis lipoidica

Metabolic

Drugs
- Coumadin
- Heparin
- Bleomycin

Hemoglobinopathy
- Sickle cell anemia
- Thalassemia

Other
- Cryoglobulinemia

Protozoan
- Leishmaniasis

Viral
- Herpes simplex

Bacterial
- Tuberculosis
- Syphilis
- Chlamydia trachomatis
- Klebsiella granulomatis

Fungal
- Histoplasmosis
- Coccidioido-mycosis
- Cryptococcosis
SKIN ULCER BY LOCATION: Genitals

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

**Skin Ulcer**

**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 and 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
SKIN ULCER BY LOCATION: Oral Ulcers

Skin Ulcer

- Oral
  - Single Ulcer
    - Traumatic ulcer
    - Angular ulcer
    - Aphthous ulcer
    - Herpes simplex
  - Multiple Acute Ulcers
    - Viral stomatitis
    - Erythema multiforme
    - Acute necrotizing ulcerative gingivitis
- Head/Neck
  - Multiple Recurrent Ulcers
    - Aphthous stomatitis
    - Herpes simplex infection
- Trunk/Sacral Region
- Genitals
  - Multiple Chronic Ulcers
    - Pemphigus vulgaris
    - Lichen planus
    - Lupus erythematosus
    - Bullous pemphigoid
- Lower Legs/Feet
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
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 Presentations

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<td>Degenerative</td>
<td>- Degenerative Disc Disease, Osteoarthritis, Osteoporosis</td>
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CHRONIC JOINT PAIN

Chronic/Degenerative Change

Peri-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

- Articular Cartilage
  - Osteoarthritis
  - Chondromalacia

- Joint Capsule
  - Baker Cyst
  - Ganglion Cyst
  - Adhesive Capsulitis

- Synovium
  - Monoarthritis
  - Polyarthritis

Intra-Articular

- Skin/Fascia
  - Fascitis (e.g., Myofascial Pain, Iliotiibial Band Friction, Plantar Fasciitis

- Muscle
  - Delayed Onset Muscle Soreness
  - Fibromyalgia
  - Myositis
  - Ossificans
Bone Lesion on X-ray

Rule Out Osteomyelitis & Secondary Metastases

Non-aggressive

- Exostotic
  - Narrow, <1mm margin
  - Reactive bone formation
  - Asymptomatic &/or Non-Active Bone Scan
    - Osteochondroma
    - Unicameral Bone Cysts
    - Aneurysmal Bone Cysts
    - Non-ossifying Fibroma

Aggressive

- Broad or Indistinct Margin &/or Soft Tissue Invasion
- Multiple Lytic Lesions
  - Asymptomatic &/or Non-Active Bone Scan
    - Benign
      - No Bone Mineralization
      - Enchondroma (can calcify &/or turn malignant)
      - Giant Cell Tumor ("Soap Bubble" appearance)
      - Non-aggressive
        - Osteoid Osteoma ("Nidus" appearance)
        - Chondroblastoma
        - Osteoblastoma (may be malignant or sclerotic in appearance)
  - Symptomatic &/or Active Bone Scan
    - Malignant
      - Bone Mineralization, Constitutional Symptoms, Codman’s Triangle, Excessive Scalloping & Destruction of Cortical Bone
      - Osteosarcoma (Codman’s Triangle)
      - Chondrosarcoma ("Popcorn" appearance)
      - Ewing’s Sarcoma

- Not Inflammatory Appearance
  - Chondromyxoid Fibroma
Always check neurological and vascular status one joint below the injury.
INFECTIOUS JOINT PAIN

- 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 Fasciitis
  - Septic Bursitis
  - Abscess
  - Osteomyelitis
  - Lymphadenitis
  - Warts

- Acute Onset
  - Septic Arthritis

- Insidious Onset
  - Fungal tuberculosis
  - Lyme Disease (Erythema Migrans)
INFLAMMATORY JOINT PAIN

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)
  - Gout
  - Psoriatic (Nail Changes, Plaques)
  - Enteropathic (e.g. Inflammatory Bowel Disease)
  - Reactive
  - Rheumatic Fever (recent Pharyngitis, Carditis)
  - Lyme Disease (Tick bite, Migratory red Macules)

- Peripheral Only

- Subacute & Symmetrical
  - Rheumatoid Arthritis
  - Systemic Lupus Erythematosus
  - Sjögren’s (a.k.a. Sicca) Syndrome
  - Scleroderma
  - Henoch-Schönlein Purpura
  - Polymyalgia Rheumatica
  - Wegener’s Granulomatosis

- Insidious Monoarticular
  - Symmetric (Polymyositis/Dermatomyositis)
  - Asymmetric (Psoriatic Arthritis)

- Migratory
  - Rheumatic Fever

- Peripheral & Axial

- Acute Onset
  - Reactive

- Insidious Onset
  - 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

Pathologic/Fragility 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
Vertebrae/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/Ricketts
Diffuse Pain/Proximal Muscle Weakness

- Vitamin D Deficiency
- Mineralization Defect
- Phosphate Deficiency

Fracture Healing

- Delayed Union (3 – 6 months)
- Non-Union (after 6 months)
- Malunion

**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
- Non Functional
  - Small deviations from normal axis

**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

**Tobacco / nicotine**
**NSAIDS**
**Ca^{2+} / Vitamin D deficiency**

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OSTEOPOROSIS - BMD testing

Osteoporosis

Age > 50 years
- All men and women ≥ 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

T-Scores:
- Normal ≥ -1
- -2.49 < Osteopenia < -1
- Osteoporosis - ≤ -2.5

OSTEOPOROSIS - BMD testing

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2010 Clinical Practice Guidelines for the Diagnosis and Management of Osteoporosis in Canada
Tumour

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>
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<th>Muscle Group</th>
<th>Action</th>
<th>Myotome</th>
<th>Peripheral Nerve</th>
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<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

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<th>Sensory</th>
<th>Motor</th>
<th>Reflex</th>
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<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>
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<tr>
<td>L2</td>
<td>Anterior Medial Thigh</td>
<td>Hip Flexion</td>
<td>Cremasteric Reflex</td>
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<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 (1&lt;sup&gt;st&lt;/sup&gt;/2&lt;sup&gt;nd&lt;/sup&gt; 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>
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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 Presentations

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Qasim Hirani
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.)

Separation From Attachment Figure

Using Public Transportation, Open Spaces, Enclosed Spaces, Being in a Line, Crowd, or Outside the Home

Public Setting Where a Negative Evaluation May Occur

Recurrent, Unexpected Panic Attacks

Panic 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

Social Anxiety Disorder

Specific Phobia

Separation Anxiety Disorder

Agoraphobia

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**

Specific Worry
- 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)**

(*)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

* Not considered an anxiety disorder according to DSM-V

Trauma- and 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

1. American Psychiatric Association (2013). Diagnostic and Statistical Manual of Mental Disorders (5th ed. DSM-V.)
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

Hair Pulling

Trichotillomania

Skin Picking

Excoriation 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

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

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 Only

- 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

- Depressed mood in context of personal loss < 2 months
  - Bereavement

Prevalence = 5%
Hospitalized patients

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:
- Amphetamines
- Alcohol
- Cocaine

Medications:
- Corticosteroids
- Antihypertensives
- Antipsychotics
- Oral contraceptives

Suicide = 15% over lifetime
Prevalence = 3% over lifetime

Depressed Mood
- Sleep changes
- Interest – anhedonia
- Guilt
- Energy – anergia
- Concentration - decrease
- Appetite +/- 5% body weight in one month
- Psychomotor agitation or retardation
- Suicidal thoughts

Suicide = 15% over lifetime

Depressed mood

Persistent Depressive Disorder

2 or more:
1) Decreased appetite
2) Insomnia
3) Anergia
4) Poor concentration
5) Hopelessness
6) Low self-esteem

Prevalence = 3% over lifetime

Persistent Depressive Disorder

2 or more:
1) Decreased appetite
2) Insomnia
3) Anergia
4) Poor concentration
5) Hopelessness
6) Low self-esteem

Prevalence = 3% over lifetime

Adjustment Disorder with Depressed Mood

Prevalence = 5%
Hospitalized patients

None of:
1) Suicidal ideation
2) Psychosis (except hallucinations of deceased)
3) Guilt (except deceased)
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

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:
- Amphetamines
- Alcohol
- Cocaine

Medications:
- Corticosteroids
- Antihypertensives
- Antipsychotics
- Oral contraceptives
Psychotic Disorder

Psychosis
Rule out psychotic disorder due to substances and/or general medical condition

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

Psychotic symptoms also present outside of mood episodes
- Schizoaffective disorder (bipolar & depressive)

Duration of illness ≤ 1 month
- Brief psychotic disorder

Duration of illness 1-6 months
- Schizophreniform disorder

Duration of illness ≥ 6 months
- Schizophrenia

Mood syndromes absent (or brief relative to duration of psychotic symptoms)

Psychotic symptoms not limited to delusions

Psychotic symptoms limited to non-bizarre delusions only

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)

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

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)
- Amphetamines: PCP
- Hallucinogens: Methylphenidate, Steroids

Medications:
- Amphetamines: Anticholinergic, L-Dopa
- Dopamine Agonist: Steroids

Suicide = 10%

Neuroleptic Malignant Syndrome:
Side effects of anti-psychotics
Sx: Hyperpyrexia (>38.5°C), muscle rigidity and mental status changes
20% mortality
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 Presentations

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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
- Otosclerosis
- Congenital (Ossicular Chain Malformation)
- Eustachian Tube Dysfunction

External Ear
- Cerumen
- Foreign Body
- Otitis Externa
- Inflammation
- Congenital (Atresia)
- Trauma
- Benign Mass (Polyp, Osteoma, Exostosis)
- Tumors (SCC)
- Dermatologic

Middle Ear
- Otitis Media
- Tympanic Membrane Perforation
- Cholesteatoma
- Trauma (barotrauma)
- Tumors (Glomus, Adenoma)
- Eustachian Tube Dysfunction
HEARING LOSS: Sensorineural

Hearing Loss

Otoscopy, Tuning Fork, Confirm with Audiogram

Conductive Hearing Loss

Symmetric

Sensorineural Hearing Loss

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

Hoarseness

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: Non-Acute

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
NECK MASS

Neck Mass

Inflammatory
- Lymphadenitis
  - 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
- Squamous Cell Carcinoma
- Thyroid (Spread to Cervical Lymph Nodes)
- Melanoma
- Distant site (Stomach, etc.)
OTALGIA

Increased Pain With Pinna Manipulation

- 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)

Pain Unchanged With Pinna Manipulation

- External Auditory Canal
  - Otitis Externa
  - Osteomyelitis of Temporal Bone
  - Herpes Simplex Zoster (Ramsay Hung Syndrome if Facial Nerve Paralysis)
  - Furunculosis

- Periauricular
  - TMJ Pathology
  - Parotiditis

- Otologic
  - Referred
    - Via Vagus or Glossopharyngeal Nerves
    - Nasopharyngeal, Oropharyngeal, Laryngeal, Hypopharyngeal Pain
    - Thyroiditis
    - Aerodigestive Tract Malignancy
    - Post-tonsillectomy

- Thyroiditis
- Aerodigestive Tract Malignancy
- Post-tonsillectomy
SMELL DYSFUNCTION

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

Subjective
Heard only by patient (Common)

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

No Hearing Loss

Bilateral
On Audiogram

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

Sensorineural Hearing Loss

Somatic
• TMJ
• Bruxism
• Whiplash
• Skull Fracture
• Closed Head Injury

Objective
Heard by others (Rare)

Metabolic Causes:
Thyroid Dysfunction, Vitamin A, B, Zinc Deficiency.
• Psychogenic, Anxiety, Depression
• Drugs (Salicyclates, Quinidine, Indomethacin)
• Idiopathic

No Hearing Loss

Sensorineural Hearing Loss

Somatic
• TMJ
• Bruxism
• Whiplash
• Skull Fracture
• Closed Head Injury

Subjective
Heard only by patient (Common)

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Somatic
• TMJ
• Bruxism
• Whiplash
• Skull Fracture
• Closed Head Injury
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CROSS SECTION OF THE EYE and ABBREVIATIONS

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 and 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: Bilateral

Vision Loss

Acute

- Infarct
- Intracranial Hemorrhage
- Tumor

Chronic

Unilateral

Bilateral

Complete/ Partial Homonymous Hemianopia

- Infarct
- Intracranial Hemorrhage
- Tumor

Other

- Migraine
- Systemic Hypoperfusion

Clinical Pearl:
- Patients with bilateral acute vision loss should have a CT.
ACUTE VISION LOSS: Unilateral

Clinical Pearls:
- Optic neuritis causes pain with EOM
- Temporal arteritis causes temporali 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

Unilateral

Bilateral

Painful

Painless

Optic Nerve

Cornea

- Keratopathy

No Abnormalities of the Optic Nerve

Abnormalities of the Optic Nerve

- Acute Angle Closure Glaucoma (fixed dilated pupil)
- Temporal Arteritis
- Demyelination
- MS
- Idiopathic
- Glaucoma

Retina

Transmit
Ischemic Attack

Vitreous

Retina Visible

- Retinal Detachment
- Retinal Artery Occlusion
- Retinal Vein Occlusion
- Ischemic Optic Neuropathy

Retina Not Visible

- Visual Cortex Infarction
- Retinal Hemorrhage
- Vitreous Hemorrhage
CHRONIC VISION LOSS: Anatomic

Perform slit-lamp exam to localize: Left →Right on Scheme

**Cornea**
- Keratoconus
- Stromal Scarring
- Neovascularization
- Edema
- Pterygium

**Lens**
- Cataract (Nuclear, Subcapsular, Cortical)
- Observe Red Reflex, Poor fundus Visibility

**Macula**
- Drusen or Edema
- Age Related Macular Degeneration (Wet, Dry)

**Retina**
- Cotton wool spots, Micro-aneurysms, Hemorrhage and Macular Edema
- Diabetic Retinopathy (Background, Pre-Proliferative, Proliferative)
- Retinitis Pigmentosa (Decreased night vision, loss of peripheral vision)
- Systemic inflammatory conditions

**Optic Nerve**
- Pallor, Papilledema, Irregular Disc Large Cup:Disc
- Glaucoma (Open-Angle)

**Optic Track**
- Visual field defects, decrease in color vision
- Optic Nerve Compression
- Pituitary Lesion
- Meningioma
- Craniopharyngioma

Clinical Pearls:
- Edema can cause halos in the vision.
- Bilateral disc swelling and any suspected mass require imaging.
**AMBLYOPIA**

- **Deprivational***
  - Obstruction of Visual Axis
  - Ptosis
  - Congenital Cataracts
  - Congenital Corneal Opacities
  - Hemangioma
  - Retinal Disease/Damage (undiagnosed not responsive to treatment)

- **Refractive Error**
  - Severe Anisometria (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)
Cannot Abduct

- Ischemia
- Diabetes Mellitus
- Aneurysm
- Tumor
- Trauma

Neuronal
(Non-Comitant)

Horizontal and/or Vertical

Cranial Nerve III
Eye depressed, abducted, ptosis,
large/unreactive pupil

- Ischemia
- Diabetes Mellitus
- Aneurysm
- Trauma

Cranial Nerve IV
Eye cannot depress when looking medially

- Ischemia
- Diabetes Mellitus
- Aneurysm
- Trauma
- Subdural Hemorrhage

Extraocular Muscle Restriction/Entrapment

- Orbital Inflammation
- Orbital Tumor
- Orbital Floor Fracture

Binocular

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

Unequal (Anisocoria)

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

Pupillary Abnormality

Equal (Isocoria)

Unequal (Anisocoria)

Pathological

Impaired Constriction
Parasympathetic dysfunction
Anisocoria greater in light
Large pupil abnormal

Physiological
Anisocoria equal in light and dark,
10% cocaine: pupils dilate symmetrically

Simple Anisocoria (<0.5mm)

Impaired Dilation
Sympathetic dysfunction/Horner’s Syndrome: miosis, anhydrosis, ptosis
Anisocoria greater in dark
Small pupil abnormality

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.

Fixed Pupil

Preganglionic
Ptosis, ophthalmoplegia
Constriction with 0.1% pilocarpine

Postganglionic
Constriction with 0.1% pilocarpine

Neuromuscular Junction
No constriction with 0.1% pilocarpine

Preganglionic
No dilation with 0.125% adrenaline

Postganglionic
Dilation with 0.125% adrenaline

• Angle Closure Glaucoma (mid-fixed)
• Iritis/Synechiae (not complete fixation)
• Trauma (not complete fixation)

• Oculomotor Nerve/Fascicle
  (Other CN III Findings)
• Tonic (Adie’s) Pupil
  (Ciliary Ganglion Lesion)
• Pharmacologic
• Factitious

Idiopathic
• Trauma
• Tumor (Lung, Breast, Thyroid)

Cluster Headache
• Carotid Dissection
• Trauma
• Idiopathic
RED EYE: Atraumatic

**Clinical Pearl:**
- Orbital cellulitis can present with pain on EOM and orbital signs of involvement

### 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
RED EYE: Traumatic

**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.

**Red Eye**

- **Traumatic**
  - Surface Injury
    - Corneal Abrasion
    - Ultraviolet Keratitis
    - Chemical (Acid, alkali)
  - Blunt Trauma
    - Hyphema, diplopia, periorbital ecchymosis, subcutaneous emphysema of lid
  - Globe Penetrating Injury
    - Hyphema, history of trauma/high velocity impact, reduced visual acuity

- **Atraumatic**
  - 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

**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**

- **Phoria**
  - Latent deviation
  - Symmetrical corneal light reflex,
  - Negative cover test positive cover/uncover test
  - Esophoria (eye moves medial → centre when uncovered)
  - Exophoria (eye moves lateral → 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

**Clinical Pearl:** Strabismus is most often seen in pediatrics.

**Horizontal** (eso/exotropia)
- CN VI problem (eye cannot abduct)

**Horizontal and/or vertical** (Eso/exotropia, hyper/hypotropia, mixed)
- 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 → straight when ipsilateral covered)
- Exotropia (contralateral eye deviates lateral → straight when ipsilateral covered)
Optic Chiasm Lesion
(bitemporal hemianopia)
- Pituitary/metastatic tumor
- Craniopharyngioma
- Meningioma
- Optic nerve glioma
- Aneurysm
- Infection
- MS
- Sarcoidosis

Optic Nerve Lesion
(Monocular vision loss)

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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DEVELOPMENTAL DELAY

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

Milestones Lost

- Neurodegenerative Disorder
- Metabolic Disorder
- Neoplastic Disorder

Global Developmental Delay

- Syndromic
- Genetic Disorder
- Teratogenic Disorder (e.g. Fetal Alcohol Spectrum Disorder)

Language and Social Impairment

- Autism Spectrum Disorder
- Pervasive Developmental Disorder
- Landau-Kleffner Syndrome
- Selective Mutism
- Mechanical (e.g. dental, cleft palate)
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
- Home Environment
  - Neglect
  - Abuse
  - Trauma

Atypical Behaviour

- Psychiatric Illness
  - Anxiety Disorder
  - Depressive Disorder

Isolated to Specific Academic Areas

- Learning Disability

Primarily Academic Difficulties

All Areas Impacted

- Cognitive Impairment (Mental Retardation, Intellectual Handicap)
SMALL FOR GESTATIONAL AGE

Small for Gestational Age

Birth Weight < 10th Percentile

Constitutionally Small

Intrauterine Growth Restriction

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 Abruption
- Placenta Previa
- Abnormal Cord Insertion
LARGE FOR GESTATIONAL AGE

Suspected LGA

Birth Weight > 90th 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

Congenital Anomalies

Isolated

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)

Multiple

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

- Transient Tachypnea of the Newborn (TTN)
- Respiratory Distress Syndrome (RDS)
- Chronic Lung Disease (CLD)
- Bronchopulmonary Dysplasia (BPD)
- Apnea of Prematurity (AOP)
- Persistent Ductus Arteriosus (PDA)
- Necrotizing Enterocolitis (NEC)
- Intraventricular Hemorrhage (IVH)
- Neurodevelopmental Impairments (NDI)
- Retinopathy of Prematurity (ROP)
FAILURE TO THRIVE: Adequate Calorie Consumption

- Inadequate Calorie Consumption
- Adequate 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

- 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 Neuronal Degeneration
      - Poliomyelitis
  - 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

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

• Appendicitis
• Ovarian Cyst
• Ovarian Torsion
• Ectopic Pregnancy
• Pelvic Inflammatory Disease
• Nephrolithiasis
• Dysmenorrhea

• Intussusception
• Gastroenteritis
• Viral Illness
• Diabetic Ketoacidosis
• Bowel Obstruction
• Henoch-Schonlein Purpura
• Malrotation/Volvulus
• Urinary Tract Infection
• Peritonitis
• Somatization
• Sickle Cell Crisis
• Ileus
• Infantile Colic

• Right Lower Quadrant

• Left Lower Quadrant

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PEDIATRIC VOMITING: Gastrointestinal causes

Vomiting

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

Hepatobiliary

- Acute Hepatitis
- Acute Pancreatitis

Other Systemic Disease

Lower Gastrointestinal

- Acute
  - Infectious Gastroenteritis
  - Small/Large Bowel Obstruction
  - Intussusception
  - Acute Appendicitis
  - Incarcerated Hernia

- Chronic
  - Intestinal Atresia
  - Midgut malrotation
PEDIATRIC VOMITING: Systemic causes

- **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
  - **High Intracranial Pressure**
    - Hemorrhage
    - Meningitis
    - Head Trauma
    - Brain Tumour
    - Hydrocephalus

- **Other Systemic Disease**
  - **Drugs/Toxins**
    - Chemotherapy
    - Antibiotics
    - Carbon Monoxide
  - **Vestibular (Inner Ear)**
    - Ear Infection (Otitis Media)
    - Motion Sickness
    - Vestibular Migraine
    - Ménière’s Disease
    - Labrynthitis
  - **Psychiatric**
    - Self-Induced (Bulimia)
    - Cyclic Vomiting
    - Psychogenic
NEONATAL JAUNDICE

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

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

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 DISORDERS: 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
  - Congenital
    - Birth Injury
    - Congenital Malformation
    - TORCH Infection
    - Congenital Heart Defect
  - Respiratory
    - Respiratory Distress Syndrome
    - Birth Asphyxia
    - Pneumothorax
    - Meconium Aspiration
    - Sepsis
  - Other
    - Anemia
    - Shock
    - Hypothermia
    - Hypoglycemia

- Maternal Related
  - Drugs (Ex. SSRI)
  - Diabetes Mellitus
  - Gestational Hypertension
CYANOSIS IN THE NEWBORN: Non-Respiratory

Cyanosis

Central and Peripheral

Cardiovascular

Left-to-Right Shunt
- Patent Ductus Arteriosus
- Ventricular Septal Defect
- Atrioventricular Canal
- Truncus Arteriosus
- Atrial Septal Defect
- Total Anomalous Pulmonary Venous Return

Hemoglobinopathy

Congenital
Acquired
Sulfhemoglobin

Peripheral Only

- Poor Perfusion
- Acrocyanosis

Respiratory

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
CYANOSIS IN THE NEWBORN: Respiratory

Cyanosis

Central and/or Peripheral

Peripheral Only

- 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

Wheeze 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

- R/O Endobronchial Disease
  - Vascular Compression Syndrome
  - Foreign Body Aspiration*
  - Endobronchitis
  - Structural Anomaly

- Pulmonary Sequestration
- Congenital Adenoid Cystic Malformation
- Bronchogenic Cyst
- Neuroblastoma
- Teratoma
- Mediastinal Mass

* 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

Acute Onset

Febrile
• Peritonsillar/Retropharyngeal Abscess*
• Epiglottitis*
• Mononucleosis
• Bacterial Tracheitis*

Afebrile

Barking Cough
• Croup
• Atypical Croup

Partially-Treated Bacterial Tracheitis

* Denotes acutely life-threatening causes
Acute Cough in Children
(< 3 wks)

No Fever, No Tachypnea

URTI Symptoms

Normal Chest Auscultation

- Post-nasal drip

Wheeze and/or Crackles

- History or suspicion of foreign body?

No URTI Symptoms

Normal CXR

- Foreign body aspiration*
- Bronchitis/Bronchiolitis

CXR Shows Consolidation

- Bacterial pneumonia

CXR Shows Diffuse Changes

- Atypical or viral pneumonia

Fever, Tachypnea

No URTI Symptoms

Normal CXR

- History or suspicion of foreign body?

CXR Shows Consolidation

- Bacterial pneumonia

CXR Shows Diffuse Changes

- Atypical or viral pneumonia

* Denotes acutely life-threatening causes
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

• Asthma

Abnormal CXR

CT Scan

• Tumors
• Congenital Anomaly

Normal Growth

Abnormal CXR

• Chronic Sinusitis
• Post Nasal Drip
• GERD +/- Aspiration
• Habit Cough
• Environmental Exposure

Normal CXR

CT Scan
RESPIRATORY DISTRESS IN THE NEWBORN

Respiratory Distress In The Newborn

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 (SUDI)

Sudden Unexpected Death in Infancy

Must be Reported to Medical Examiner

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

Enuresis

Rule in/out age-appropriate enuresis

<table>
<thead>
<tr>
<th>Age</th>
<th>Dry during day</th>
<th>Dry during night</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>2.5</td>
<td>85%</td>
<td>48%</td>
</tr>
<tr>
<td>3</td>
<td>98%</td>
<td>78%</td>
</tr>
</tbody>
</table>

Nocturnal 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)

Diurnal Enuresis

- Pediatric Unstable Bladder
- Infrequent Voiding (Urinary Tract Infection)
- Cystitis
- Behavioural/Psychogenic
- Idiopathic
- Non-neurogenic (Hinman Syndrome)
- Vaginal Voiding (Labial Adhesion)
Based on History from Parent
(Extent of investigations based on initial examination)

**Apparent Life Threatening Event**

- **Acute Illness**
  - Congenital Heart Disease
  - Arrhythmia
  - Cardiomyopathy
  - Myocarditis

- **Witnessed Choking Spell**
  - Inborn Errors of Metabolism
  - Reye's Syndrome
  - Electrolyte Disturbances
  - Seizure
  - Malignancy
  - Neuromuscular Disorders
  - Central Apnea

- **Injury**
  - Non-Accidental
  - Unnoticed
  - Factitious by Proxy

- **Apnea**
  - Periodic Breathing
  - Apnea of Infancy

- **Cardiac**
  - Congenital Heart Disease
  - Arrhythmia
  - Cardiomyopathy
  - Myocarditis

- **Metabolic**
  - Inborn Errors of Metabolism
  - Reye's Syndrome
  - Electrolyte Disturbances

- **Neurologic**
  - Seizure
  - Malignancy
  - Neuromuscular Disorders
  - Central Apnea

- **Respiratory**
  - Anatomical Foreign Body Aspiration
  - Breath-holding spell (age-dependent)

- **Infectious**
  - Pneumonia
  - Sepsis
  - Upper Respiratory Tract Infection
  - Empyema
  - Urinary Tract Infection

- **Gastrointestinal**
  - Gastroesophageal Reflux
  - Volvulus
  - Gastroenteritis
  - Incarcerated Hernia
PEDIATRIC FRACTURES

Pediatric Fractures

Non-Accidental Trauma (indication of child abuse)
- Femur # < 1 y.o.
- Scapular # Without Traumatize Hx

Accidental Trauma
- Distal Radius
  - Torus (junction of metaphysis)
  - Green stick (bone bent at convex side)
  - Complete (spiral, oblique, transverse)
- Clavicle Fracture
- Tibia Fibular Fracture
- Elbow
  - Supra condylar
  - Lateral supracondylar
- Toddlers Fracture
  - < 2 y.o.
- Transverse Fractures < 3 y.o.
  - Femur
  - Humerus
  - Tibia
  - Ribs
  - Radius
  - Skull
  - Spine
  - Ulna
  - Fibula
### Type Population Features

<table>
<thead>
<tr>
<th>Type</th>
<th>Population</th>
<th>Features</th>
</tr>
</thead>
<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>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>Fracture Line through the metaphysis, physis and epiphysis</td>
</tr>
<tr>
<td>V</td>
<td></td>
<td>Compression fracture of the growth plate</td>
</tr>
</tbody>
</table>

| S    | Straight through         |
| A    | Above                    |
| L    | Lower                    |
| T    | Through                  |
| R    | Crush                    |
PEDIATRIC SEIZURE: Unprovoked

- Unprovoked
  - Infantile
    - Benign Focal Epilepsy of Infancy
    - West Syndrome
    - Dravet Syndrome

- Provoked “DIMS”
  - Childhood Absence Epilepsy
  - Myoclonic Absence Epilepsy
  - Juvenile Absence Epilepsy
  - Juvenile Myoclonic Epilepsy
  - Lennox Gastaut Syndrome

- Spells
  - 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

- Unprovoked Spells
  - 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
  - Childhood and Adolescents
    - Daydreaming
    - Syncope
    - Migraine-variants
    - Panic Attack
    - Transient Ischemic Attack
    - Narcolepsy
    - Cataplexy
- Provoked “DIMS” Spells

Spells
PEDIATRIC MOOD AND ANXIETY DISORDERS

Mood or Anxiety Disorder

Mood
- Major Depressive Disorder
- Persistent Depressive Disorder
- Disruptive Mood Dysregulation Disorder*

Bipolar

Anxiety
- Panic Disorder and Agoraphobia
- Specific Phobia
- Social Phobia
- Generalized Anxiety Disorder
- Selective Mutism*
- Separation Anxiety Disorder*

*More commonly or exclusively found in pediatric populations
Other Presentations

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Kathy Truong
**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

- **Psychogenic**
  - Anxiety
  - Somatization Disorder
  - Malnutrition/Drug Addiction

- **Idiopathic**
  - Chronic Fatigue Syndrome

**No Organic Etiologies**

- **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

**Endocrine**

- Hypo/Hyperthyroidism
- Diabetes
- Pituitary Insufficiency
- Adrenal Insufficiency

**Metabolic**

- Renal Failure
- Liver Failure
- Hypercalcemia
**ACUTE FEVER**

**Fever (acute onset)**

**Infectious**
- **Viral**
  - Rhinovirus
  - Influenza Virus
  - Parainfluenza Virus
  - Adenovirus
  - Enterovirus
  - Coronavirus
  - HIV
- **Bacterial**
- **Other**
  - Fungal
  - Protozoa (e.g. malaria)
  - Other parasites

**Non-infectious**
- **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
      - Tularaemia
      - Septic phlebitis
      - Rheumatic fever
      - Lyme disease
      - TB
      - Whipple’s disease
  - Non-infectious
    - Hepatitis
    - Recurrent PE

- 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

- Viral
  - HIV
  - EBV
  - CMV
  - Viral hepatitis
  - Enterovirus

- Other
  - Fungal
  - Protozoa (e.g., malaria)
  - Other parasites
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
  - Streptococcal Tonsillopharyngitis
  - Peritonsillar Abscess
  - Ludwig’s Angina
- Chronic
  - GERD
  - Environmental
  - Trauma
  - Foreign Body
  - Neoplasm

Viral
- Acute viral Pharyngitis
- Acute Influenza
- Acute Viral Laryngotracheitis
- Acute Viral Tracheobronchitis
- Acute Infectious Mononucleosis
- Herpangina
Historical Executive Student Editors

2007 to 2008  Brett Poulin (Founder of the Calgary Black Book Project)
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2009 to 2010  Lucas Gursky
              Ting Li
2010 to 2011  Jonathan Dykeman
              Kathy Truong
2011 to 2012  Katrina Kelly
              Harinee Surendra
2012 to 2013  Neha Sarna
              Sarah Sy
2013 to 2014  Yang (Steven) Liu
              Brian Glezerson
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<tr>
<th>Student Scheme Creators</th>
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<tbody>
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<td>M. Abouassaly</td>
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<td>A. Aristarkhova</td>
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<td>V. David</td>
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<td>H. Rabin</td>
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<td>B. Ruether</td>
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<td>A. Smithee</td>
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<td>O. Suchowersky</td>
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<td>P. Veale</td>
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<td>B. Walley</td>
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<tr>
<td>L. Welikovitch</td>
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<tr>
<td>R.C. Woodman</td>
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<td>L. Zanussi</td>
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*If you are the creator of a scheme currently used in the Calgary Black Book and believe you have not been credited appropriately, please contact blackbk@ucalgary.ca*
# List of Abbreviations

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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>AAA</td>
<td>Abdominal Aortic Aneurysm</td>
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<tr>
<td>ACE</td>
<td>Angiotensin-Converting Enzyme</td>
</tr>
<tr>
<td>ACTH</td>
<td>Adrenocorticotropic Hormone</td>
</tr>
<tr>
<td>ADPKD</td>
<td>Autosomal Dominant Polycystic Kidney Disease</td>
</tr>
<tr>
<td>ADH</td>
<td>Antidiuretic Hormone</td>
</tr>
<tr>
<td>AIN</td>
<td>Acute Interstitial Nephritis</td>
</tr>
<tr>
<td>ALS</td>
<td>Amyotrophic Lateral Sclerosis</td>
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<tr>
<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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<tr>
<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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<tr>
<td>COPD</td>
<td>Chronic Obstructive Pulmonary Disease</td>
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<tr>
<td>CRF</td>
<td>Chronic Renal Failure</td>
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<tr>
<td>CRH</td>
<td>Corticotropic Releasing Hormone</td>
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<tr>
<td>CT</td>
<td>Computed Tomography</td>
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<td>DCIS</td>
<td>Ductal Carcinoma In Situ</td>
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<td>DHEA</td>
<td>Dehydroepiandrosterone</td>
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<td>DIC</td>
<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>DVT</td>
<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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<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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<td>FSGS</td>
<td>Focal Segmental Glomerulosclerosis</td>
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<tr>
<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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<td>GBM</td>
<td>Glomerular Basement Membrane</td>
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<td>GERD</td>
<td>Gastrointestinal Esophageal Reflux Disease</td>
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<td>Acronym</td>
<td>Term</td>
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<td>GFR</td>
<td>Glomerular Filtration Rate</td>
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<td>Growth Hormone Releasing Hormone</td>
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<td>GH</td>
<td>Growth Hormone</td>
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<td>Gastrointestinal</td>
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<td>GN</td>
<td>Glomerulonephritis</td>
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<td>GnRH</td>
<td>Gonadotropin Releasing Hormone</td>
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<td>GRA</td>
<td>Glucocorticoid-Remediable Aldosteronism</td>
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<tr>
<td>GTN</td>
<td>Gestational Trophoblastic Neoplasm</td>
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<tr>
<td>H+</td>
<td>Hydrogen</td>
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<tr>
<td>HCG</td>
<td>Human Chorionic Gonadotropin</td>
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<tr>
<td>HDL</td>
<td>High Density Lipoprotein</td>
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<tr>
<td>HELLP</td>
<td>Hemolysis, Elevated Liver Enzymes, Low Platelets</td>
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<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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<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>
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<tr>
<td>Abbreviation</td>
<td>Definition</td>
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<tr>
<td>MEN</td>
<td>Multiple Endocrine Neoplasia</td>
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<tr>
<td>MI</td>
<td>Myocardial Infarction</td>
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<tr>
<td>MPGN</td>
<td>Membranoproliferative Glomerulonephritis</td>
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<td>MS</td>
<td>Multiple Sclerosis</td>
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<tr>
<td>MSK</td>
<td>Musculoskeletal</td>
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<tr>
<td>Na⁺</td>
<td>Sodium</td>
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<tr>
<td>NSAIDs</td>
<td>Non-Steroidal Anti-Inflammatory</td>
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<tr>
<td>OCP</td>
<td>Oral Contraceptive Pill</td>
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<td>OSM</td>
<td>Osmolality</td>
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<td>PE</td>
<td>Pulmonary Embolism</td>
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<td>PID</td>
<td>Pelvic Inflammatory Disease</td>
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<td>PMN</td>
<td>Polymorphic Neutrophils</td>
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<td>POSM</td>
<td>Plasma Osmolality</td>
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<td>PPROM</td>
<td>Preterm Premature Rupture of Membranes</td>
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<tr>
<td>PROM</td>
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<td>PT</td>
<td>Prothrombin Time</td>
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<td>PTH</td>
<td>Parathyroid Hormone</td>
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<td>PTT</td>
<td>Partial Thromboplastin Time</td>
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<td>PUD</td>
<td>Peptic Ulcer Disease</td>
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<td>PUJ</td>
<td>Pelviureteric Junction</td>
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<td>RAPD</td>
<td>Right Afferent Pupillary Defect</td>
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<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>
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<tr>
<td>TSH</td>
<td>Thyroid Stimulating Hormone</td>
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<tr>
<td>TSHR</td>
<td>Thyroid Stimulating Hormone Receptor</td>
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<tr>
<td>TTKG</td>
<td>Transtubular Potassium Gradient</td>
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<tr>
<td>TTP</td>
<td>Thrombotic Thrombocytopenic Purpura</td>
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<td>UTI</td>
<td>Urinary Tract Infection</td>
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<tr>
<td>US</td>
<td>Ultrasound</td>
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<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>
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<td>VUJ</td>
<td>Vesicoureteral Junction</td>
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Approaching Medical Presentations with Schemes

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, *The Calgary Black Book* 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, *The Calgary Black Book* is a joint production of the students and Faculty of Medicine of the University of Calgary.

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