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.
Blackbook: Approaches to Medical Presentations

Chief Editors
Rebecca Phillips
Ainna Preet Randhawa
Vaneet Randhawa

Consulting Editors
Kea Archibold
Sunny Fong
Lucas Streith

Incoming Editors
Erin Kelly
Tony Gu

Faculty Editor
Dr. Sylvain Coderre

Editorial Board
Dr. Henry Mandin
Dr. Kevin McLaughlin
Dr. Brett Poulin
Copyright © 2007-2019. Faculty of Medicine, University of Calgary. All Rights Reserved.

<table>
<thead>
<tr>
<th>Edition</th>
<th>Year</th>
<th>Edition</th>
<th>Year</th>
</tr>
</thead>
</table>

ISBN Pending Assignment

This material is covered by the following Creative Commons License:
Creative Commons Attribution-NonCommercial 4.0 International License.

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 accuracy of the content within, the accuracy is not guaranteed.
The Black Book Project may be contacted at:
Undergraduate Medical Education
Faculty of Medicine
University of Calgary
Health Sciences Centre
3330 Hospital Drive N.W.
Calgary, Alberta, Canada T2N 4H1
blackbk@ucalgary.ca

Medical presentation schemes conceived by Henry Mandin.
The Calgary Black Book Project founded by Brett Poulin.

Printed in Calgary, Alberta, Canada.

Design
Michael Cheshire

Illustrations
Gray's Anatomy (Public Domain)
Vecteezy.com
A Message from the Editors

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

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

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

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

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

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

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

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

Dr. Henry Mandin
Dr. Sylvain Coderre
# Table of Contents

* A Message from the Editors ..................................... v

* Introduction to Schemes ................................. vii

## Cardiovascular ............................................. 1

- Abnormal Rhythm (1) ........................................ 3
- Abnormal Rhythm (2) ......................................... 4
- Chest Discomfort Cardiovascular ...................... 5
- Chest Discomfort Pulmonary / Mediastinal .......... 6
- Chest Discomfort Other ...................................... 7
- Hypertension .................................................... 8
- Hypertension in Pregnancy ................................. 9
- Left-Sided Heart Failure .................................... 10
- Isolated Right-Sided Heart Failure ...................... 11
- Pulse Abnormalities ........................................ 12
- Shock ........................................................................ 13
- Syncope ............................................................... 14
- Systolic Murmur Benign & Stenotic .................... 15
- Systolic Murmur Valvular & Other ...................... 16
- Diastolic Murmur ................................................ 17

## Respiratory .................................................. 19

- Pulmonary Function Tests Interpretation .......... 21
- Acid-Base Disorder Pulmonary ......................... 22
- Chest Discomfort Cardiovascular .................... 23
- Chest Discomfort Pulmonary ............................ 24
- Chest Discomfort Other ..................................... 25
- Chest Trauma Complications ............................ 26
- Cough Chronic ................................................... 27
- Cough, Dyspnea & Fever ................................... 28
Dyspnea Acute .............................................................. 29
Dyspnea Chronic Cardiac ........................................... 30
Dyspnea Chronic Pulmonary / Other .......................... 31
Excessive Daytime Sleepiness .................................... 32
Hemoptysis ................................................................. 33
Hypoxemia ................................................................. 34
Lung Nodule ................................................................ 35
Mediastinal Mass ........................................................ 36
Pleural Effusion ........................................................... 37
Pulmonary Hypertension ........................................... 38

**Hematologic** ............................................................. 39

Overall Approach to Anemia ...................................... 41
Approach to Anemia Mean Corpuscular Volume ......... 42
Anemia with Elevated MCV ....................................... 43
Anemia with Normal MCV ......................................... 44
Anemia with Low MCV .............................................. 45
Approach to Bleeding / Bruising Platelets & Vascular System ......................................................... 46
Approach to Bleeding / Bruising Coagulation Proteins ................................................................. 47
Approach to Prolonged PT (INR), Prolonged PTT .......... 48
Prolonged PT (INR), Normal PTT .............................. 49
Prolonged PTT, Normal PT (INR) Bleeding Tendency ................................................................. 50
Prolonged PTT, Normal PT (INR) No Bleeding Tendency ............................................................... 51
Approach to Splenomegaly ......................................... 52
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever in the Immunocompromised Host</td>
<td>53</td>
</tr>
<tr>
<td>Lymphadenopathy Diffuse</td>
<td>54</td>
</tr>
<tr>
<td>Lymphadenopathy Localized</td>
<td>55</td>
</tr>
<tr>
<td>Neutrophilia</td>
<td>56</td>
</tr>
<tr>
<td>Neutropenia Decreased Neutrophils Only</td>
<td>57</td>
</tr>
<tr>
<td>Neutropenia Bicytopenia / Pancytopenia</td>
<td>58</td>
</tr>
<tr>
<td>Polycythemia</td>
<td>59</td>
</tr>
<tr>
<td>Suspected Deep Vein Thrombosis (DVT)</td>
<td>60</td>
</tr>
<tr>
<td>Suspected Pulmonary Embolism (PE)</td>
<td>61</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>62</td>
</tr>
<tr>
<td>Thrombocytosis</td>
<td>63</td>
</tr>
<tr>
<td>Hemolysis</td>
<td>64</td>
</tr>
<tr>
<td>Abdominal Mass</td>
<td>72</td>
</tr>
<tr>
<td>Abdominal Pain (Adult) Acute - Diffuse</td>
<td>73</td>
</tr>
<tr>
<td>Abdominal Pain (Adult) Acute - Localized</td>
<td>74</td>
</tr>
<tr>
<td>Abdominal Pain (Adult) Chronic - Constant</td>
<td>75</td>
</tr>
<tr>
<td>Abdominal Pain (Adult) Chronic - Crampy / Fleeting</td>
<td>76</td>
</tr>
<tr>
<td>Abdominal Pain (Adult) Chronic - Post-Prandial</td>
<td>77</td>
</tr>
<tr>
<td>Anorectal Pain</td>
<td>78</td>
</tr>
<tr>
<td>Acute Diarrhea</td>
<td>79</td>
</tr>
<tr>
<td>Chronic Diarrhea Small Bowel</td>
<td>80</td>
</tr>
<tr>
<td>Chronic Diarrhea Steatorrhea &amp; Large Bowel</td>
<td>81</td>
</tr>
<tr>
<td>Constipation (Adult) Altered Bowel Function &amp; Idiopathic</td>
<td>82</td>
</tr>
<tr>
<td>Constipation (Adult) Secondary Causes</td>
<td>83</td>
</tr>
<tr>
<td>Constipation (Pediatric)</td>
<td>84</td>
</tr>
</tbody>
</table>

**Gastrointestinal**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal Distention</td>
<td>69</td>
</tr>
<tr>
<td>Abdominal Distention Ascites</td>
<td>70</td>
</tr>
<tr>
<td>Abdominal Distention Other Causes</td>
<td>71</td>
</tr>
</tbody>
</table>
Dysphagia.................................................................85
Elevated Liver Enzymes ............................................86
Hepatomegaly ..........................................................87
Jaundice .....................................................................88
Liver Mass ...................................................................89
Mouth Disorders (Adult & Elderly) ............................90
Nausea & Vomiting Gastrointestinal Disease ..............91
Nausea & Vomiting Other Systemic Disease .................92
Stool Incontinence ..................................................93
Upper Gastronintestinal Bleed (Hematemesis / Melena) .................................................................94
Lower Gastrointestinal Bleed ......................................95
Weight Gain ............................................................96
Weight Loss ................................................................97

Renal ........................................................................99
Acute Kidney Injury ................................................101
Chronic Kidney Disease .........................................102
Dysuria ....................................................................103
Generalized Edema ................................................104
Hematuria ...............................................................105
Hyperkalemia Intercellular Shift ...............................106
Hyperkalemia Reduced Excretion .............................107
Hypokalemia ..........................................................108
Hypernatremia ........................................................109
Hyponatremia .........................................................110
Hypertension ..........................................................111
Increased Urinary Frequency ....................................112
Nephrolithiasis .......................................................113
Polyuria .................................................................114
Proteinuria .............................................................115
Renal Mass Solid ............................................................ 116
Renal Mass Cystic ........................................................... 117
Scrotal Mass ................................................................... 118
Suspected Acid-Base Disturbance ................ 119
Metabolic Acidosis Elevated Anion Gap .... 120
Metabolic Acidosis Normal Anion Gap ........ 121
Metabolic Alkalosis ..................................................... 122
Urinary Incontinence ................................................... 123
Urinary Tract Obstruction ........................................... 124

**Endocrinology** 125

Abnormal Lipid Profile Combined & Decreased HDL ........................................ 129
Abnormal Lipid Profile Increased LDL & Increased Triglycerides ........................ 130
Abnormal Serum TSH .................................................. 131
Adrenal Mass Benign ................................................... 132
Adrenal Mass Malignant ............................................ 133
Amenorrhea ............................................................... 134
Breast Discharge ......................................................... 135
Gynecomastia Increased Estrogen & Increased HCG .................................... 136
Gynecomastia Increased LH & Decreased Testosterone ................................. 137
Hirsutism ................................................................. 138
Hirsutism & Virilization Androgen Excess .................................................. 139
Hirsutism & Virilization Hypertrichosis ...................................................... 140
Hypercalcemia Low PTH ............................................. 141
Hypercalcemia Normal / High PTH ........................................ 142
Hypocalcemia High Phosphate .................................................. 143
Hypocalcemia Low Phosphate ..................................................... 144
Hypocalcemia High / Low PTH ........................................... 145
Hyperglycemia ........................................................... 146
Hypoglycemia ............................................................ 147
Hyperphosphatemia .................................................... 148
Hypophosphatemia .................................................... 149
Hyperthyroidism ........................................................ 150
Hypothyroidism .......................................................... 151
Hyperuricemia ............................................................. 152
Male Sexual Dysfunction ............................................ 153
Sellar / Pituitary Mass ................................................ 154
Sellar / Pituitary Mass Size ............................................ 155
Short Stature ............................................................... 156
Tall Stature ................................................................. 157
Weight Gain / Obesity ................................................ 158

**Neurologic** ............................................................ 159

Altered Level of Consciousness Approach 163
Altered Level of Consciousness GCS ≤ 7 .... 164
Aphasia Fluent ............................................................ 165
Aphasia Non-Fluent ..................................................... 166
Back Pain ................................................................. 167
Cognitive Impairment ................................................ 168
Dysarthria ................................................................. 169
Falls in the Elderly ..................................................... 170
Gait Disturbance ........................................................ 171
Headache Primary ..................................................... 172
Headache Secondary, without Red Flag Symptoms .... 173
Hemiplegia ................................................................. 174
Mechanisms of Pain ................................................... 175
Movement Disorder Hyperkinetic ............................... 176
Movement Disorder Tremor ....................................... 177
Movement Disorder Bradykinetic ............................... 178
Peripheral Weakness .................................................. 179
Peripheral Weakness Sensory Changes ....................... 180
Spell / Seizure Epileptic Seizure ................................. 181
Spell / Seizure Secondary Organic ............................. 182
Spell / Seizure Other ..................................................183
Stroke Intracerebral Hemorrhage ............. 184
Stroke Ischemia ..........................................................185
Stroke Subarachnoid Hemorrhage ........... 186
Syncope .................................................................187
Dizziness .................................................................188
Vertigo .................................................................189

**Obstetrical & Gynecological** 191

Intrapartum Abnormal Fetal HR Tracing
  Variability & Decelerations .......................193
Intrapartum Abnormal Fetal HR Tracing
  Baseline ............................................................194
Abnormal Genital Bleeding .........................195
Acute Pelvic Pain .................................................196
Chronic Pelvic Pain ..............................................197
Amenorrhea Primary .........................................198
Amenorrhea Secondary ........................................ 199
Antenatal Care ....................................................200
Bleeding in Pregnancy < 20 Weeks ...............201
Bleeding in Pregnancy 2nd & 3rd Trimester
  .............................................................................202
Breast Disorder .....................................................203
Growth Discrepancy Small for Gestational
  Age / Intrauterine Growth Restriction ......... 204
Growth Discrepancy Large for Gestational
  Age ........................................................................ 205
Infertility (Female) ............................................... 206
Infertility (Male) ..................................................... 207
Intrapartum Factors that May Affect Fetal
  Oxygenation ......................................................... 208
Pelvic Mass ........................................................... 209
Ovarian Mass .........................................................210
Pelvic Organ Prolapse .........................................211
Post-Partum Fever ........................................................... 212
Post-Partum Hemorrhage ............................................. 213
Recurrent Pregnancy Loss ............................................. 214
Vaginal Discharge ........................................................ 215

Dermatologic ............................................................ 217
Burns ........................................................................... 221
Dermatoses in Pregnancy Physiologic Changes ............. 222
Dermatoses in Pregnancy Specific Skin Conditions ....... 223
Disorders of Pigmentations
    Hyperpigmentation .................................................. 224
Disorders of Pigmentations
    Hypopigmentation ................................................... 225
Genital Lesion ............................................................ 226
Hair Loss (Alopecia) Diffuse ........................................ 227
Hair Loss (Alopecia) Localized ..................................... 228
Morphology of Skin Lesions Primary Skin Lesions ......... 229
Morphology of Skin Lesions Secondary Skin Lesions .... 230
Mucous Membrane Disorder Oral Cavity ....................... 231
Nail Disorders Primary Dermatologic Disease ............... 232
Nail Disorders Systemic Disease ................................... 233
Nail Disorders Systemic Disease - Clubbing .................. 234
Pruritus No Primary Skin Lesion .................................. 235
Pruritus Primary Skin Lesion ........................................ 236
Skin Rash Eczematous ............................................... 237
Skin Rash Papulosquamous ........................................ 238
Skin Rash Pustular ..................................................... 239
Skin Rash Reactive ..................................................... 240
Skin Rash Vesiculobullous.................................................241
Skin Ulcer by Etiology ..................................................242
Skin Ulcer by Location Genitals............................243
Skin Ulcer by Location Head & Neck....................244
Skin Ulcer by Location Lower Legs / Feet 245
Skin Ulcer by Location Oral Ulcers..............................246
Skin Ulcer by Location Trunk / Sacral Region
.................................................................................................................247
Vascular Lesions.................................................................248

Musculoskeletal 249
Acute Joint Pain Vitamin CD.................................251
Chronic Joint Pain..........................................................252
Bone Lesion.................................................................253
Deformity / Limp..............................................................254
Infectious Joint Pain......................................................255
Inflammatory Joint Pain...............................................256
Vascular Joint Pain..........................................................257
Pathologic Fractures......................................................258
Soft Tissue.....................................................................259
Fracture Healing............................................................260
Osteoporosis BMD Testing............................................261
Tumour.......................................................................262
Mytomes Segmental Innervation of Muscles
..................................................................................................................263
Guide to Spinal Cord Injury.........................................264

Psychiatric 265
Anxiety Disorders Associated with Panic..............267
Anxiety Disorders Recurrent Anxious Thoughts.............268
Trauma & Stressor Related Disorders....................269
Obsessive-Compulsive & Related Disorders
....................................................................................................................270
Personality Disorder .................................................... 271
Mood Disorders Depressed Mood ......................272
Mood Disorders Elevated Mood .........................273
Psychotic Disorders ...........................................274
Somatoform Disorders .......................................275

**Otolaryngologic** 277
Hearing Loss Conductive ........................................279
Hearing Loss Sensorineural ..................................280
Hoarseness Acute ................................................281
Hoarseness Non-Acute ..........................................282
Neck Mass ............................................................283
Otaligia ............................................................... 284
Smell Dysfunction ................................................285
Tinnitus Objective ...............................................286
Tinnitus Subjective ..............................................287

**Ophthalmologic** 289
Cross Section of the Eye & Acronyms ..................291
Approach to an Eye Exam ....................................292
Acute Vision Loss Bilateral ..................................293
Acute Vision Loss Unilateral ................................294
Chronic Vision Loss Anatomic ..............................295
Amblyopia ...........................................................296
Diplopia ............................................................ 297
Pupillary Abnormalities Isocoria .........................298
Pupillary Abnormalities Anisocoria ......................299
Red Eye Atraumatic .............................................300
Red Eye Traumatic ..............................................301
Strabismus Ocular Misalignment .........................302
Neuro-Ophthalmology Visual Field Defects ............303
Pediatric

305

Developmental Delay................................................................. 311
School Difficulties.............................................................................................................. 312
Small for Gestational Age................................................................................................. 313
Large for Gestational Age................................................................................................. 314
Congenital Anomalies....................................................................................................... 315
Headache.......................................................................................................................... 316
Failure to Thrive Adequate Calorie Consumption............................................................. 317
Failure to Thrive Inadequate Calorie Consumption.......................................................... 318
Hypotonic Infant (Floppy Newborn).................................................................................. 319
Acute Abdominal Pain....................................................................................................... 320
Chronic Abdominal Pain.................................................................................................... 321
Pediatric Vomiting............................................................................................................. 322
Neonatal Jaundice: Approach to Indirect Hyperbilirubinemia......................................... 323
Neonatal Jaundice: Approach to Indirect Hyperbilirubinemia......................................... 324
Pediatric Diarrhea.............................................................................................................. 325
Constipation: Pediatric...................................................................................................... 326
Mouth disorder: Pediatric.................................................................................................... 327
Depressed/Lethargic Newborn........................................................................................... 328
Cyanosis in the Newborn.................................................................................................... 329
Limp.................................................................................................................................... 330
Respiratory Distress in the Newborn.................................................................................. 331
Pediatric Dyspnea.............................................................................................................. 332
Noisy Breathing: Pediatric Stridor..................................................................................... 334
Pediatric Cough: Acute...................................................................................................... 335
Pediatric Cough: Chronic.................................................................................................. 336
Respiratory Distress in the Newborn: Tachypnea.............................................................. 337
Sudden Unexpected Death in Infancy.............................................................................. 338
Enuresis............................................................................................................................... 339
Apparent Life Threatening Event..................................................................................... 340
Pediatric Fractures............................................................................................................ 341
Salter Harris Classification.................................................................................................. 342
Sudden Paroxysmal Event................................................................................................. 343
Non-Epileptic Paroxysmal Event...................................................................................... 344
Pediatric Epilepsies........................................................................................................... 345
Pediatric Seizures............................................................................................................... 346
Febrile Seizures................................................................................................................ 347
Pediatric Mood and Anxiety Disorders........................................................................... 348
Abdominal Mass................................................................................................................ 349
Shock................................................................................................................................ 350
Hypoglycemia................................................................................................................... 351
Altered Level of Consciousness....................................................................................... 352
Bleeding/Bruising.............................................................................................................. 353
Thrombocytopenia............................................................................................................ 354
Long PT (INR), Long PTT................................................................................................. 355
Long PT (INR), Normal PTT............................................................................................. 356
Normal PT (INR), Long PTT............................................................................................ 357
Dehydration....................................................................................................................... 358
Hyponatremia.................................................................................................................... 359
Cardiovascular

Abnormal Rhythm (1) .......................................................... 3
Abnormal Rhythm (2) .......................................................... 4
Chest Discomfort Cardiovascular ..................................... 5
Chest Discomfort Pulmonary / Medistinal ...... 6
Chest Discomfort Other ................................................... 7
Hypertension ..................................................................... 8
Hypertension in Pregnancy ........................................... 9
Left-Sided Heart Failure ............................................. 10
Isolated Right-Sided Heart Failure ...................... 11
Pulse Abnormalities ..................................................... 12
Shock ........................................................................ 13
Syncope ........................................................................ 14
Systolic Murmur Benign & Stenotic .............. 15
Systolic Murmur Valvular & Other .................. 16
Diastolic Murmur ......................................................... 17
Historical Editors
Katie Lin
Payam Pournazari
Marc Chretien
Tyrone Harrison
Hamza Jalal
Geoff Lampard
Luke Rannelli
Connal Robertson-More
Jeff Shrum
Sarah Surette
Lian Szabo
Kathy Truong
Vishal Varshney

Student Editors
Azy Golian
Harsimranjit Singh
Shaye Lafferty

Faculty Editor
Dr. Sarah Weeks
Abnormal Rhythm

Types of Arrhythmia

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

- Abnormal Beats
  - Premature atrial contraction
  - Premature ventricular contraction

- Tachyarrhythmia (>100 bpm)

Narrow QRS (<120 msec)
- SVT

- 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

Cardiovascular
Chest Discomfort
Cardiovascular

- Outflow Obstruction
  - Aortic Stenosis

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

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

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

- Cardiovascular
- Pulmonary/Mediastinal
- Other

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

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

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

* Denotes acutely life-threatening causes
Chest Discomfort

Other

Cardiovascular

Pulmonary/Mediastinal

Other

Gastrointestinal

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

Musculoskeletal

• Costochondritis
• Muscular Injury
• Trauma

Neurologic/Psychiatric

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

* Denotes acutely life-threatening causes
Hypertension

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

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 >95thile), but the approach is the same.

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

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

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

Myocardial

Systolic Dysfunction (Reduced Ejection Fraction)

Impaired Contractility

Coronary Artery Disease
- Myocardial Infarction
- Transient Myocardial Ischemia

Chronic Volume Overload
- Mitral Regurgitation
- Aortic Regurgitation

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

Diastolic Dysfunction (Preserved Ejection Fraction)

Impaired Diastolic Filling

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

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

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

Cardiac

Myocardium
- Right Ventricle Infarction
- Restrictive Cardiomyopathy

Valves
- Pulmonary Stenosis
- Tricuspid Regurgitation

Pericardium
- Constrictive Pericarditis
- Pericardial Tamponade

Pulmonary

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

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

Rule out Left-Sided Heart Failure (Most Common)

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 >10mmHg
- Cardiac tamponade
- AECOPD/ Acute Exacerbation of Asthma
- Hypovolemic shock
- Constrictive Pericarditis
- Restrictive Cardiomyopathy

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

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

Shock

Warm Extremities

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

Cold Extremities

High JVP

Low JVP

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

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

Cardiac

CO = SV x HR

Stroke Volume
- Contractility
  - MI
  - DCM
- Afterload
  - Mitral/Aortic Stenosis
  - HCM (LVOT)
- Preload
  - Blood Loss/Hypotension
  - Mitral Stenosis
  - Cardiac Tamponade
  - Constrictive Pericarditis

Heart Rate/Rhythm
- Tachyarrhythmia
  - VT/VFib
  - AFib/AFlutter
  - AVNRT/AVRT
- Bradyarrhythmia
  - Sick Sinus Syndrome (SA Node)
  - 2nd/3rd degree AV Block
  - Pacemaker Malfunction
  - Tachy-Brady Syndrome

Respiratory
- Pulmonary Embolism
- Hypoxia
- Hypercapnia

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

Rule out Seizure

Neurocardiogenic Respiration Other
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

- Incompetent Valve

- Other
Systolic Murmur
Valvular & Other

Systolic Murmur

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

S1 S2

• Mitral Regurgitation/

* Mitral Valve Prolapse (OS –
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)
Respiratory

Pulmonary Function Tests Interpretation 21
Acid-Base Disorder Pulmonary 22
Chest Discomfort Cardiovascular 23
Chest Discomfort Pulmonary 24
Chest Discomfort Other 25
Chest Trauma Complications 26
Cough Chronic 27
Cough, Dyspnea & Fever 28
Dyspnea Acute 29
Dyspnea Chronic Cardiac 30
Dyspnea Chronic Pulmonary / Other 31
Excessive Daytime Sleepiness 32
Hemoptysis 33
Hypoxemia 34
Lung Nodule 35
Mediastinal Mass 36
Pleural Effusion 37
Pulmonary Hypertension 38
Historical Editors
Calvin Loewen
Yan Yu
Marc Chretien
Vanessa Millar
Geoff Lampard
Shaina Lee
Reena Pabari
Katrina Rodrigues
Eric Sy
Lian Szabo
Ying Wang

Student Editors
Amanda Comeau
Shaye Lafferty

Faculty Editor
Dr. Naushad Hirani
Dr. Daniel Miller
Pulmonary Function Tests

Interpretation

Pulmonary Function Tests Interpretation

FEV₁/FVC ≥ LLN

FVC ≥ LLN

YES

FVC ≥ LLN

NO

TLC ≤ LLN

Restriction

DL,CO ≥ LLN

Normal

Pulmonary Hypertension, Anemia, Carboxyhemoglobinemia

DL,CO ≥ LLN

Chest Wall or Neuromuscular Disorders

Interstitial Lung Disease

Mixed Defect

TLC ≥ LLN

Obstruction

DL,CO ≥ LLN

Asthma or Non-Emphysematous COPD

Emphysematous COPD

LLN: Lower limit of Normal

Acid-Base Disorder

**Pulmonary**

### Acid-Base Disorder

- **pH < 7.35**
  - Acidemia
  - Metabolic Acidosis
    - Elevated Anion Gap
    - See “Metabolic Acidosis Elevated Anion Gap” on page 120
    - Normal Anion Gap
    - See “Metabolic Acidosis Normal Anion Gap” on page 121
  - Respiratory Acidosis
    - Hypoventilation present for hours to days
  - Mixed Acid-Base Disorder

- **pH 7.35-7.45**
  - Normal pH
  - Metabolic Acidosis
    - Elevated Anion Gap
  - Respiratory Acidosis
    - Hypoventilation present for hours to days
  - Metabolic Alkalosis
    - Hyperventilation present for minutes to hours
- **pH > 7.45**
  - Alkalemia
  - Metabolic Alkalosis
    - Decrease EABV
    - Hypokalemia*
  - Respiratory Alkalosis
    - Hyperventilation present for minutes to hours

### Appropriate Compensation:

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

*Denotes acutely life-threatening causes

See “Metabolic Acidosis Elevated Anion Gap” on page 120
See “Metabolic Acidosis Normal Anion Gap” on page 121
See “Metabolic Alkalosis” on page 122
Chest Discomfort

Cardiovascular

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

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

* Potentially acutely life-threatening
Chest Discomfort

Pulmonary

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

* Potentially acutely life-threatening
Chest Discomfort

Other

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

- Pulmonary/Mediastinal
  - Costochondritis
  - Muscular Injury
  - Trauma

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

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

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

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

* Potentially acutely life-threatening
Cough, Dyspnea & Fever

Cough

Chronic Cough ( > 3 wks )

- Normal CXR
  - Acute Bronchitis
  - AECOPD

- Infectious
  - Bacterial (often non-pathogenic with immune competence)
  - Fungal (e.g. Pneumocystis jirovecii)
  - Viral

- Pneumonia in the Immunocompetent Host
  - New/Changed Murmur

- Pneumonia in the Immunocompromised Host

Cough & Dyspnea & Fever

- Abnormal CXR

- *Potentially acutely life-threatening*
Dyspnea

Acute

Dyspnea

Acute

Cardiovascular

- Myocardial Infarction*
- Cardiac Tamponade*
- CHF

Pleural

- Pneumothorax (Tension*)

Parenchymal

- Pneumonia

Vascular

- Pulmonary Embolism*

Airway

Lower Airway (Wheeze)

- Asthma*
- AECOPD
- CHF

Upper Airway (Stridor)

- Aspiration*
- Anaphylaxis*

* Denotes acutely life-threatening causes
Dyspnea Chronic

Cardiac

Dyspnea

Acute
Presents in minutes to hours

Chronic

Cardiac

Pulmonary

Other

Pericardial
- Effusion
- Cardiac Tamponade*
- Constriction

Myocardial
- Systolic Dysfunction
- Diastolic Dysfunction
- Restrictive Cardiomyopathy

Valvular
- Stenosis
- Regurgitation
- Sub-Valvular Disease

Coronary Artery Disease
- Stable Angina
- Acute Coronary Syndrome*

Arrhythmia
- Atrial Fibrillation
- Bradyarrhythmia
- Tachyarrhythmia

* Potentially acutely life-threatening
Dyspnea Chronic
Pulmonary / Other

Dyspnea

Acute
Presents in minutes to hours

Cardiac
Pulmonary
Other

Airways
• Asthma
• COPD
• Bronchiectasis

Parenchyma
(abnormal chest X-ray)

Pump
• Chest Wall
• Neuromuscular
• Pleura

Alveoli
• Pneumonia

Interstitial
• Interstitial Pulmonary Fibrosis
• Hypersensitivity Pneumonitis
• CHF
• Sarcoidosis

Vessels
• Pulmonary Embolism*
• Pulmonary Hypertension

*Note: Pulmonary Embolism is a specific category within the Other category.
Excessive Daytime Sleepiness

Differentiate Fatigue from Sleepiness

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

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

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

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

Massive Hemoptysis
(>100 mL in 24 hours)

- Malignancy
- Bronchiectasis
- Abscess/Mycetoma
- Arteriovenous Malformation

Non-Massive Hemoptysis

CXR +/- CT

Normal

- Hematemesis
- Epistaxis
- Bronchitis

Focal Abnormality

Diffuse Abnormality

- CHF
- Bronchiectasis
- Pulmonary Vasculitis

Infection

- Bacterial
- Viral
- Tuberculosis
- Fungal

Malignancy

Pulmonary Vasculitis

- Lupus Erythematosus
- Goodpasture's Syndrome
- Granulomatosis with polyangiitis /microscopic polyangiitis

Vascular

- Pulmonary Embolism
- Arteriovenous Malformation
Hypoxemia

Alveolar-Arterial Gradient = $P_{A}O_2 - P_{a}O_2$

$P_{A}O_2 = F_{O}O_2 (P_{b}H_2O) - (P_{a}CO_2/0.8)$

*In Calgary, $P_b = 660mmHg$, Sea level $P_b = 760mmHg$

**Potentially acutely life-threatening.

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

- New Nodule
  - Multiple Nodules
  - Solitary Nodule
  - Malignancy
    - Primary lung cancer
    - Metastases ("cannonball lesions": Eg. Melanoma, Head & Neck, Sarcoma, Colon, Kidney, Breast, Testicle)
  - Infection
    - Fungal
    - Tuberculosis
    - Septic Embolism
    - Parasitic
  - Inflammation
    - Rheumatoid Arthritis
    - Granulomatosis with polyangiitis (GPA)/microscopic polyangiitis (MPA)
    - Sarcoidosis
    - Pneumoconiosis
  - Vascular
    - Arteriovenous Malformation

* Potentially acutely life-threatening
Mediastinal Mass

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

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

- **Posterior**
  - Neurogenic Tumour
  - Esophageal Lesion
  - Diaphragmatic Hernia

*Potentially acutely life-threatening*
Pleural Effusion

Thoracic Ultrasound should be used to perform Diagnostic Thoracentesis

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

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

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

* Potentially acutely life-threatening
Pulmonary Hypertension

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

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

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

- Chronic Thromboembolic Disease

- Miscellaneous
  - Hematologic Disorders
  - Metabolic Disorders
Hematologic

Overall Approach to Anemia...........................................41
Approach to Anemia Mean Corpuscular Volume..........................42
Anemia with Elevated MCV............................................43
Anemia with Normal MCV.............................................44
Anemia with Low MCV.................................................45
Approach to Bleeding / Bruising Platelets & Vascular System..........................46
Approach to Bleeding / Bruising Coagulation Proteins..........................47
Approach to Prolonged PT (INR), Prolonged PTT..........................48
Prolonged PT (INR), Normal PTT....................................49
Prolonged PTT, Normal PT (INR) Bleeding Tendency..........................50
Prolonged PTT, Normal PT (INR) No Bleeding Tendency..........................51
Approach to Splenomegaly.............................................52
Fever in the Immunocompromised Host.............................53
Lymphadenopathy Diffuse...........................................54
Lymphadenopathy Localized........................................55
Neutrophilia.................................................................56
Neutropenia Decreased Neutrophils Only.............................57
Neutropenia Bicytopenia / Pancytopenia..........................58
Polycythemia...............................................................59
Suspected Deep Vein Thrombosis (DVT)..........................60
Suspected Pulmonary Embolism (PE)..............................61
Thrombocytopenia........................................................62
Thrombocytosis............................................................63
Hemolysis.................................................................64
Historical Editors
Soreya Dhanji
Jen Corrigan
Jennifer Mikhayel
Yang (Steven) Liu
Megan Barber
Lorie Kwong
Khaled Ahmed
Aravind Ganesh
Jesse Heyland
Tyrone Harrison
Nancy Nixon
Nahbeel Premji
Connal Robertson-More

Lian Szabo
Evan Woldrum
Ying Wang

Student Editors
Andrea Letourneau
Victoria David

Faculty Editor
Dr. Lynn Savoie
Overall Approach to Anemia

Anemia

Blood Loss

Normocytic/Normochromic RBCs on Smear
- Acute Bleed
- Chronic Bleed

Any combination of:
- Decreased Reticulocytes
- MCV, MCH, MCHC, Serum Iron, Ferritin
- Increased TIBC, Hypochromic RBCs

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

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

Congenital
- Hemoglobinopathy
- Thalassemia
- RBC Membrane Disorder
- RBC Metabolism Disorder

Acquired
- Immune
- Non-Immune
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
  - Low RBC Folate
    - Dietary Deficiency
    - Malabsorption
    - Increased Requirement (e.g. Pregnancy)

- Oval Macrocytes Hypersegmented Neutrophils

- RBCs in Rouleaux Formation
  - Multiple Myeloma

- Dysplastic
  - Myelodysplastic Syndromes

- Macrocytosis Target Cells Normal WBCs

- Low Serum B12 Antibody Testing
  - Anti-IF Antibodies Present
    - Pernicious Anemia
  - Anti-IF Antibodies Not Present
    - Small Bowel Disorder
    - Pancreatic Disease
    - Parasites
    - Pernicious Anemia

- Normal Liver Function Tests
  - Rule out B12 and Folate Deficiency

- Abnormal Liver Function Tests
  - Liver Disease
Anemia with Normal MCV

Anemia with normal Mean Corpuscular Volume

- Decreased WBCs
  - Decreased/Normal Reticulocytosis
    - Marrow Aplasia
    - Marrow Infiltration
  - Increased Reticulocytosis
    - Primary Hypersplenism
    - Secondary (e.g. RA, SLE, PRV, Chronic)

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

- Polychromatric Macrocytes, Normal RBCs
  - Acute Bleed
  - Hemolysis

- Polychromatric 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 NInflammation

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

Increased HgbA2
Normal HgbA

- β-Thalassemia Minor

Increased HgbA2
Increased HgbF
No HgbA

- β-Thalassemia Major

Increased HgbH, HgbH inclusions in RBC

- α-Thalassemia 2-3 digene deletion

Other

- e.g. HgbE, HgbC, etc.
Approach to Bleeding / Bruising
Platelets & Vascular System

Bleeding/Bruising

Platelets
Thrombocytopenia
- Quantitative Defect
  - Decreased Production
  - Increased Destruction
  - Abnormal Sequestration
  - (See thrombocytopenia scheme)

Disordered Platelet Function
- Qualitative Defect

Congenital
- Rare

Congenital
- Connective Tissue Disorders
- Hereditary Telangiectasia

Acquired
- Steroids
- Vasculitis

Vascular System

Coagulation Proteins

Acquired
- Drugs (e.g. ASA)
- Renal Disease
Approach to Bleeding / Bruising

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
- Vit K Deficiency (decreases levels of Factors II, VII, IX, X, and Protein C+5)

Acquired
- Vitamin K Problem
- Liver Disease
- Antagonist
  - Coumadin

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

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

Normal PTT/Long PT

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

Insufficient Vitamin K

Vitamin K Deficiency

Child/Adult
- Antibiotics and Poor Nutrition
- Fat Malabsorption

Vitamin K Antagonist

Newborn
- Hemorrhagic Disease of the Newborn
- Coumadin (Warfarin) use
Prolonged PTT, Normal PT (INR)

Bleeding Tendency

Long PTT/Normal PT

Bleeding Tendency

- 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

No Bleeding Tendency

Acquired

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

- Drugs
  - Heparin
Prolonged PTT, Normal PT (INR)

No Bleeding Tendency

Long PTT/Normal PT

Bleeding Tendency

Congenital
(Intrinsic Pathway Factor Deficiency)
- Factor XII
- Prekallikrein (Fletcher Factor)
- High Molecular Weight Kininogen (Fitzgerald Factor)

No Bleeding Tendency

Acquired
- Antiphospholipid Antibodies (APLA)
Approach to Splenomegaly

Splenomegaly

- Evidence of portal hypertension or coagulopathy?
  - Congestive
    - Cirrhosis
    - Thrombus (e.g. Hepatic, Portal, Splenic)
- Infectious
  - Bacterial
  - Viral (EBV)
  - Parasitic
  - Fungal
- Infiltrative
- Inflammatory
  - Systemic Lupus Erythematosus
  - Sarcoidosis
  - Felty’s Disease
  - Serum Sickness
- Blood smear abnormalities?
  - 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 (e.g. polycythemia vera, essential thrombocytosis, myelofibrosis)
Fever in the Immunocompromised Host

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

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

Infectious
- EBV
- CMV
- HIV
- Tuberculosis
- Hepatitis

Other
- Acne
- Allergy
- Insect Bites
- Young age

Leukemia
- History of Bleeding, Infection, Fatigue
  - Acute Lymphoblastic Leukemia
    (Pancytopenia, WBC differential includes Blasts)
- Asymptomatic, Age > 50
  - Chronic Lymphocytic Leukemia (CBC with Lymphocytes)

Neoplastic

Monoclonal Lymphocytes on Biopsy
- Non-Hodgkin’s Lymphoma

Reed-Sternberg Cells on Biopsy
- Hodgkin’s Lymphoma

Systemic Inflammatory

Infectious

Other

Leukemia

History of Bleeding, Infection, Fatigue

Asymptomatic, Age > 50
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

<table>
<thead>
<tr>
<th>Cervical</th>
<th>Supraclavicular</th>
<th>Axillary</th>
<th>Epitrochlear (Always pathologic)</th>
<th>Inguinal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior</td>
<td>Thoracic Malignancy (Breast, Mediastinum, Lungs, Esophagus)</td>
<td>Infection (Arm, Thoracic Wall, Breast)</td>
<td>Infection (Forearm/Hand)</td>
<td>Leg Infection</td>
</tr>
<tr>
<td>Posterior</td>
<td>Abdominal Malignancy (Virchow's Node)</td>
<td>Cancer (in absence of infection in upper extremity)</td>
<td>Lymphoma</td>
<td>Sexually Transmitted Infection</td>
</tr>
<tr>
<td>TB</td>
<td></td>
<td></td>
<td>Sarcoidosis</td>
<td></td>
</tr>
<tr>
<td>Lymphoma</td>
<td></td>
<td></td>
<td>Tularemia</td>
<td></td>
</tr>
<tr>
<td>Kikuchi Disease</td>
<td></td>
<td></td>
<td>Secondary Syphilis</td>
<td></td>
</tr>
</tbody>
</table>
**Neutrophilia**

**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)

**Hematologic**

56
Neutropenia
Decreased Neutrophils Only

Neutropenia

Isolated Neutrophil Decrease

Congenital

Decreased Marrow Production

Idiopathic
Chronic

Bicytopenia/Pancytopenia
(Neutrophils and Other Cell Lines Decreased)

Increased Consumption
Septicemia

• Gram Positive Bacteria
• Gram Negative Bacteria

Increased Destruction

• Systemic Lupus Erythematosus
• Rheumatoid Arthritis

Medications

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

Viral Infection

• Epstein-Barr Virus
• Cytomegalovirus
• Childhood viruses
• HIV
• Influenza
• COVID-19
Neutropenia

Bicytopenia / Pancytopenia

Isolated Neutrophil Decrease

Bicytopenia/Pancytopenia
(Neutrophils and Other Cell Lines Decreased)

Decreased Production

Sequestration

• Splenomegaly

Marrow Infiltration

• Hematologic and non-hematologic malignancies
• Infection
• Primary Myelofibrosis

Stem cell damage or suppression

• Chemotherapy
• Radiation
• Drugs
• Toxins
• Aplastic Anemia
• Myelodysplasia

Nutritional deficiency

• B12/folate/combined deficiencies
Polycythemia

Polycythemia (Erythrocytosis)

Relative
- Normal RBC Mass/
- Decreased Plasma Volume

Burns
- Diarrhea
- Dehydration
- Idiopathic

True
- Elevated RBC Mass

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

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

- Congenital Hemoglobinopathy
- Familial Polycythemia
- Carboxyhemoglobin

Hypoxia
- O₂ saturation ≤ 90%

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

- Polycythemia Vera

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

Heart Murmur,
- Cyanosis without
- Pulmonary Disease

- Cyanotic Heart Disease

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

- Sleep Apnea
- Chronic Pulmonary Disease
Suspected Deep Vein Thrombosis (DVT)

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)

Calculate Clinical Probability Score

Low: ≤ 4 Points
- Negative D-Dimer
  - STOP
- Positive D-Dimer
  - CT-PA or Compression U/S

High: > 4 Points
- CT-PA or Compression U/S
  - Negative
    - Low Clinical Suspicion
    - STOP
  - Non-Diagnostic
    - compression U/S
  - Positive
    - TREAT
      - Positive
      - 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 >100bpm (1.5)
- Immobilization or surgery in last 4 weeks (1.5)
- Previous DVT or PE (1.5)
- Hemoptysis (1.0)
- Malignancy (ongoing or previous 6 months) (1.0)


Thrombocytopenia

Low Platelet Count

Decreased Production
- 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

Autoimmune
- ITP
- SLE
- CLL
- APLA

Alloimmune
- anti-HLA antibodies

Drugs
- Quinidine
- HIT
- Others
Thrombocytosis

- Reactive
  - Spurious
    - Artifact (redo CBC)
  - Essential thrombocytosis
  - Polycythemia Vera
  - Chronic Myelogenous Leukemia
  - Primary Myelofibrosis

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

- Inflammatory
  - Post-op surgery
  - Trauma
  - Burns

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

- Non malignant hematologic conditions
  - Post-splenectomy or hyposplenic states
  - Non-hematologic malignancy
  - Iron deficiency anemia

- Other
Hematologic

Hemolysis

Extravascular
Spleen and RES-mediated hemolysis

Intravascular
Hemolysis within circulation

Extrinsic to RBC

Intrinsic to RBC

Infections

Complement-Mediated

Mechanical Shearing

Immune-Mediated

• Warm AIHA
• Cold AIHA
• Alloimmune delayed HTR
• Drug-induced AIHA

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

Membrane Defects
• Hereditary spherocytosis
• Hereditary elliptocytosis

RBC Enzyme Defects
• G6PD deficiency
• PK deficiency

• Malaria
• Babesiosis
• C. perfringens

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

• MAHA (TTP, DIC, HUS)
• Prosthetic heart valves
• Atriovenous malformations

• Warm AIHA
• Cold AIHA
• Drug-induced AIHA
• Thalassemia
• Sickle cell
• Unstable Hgb

• Alloimmune delayed HTR
• Drug-induced AIHA
• Thalassemia
• Sickle cell
• Unstable Hgb
Gastrointestinal

Abdominal Distention ................................................... 69
Abdominal Distention Ascites ....................................... 70
Abdominal Distention Other Causes ................................. 71
Abdominal Mass ................................................................. 72
Abdominal Pain (Adult) Acute - Diffuse ....................... 73
Abdominal Pain (Adult) Acute - Localized ......................... 74
Abdominal Pain (Adult) Chronic - Constant ...................... 75
Abdominal Pain (Adult) Chronic - Crampy / Fleeting .......... 76
Abdominal Pain (Adult) Chronic - Post-Prandial ............... 77
Anorectal Pain ................................................................. 78
Acute Diarrhea ................................................................. 79
Chronic Diarrhea Small Bowel ......................................... 80
Chronic Diarrhea Steatorrhea & Large Bowel ..................... 81
Constipation (Adult) Altered Bowel Function & Idiopathic .... 82
Constipation (Adult) Secondary Causes ......................... 83
Constipation (Pediatric) ..................................................... 84
Dysphagia ................................................................. 85
Elevated Liver Enzymes ................................................. 86
Hepatomegaly ................................................................. 87
Jaundice ................................................................. 88
Liver Mass ................................................................. 89
Mouth Disorders (Adult & Elderly) ......................... 90
Nausea & Vomiting Gastrointestinal Disease ..................... 91
Nausea & Vomiting Other Systemic Disease .......................................................... 92
Stool Incontinence ......................................................................................... 93
Upper Gastronintestinal Bleed (Hematemesis / Melena) ................................. 94
Lower Gastrointestinal Bleed ......................................................................... 95
Weight Gain .................................................................................................. 96
Weight Loss ................................................................................................. 97
**Historical Editors**
Dr. Chris Andrews
Khaled Ahmed
Jennifer Amyotte
Stacy Cormack
Beata Komierowski
James Lee
Shaina Lee
Matt Linton
Michael Prystajecky
Daniel Shafran
Robbie Sidhu
Mia Steiner

Shabaz Syed
Ying Wang

**Student Editors**
Scott Assen
Jonathan Seto
Jacob Charette

**Faculty Editor**
Dr. Sylvain Coderre
Dr. Kelly Burak
Abdominal Distention

- Ascites
  - Mechanical obstruction
    - Adhesions 60%
    - Volvulus 3%
    - Malignancy 20%
    - Herniation 10%
  - Acute Colonic
    - Olgivie's Syndrome
      - Trauma/Surgery
      - Medical Conditions (e.g. Myocardial Infarction, Congestive Heart Failure)
      - Drugs
      - Retroperitoneal Hemorrhage/Malignancy
  - Toxic Megacolon
    - Inflammatory
    - Infectious
    - Ischemic

- Bowel Dilatation
  - Paralytic Ileus
    - Peritonitis
    - Post-surgical
    - Hypothyroidism
  - Myopathic
    - Scleroderma
    - Familial Myopathy

- Other Causes
  - Pseudo-obstruction
  - Chronic Intestinal
    - Neuropathic
      - Enteric (e.g. Amyloidosis, Paraneoplastic, Narcotics)
      - Extrinsic (e.g. Multiple Sclerosis, Spinal Injury, Stroke)
Abdominal Distention

Ascites

**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**
  - Constipation
  - Irritable Bowel Syndrome
  - Carbohydrate Malabsorption
  - Diet (Lactose Intolerance)
  - Chronic Obstruction

- **Other Causes**
  - Hepatomegaly
  - Splenomegaly
  - Hydronephrosis
  - Renal Cysts
  - Aortic Aneurysm

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

Exclude pregnancy/hernia/abdominal wall mass

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

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

Other Causes

Feces
- Vascular (Abdominal Aortic Aneurysm)

Pulsatile

Pseudoneoplastic
- Pancreatic Pseudocyst
Abdominal Pain (Adult)

Acute - Diffuse

Acute Abdominal Pain (<72 hours)

Look For Surgical Abdomen

Upper Quadrant: R/O Cardiac, Pulmonary, Renal, Musculoskeletal Causes

Lower Quadrant: R/O Genitourinary Causes

Diffuse

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

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

Localized
Abdominal Pain (Adult)

Acute - Localized

Acute Abdominal Pain (<72 hours)

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

Diffuse

Upper Quadrant

Non-Peritoneal

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

Peritoneal

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

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

Localize

Lower Quadrant

Non-Peritoneal

- Bowel
  - Appendicitis
  - Diverticulitis
  - Incarcerated Hernia

Peritoneal

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

Chronic - Constant

Chronic Abdominal Pain

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

Constant

Cramping/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

Gastrointestinal

75
Abdominal Pain (Adult)

Chronic - Crampy / Fleeting

Chronic Abdominal Pain

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

Constant

Cramping/Fleeting

Post-Prandial

Upper Quadrant

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

Lower Quadrant

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

Any Location/Diffuse

- Bowel Obstruction (e.g. Adhesions, Crohn’s, Volvulus, Neoplasm, Hernia)
- Irritable Bowel Syndrome
Abdominal Pain (Adult)
Chronic - Post-Prandial

Chronic Abdominal Pain

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

Constant
Cramping/Fleeting
Post-Prandial

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

Lower Quadrant
- Obstructing Colon Cancer

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

Exclude: Poor Hygiene, Dietary, Anal Trauma

Internal Lesion
- Proctitis
  - Inflammation
  - Infection (Including Sexually Transmitted)
- Diagnosis of Exclusion
  - Proctalgia
- External Lesion
  - Malignancy
  - Solitary Rectal Ulcer
  - Dermatitis
  - Psoriasis
  - Fissure
  - Fistula/Abscess (Crohn’s)
  - Hemorrhoid

Other
- Dermatologic

Anorectal Disease
Acute Diarrhea

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

**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*)

**Ischemic**
- Nausea/Vomiting Predominant
  - *Bacillus cereus*
  - *Staphylococcus aureus*

**Inflammatory**
- Non-Bloody
  - *Crohn's Ileitis*
  - *Crohn's Colitis*
- Bloody
  - *Ulcerative Colitis*
  - *Crohn's Colitis*

**Dietary**

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

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

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

- Steatorrhea
  - Oily/Foul/Hard to Flush

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

- Small Bowel
  - Large Volume/Watery

- Secretory

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

- Tumors

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

- Neoplastic
  - Adenocarcinoma
  - Lymphoma

- Osmotic
  - Magnesium, Phosphate, Sulfate
  - Carbohydrate Malabsorption
  - Lactose Intolerance
Chronic Diarrhea

Steatorrhea & Large Bowel

Chronic Diarrhea

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

Steatorrhea
Oily/Foul/Hard to Flush

Malabsorptive

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

Secondary Malabsorption
• Bacterial Overgrowth
• Liver Cholestasis
• Mesenteric Ischemia
• Short Bowel/Resection

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

Motility

• Irritable Bowel Syndrome
• Hyperthyroid

Inflammatory
• Inflammatory Bowel Disease
• Radiation Colitis
• Ischemic Colitis

Small Bowel
Large Volume/Watery

Secretory

• Villous Adenoma
• Colon Cancer
• Microscopic Colitis

Maldigestive

• Pancreatic Insufficiency

Primary Malabsorption

Secondary Malabsorption

Inflammatory

Secretory

Malabsorptive

• Pancreatic Insufficiency

Primary Malabsorption

Secondary Malabsorption

Inflammatory

Secretory

Celiac Disease
Mucosal Disease
Ileal Crohn’s Disease
Bacterial Overgrowth
Liver Cholestasis
Mesenteric Ischemia
Short Bowel/Resection

Inflammatory Bowel Disease
Radiation Colitis
Ischemic Colitis
Villous Adenoma
Colon Cancer
Microscopic Colitis
Constipation (Adult)

Altered Bowel Function & Idiopathic

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

1. 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)

2. Severe Idiopathic
   - Colonic Inertia
   - Outlet Delay
     - Pelvic Floor Dyssynergia

3. Secondary Causes
   - Irritable Bowel

Flowchart:
- Constitution
- Altered Bowel Function
- Severe Idiopathic
- Secondary Causes
Constipation (Adult)

Secondary Causes

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

Altered Bowel Function

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

Severe Idiopathic

Secondary Causes

Non-Neurogenic

Metabolic
- Hypothyroidism
- Hypokalemia
- Hypercalcemia

Colorectal Disease

- Colon Cancer
- Colonic Stricture
  (Inflammatory Bowel Disease and Diverticular Disease)
Constipation (Pediatric)

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

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

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

If heartburn present: Consider GERD

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

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

Structural
• Tumors
• Zenker’s Diverticulum
• Foreign Body

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

Functional

Motor Disorder
Solids and/or Liquids

Mechanical Obstruction
Solids only

Intermittent Symptoms
• Esophageal Spasm

Progressive Symptoms
• Scleroderma
• Achalasia
• Diabetic Neuropathy

Intermittent Symptoms
• Schatzki Ring
• Esophageal Web
• Eosinophilic Esophagitis

Progressive Symptoms
• Reflux Stricture
• Esophageal Cancer
Elevated Liver Enzymes

Hepatocellular
ALT or AST > ALP

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

Severe
ALT > 15x ULN

Moderate
ALT 5–15x ULN

Mild
ALT < 5x ULN

US – Normal Bile Ducts

US – Dilated Bile Ducts

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

NAFLD
Alcohol
Viral
Hemochromatosis
Drugs
Wilson’s
Others

Mild
ALT < 5x ULN

PBC
PSC
Alcoholic hepatitis
Drugs
TPN
Sepsis
Infiltrative
Sarcoid
Amyloid
Malignancy
Infection
Cirrhosis (any)
Congenital
Biliary Atresia
Alagille Syndrome
Progressive Familial Intracholestasis

Severe
ALT > 15x ULN

• Viral
• Drugs/Toxins
• Ischemia
• Autoimmune
• Wilson’s
• Pregnancy
  • AFLP
  • HELLP

Moderate
ALT 5–15x ULN

Intracholestasis

Common Bile Duct
Stone
Biliary stricture
PSC
Worms/flukes
Cholangiocarcinoma
Pancreatic cancer
Others

Dx by biopsy ± MRI/MRCP

ERCP for dx and therapy

Liver function test

ALP > ALT or AST

Intracholestasis

US – Dilated Bile Ducts

Common Bile Duct

Pancreatic cancer

Worms/flukes

Common Bile Duct

Pancreatic cancer

Worms/flukes

Liver function test

ALP > ALT or AST

Intracholestasis

US – Dilated Bile Ducts

Common Bile Duct

Pancreatic cancer

Worms/flukes

Common Bile Duct

Pancreatic cancer

Worms/flukes
Hepatomegaly

Rule out concurrent splenomegaly and jaundice

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

Congestive

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

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

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

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

Pre-Hepatic
Unconjugated Hyperbilirubinemia

Hepatic
Conjugated Hyperbilirubinemia

Post-Hepatic
Usually has Duct Dilatation on Ultrasound

See Elevated Liver Enzymes scheme

Increased Production
• Hemolysis
• Ineffective Erythropoiesis
• Hematoma

Decreased Hepatic Uptake
• Sepsis
• Drugs (e.g. Rifampin)

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

Biliary Duct Compression
• Malignancy
• Metastases
• Pancreatitis

Intraductal Obstruction
• Gallstones
• Biliary Stricture
• Cholangiocarcinoma
• Primary Sclerosing Cholangitis
Liver Mass

- **Cystic**
  - **Benign**
    - Simple
    - Complex
      - • Cyst
      - • Polycystic Liver Disease
      - • Caroli’s
  - • Cystadenoma
  - • Hydatid Cyst

- **Solid**
  - **Benign**
  - • Cystadenocarcinoma
  - • Hemangioma
  - • Focal Nodular Hyperplasia
  - • Adenoma
  - • Abscess
  - • Hepatocellular Carcinoma
  - • Cholangiocarcinoma
  - • Metastases (e.g. Lung, Colon, Breast)

- **Malignant**
  - • Cystadenocarcinoma

- **Primary Malignancy**
- **Secondary Malignancy**
Mouth Disorders (Adult & Elderly)

Consider oral manifestations of systemic disease

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

**Mucous Membrane**
- Ulcerating
- Non-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)**
- Non-Neoplastic
  - Candidiasis
  - Lichen Planus
  - Anemia
- Neoplastic
  - Leukoplakia
  - Squamous Cell Carcinoma

**Darker (Red)**
- Gingivitis
- Kawasaki Disease (Strawberry Tongue)
- Other Gum Disease
- Mucocele
- Allergic Reaction

**No Colour Change**
- Chronic Liver Disease
- Sjögren’s Syndrome
- Acromegaly
- Amyloidosis
- Psoriasis
- Gingival Hyperplasia
- Dry Mouth
Nausea & Vomiting
Gastrointestinal Disease

Nausea and Vomiting

Gastrointestinal Disease

Upper Gastrointestinal
- Acute
  - Infectious Gastroenteritis
  - Gastric/Duodenal Obstruction
  - Gastric Volvulus
- Chronic
  - Gastroesophageal Reflux Disease
  - Peptic Ulcer Disease
  - Gastroparesis

Hepatobiliary
- Acute
  - Acute Hepatitis
  - Acute Cholecystitis
  - Cholelithiasis
  - Choledocholithiasis
  - Acute Pancreatitis
- Chronic

Lower Gastrointestinal
- Acute
  - Infectious Gastroenteritis
  - Small/Large Bowel Obstruction
  - Acute Appendicitis
  - Mesenteric Ischemia
  - Acute Diverticulitis
- Chronic
  - Inflammatory Bowel Disease
  - Colonic Neoplasm
Nausea & Vomiting
Other Systemic Disease

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

- Other Systemic Disease

Nausea and Vomiting

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

Central Nervous System

Endocrine/Metabolic

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

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

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

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

Intact Pelvic Floor

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

- Nerve/Sphincter Damage
  - Vaginal Delivery
  - Rectal Prolapse
  - Severe Hemorrhoid

- Congenital Anorectal Malformation

Affected Pelvic Floor

- 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

- Surgery: Anorectal, Prostate, Bowel
- Pelvic Fracture
- Pelvic Inflammation
- Vaginal Delivery
- Rectal Prolapse
- Severe Hemorrhoid
- 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)
- Inflammatory Bowel Disease
- Irritable Bowel Syndrome
- Chronic Laxative Use
- 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)
- Inflammatory Bowel Disease
- Irritable Bowel Syndrome
- Chronic Laxative Use
Upper Gastronintestinal Bleed

(Hematemeses / Melena)

- Acute Hematemesis/Melena
  - Blood in vomitus?/black, tarry stools
  - If Melena, 5-10% colorectal/small bowel. Exclude bleeding disorder.

- Peptic Ulcer Disease (55%)
  - Gastric Acid Hypersecretion
    - Zollinger-Ellison Syndrome
  - Non-Steroidal Anti-Inflammatory Drugs
  - Stress (ICU Setting)

- Portal Hypertension (15%)
  - Gastro-esophageal varices

- Other
  - Helicobacter Pylori
  - Retching?
    - Mallory Weiss Tear
    - Tumors
      - Benign
      - Malignancy
    - Esophagitis/Gastritis

Other

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

In Patient

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

Increased Intake
- Dietary
- Social/Behavioural
- Iatrogenic

Decreased Expenditure
- Sedentary Lifestyle
- Smoking Cessation

Neurogenic/Genetic
- Depression
- Dementia

Hypothalamic/Pituitary
- Hypothalamic Syndrome
- Growth Hormone Deficiency

Gonadic
- Polycystic Ovarian Syndrome
- Hypogonadism

Other Causes
- Cushing’s Disease
- Hypothyroidism
Weight Loss

- 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

Acute Kidney Injury..................................................101
Chronic Kidney Disease .........................................102
Dysuria ......................................................................103
Generalized Edema..................................................104
Hematuria ..................................................................105
Hyperkalemia Intercellular Shift .........................106
Hyperkalemia Reduced Excretion ......................107
Hypokalemia ...........................................................108
Hypernatremia .......................................................109
Hyponatremia ..........................................................110
Hypertension ............................................................111
Increased Urinary Frequency ................................112
Nephrolithiasis ..........................................................113
Polyuria .....................................................................114
Proteinuria .................................................................115
Renal Mass Solid ......................................................116
Renal Mass Cystic .....................................................117
Scrotal Mass ..............................................................118
Suspected Acid-Base Disturbance ....................119
Metabolic Acidosis Elevated Anion Gap ...........120
Metabolic Acidosis Normal Anion Gap ...............121
Metabolic Alkalosis ................................................122
Urinary Incontinence ..............................................123
Urinary Tract Obstruction .......................................124
Historical Editors
Dr. Andrew Wade
Dr. Sophia Chou
Dave Campbell
Derrick Chan
Marc Chretien
Mollie Ferris
Kody Johnson
Becky Kennedy
Vera Krejcik
Keith Lawson
Vanessa Millar
Eric Sy
Maria Wu

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

Faculty Editor
Dr. Kevin McLaughlin
Acute Kidney Injury

Acute increase in creatinine by at least 50%

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

Renal Hypoperfusion
• Hepatorenal syndromes
• Drugs
• Emboli

Systemic Hypotension
• Shock

Renal (FeNa > 2%)

Tubular
(Thrombocytopenia and schistocytosis on CBC)

Vascular

Glomerular
(RBC casts, dysmorphic RBCs)

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

• Benign Prostatic Hyperplasia
• Constipation
• Prostate Cancer
• Urolithiasis

Urinalysis and CBC

TTP/HUS

Rapidly Progressive Glomerulonephritis

• 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)

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)

Tubular

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

Glomerular

• Rapidly Progressive Glomerulonephritis

Renal

• Acute Interstitial Nephritis

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

Urinalysis and CBC

• Pigments

• Anti-GBM antibodies
• Immune-complex deposition (IgA, post-strep, lupus)
• Pauci-immune (Wegener’s)
• Drsugs (NSAIDs, Abx, allopurinol, PPI)
• Infections (CMV, strep, legionella)
• Immune (lupus, sarcoid, Sjögren)

• Rapidly Progressive Glomerulonephritis

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

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

Pre-Renal
(Evidence of Renovascular disease)
- Atheroemboli
- 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 (sarcoïd, Sjögren)
- Multiple myeloma
- Hyperoxaluria
- Hypercalcemia
- Hyperphosphatemia
Dysuria

- **Pyuria**
  - Leukocytes on Dipstick/Microscopy

- **No Pyuria**
  - No Leukocytes on Dipstick/Microscopy

**Bacteriuria & Hematuria**
- Dipstick positive for nitrites (if infected with enterobacteria).
- **Upper Urinary Tract Infection/Pyelonephritis**
  - WBC Casts
- **Lower Urinary Tract Infection/Cystitis**
  - WBC Clumps

**No Bacteriuria & No Hematuria**
- Dipstick negative for nitrites.

**Urethritis**
- • Gonococcal
- • Non-Gonococcal (e.g. *Chlamydia, Trichomonas*)
- • *Candida*
- • Herpes Simplex Virus

**Vaginitis**
- • *Candida*
- • *Gardnerella*
- • Neoplasm

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

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

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

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

Signs of left ventricular failure

Low serum albumin due to loss or impaired synthesis

Severely ill (e.g. in ICU)
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 +/- nitrates with bacteria on microscopy)

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

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

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

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

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

Glomerular
(Dysorphic RBCs and/or RBC casts)

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

Reduced Excretion

Increased Intake
(IV potassium with reduced excretion)

Increased Release
Increased Serum Osmoles, Increased Urate, Phosphate, Creatinine Kinase

- Non-Anion Gap Metabolic Acidosis
- Hyperosmolarity
- Cell Lysis (e.g. Tumor Lysis Syndrome, rhabdomyolysis)

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

Increased Release

Decreased Entry
Decreased Na⁺-H⁺ Exchanger
Decreased Na⁺-K⁺-ATPase

- Insulin Deficiency/Resistance
- β₂ antagonism
- α₁ agonism
- Digoxin

Exclude pseudohyperkalemia
Leukocytosis, thrombocytosis, hemolysis

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

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

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
- \(\beta_2\) antagonism
- NSAIDs

Decreased Glomerular Filtration Rate
Increased Creatinine

- Chronic renal failure
- AKI

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

Exclude pseudohyperkalemia
Leukocytosis, thrombocytosis, hemolysis
Hypokalemia

Serum Potassium <3.5 mmol/L

Increased Loss

Renal Loss
- Urine loss >20mmol/d
- High distal [K]
  - TTKG > 4

Volume Status Assessment
- EABV contracted
  - Loop diuretics/
    - Bartter’s syndrome
  - Thiazide diuretics/
    - Gittelman’s syndrome
  - Magnesium depletion
- Normal or expanded EABV
  - High renin
    - High aldosterone
      - Renal artery stenosis
  - Low renin
    - High aldosterone
      - Hyperaldosteronism
  - Low renin
    - Low aldosterone
      - Licorice intake
      - Liddle’s syndrome

Decreased intake
- (rare cause in isolation)
- GI loss
  - Urine loss <20mmol/d
  - Polyuria
  - Diarrhea
  - Vomiting
  - NG suction
  - Laxatives

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

Low renin
- Low aldosterone

High renin
- High aldosterone
**Hypernatremia**

Excess free water loss

Serum Sodium $> 145$ mmol/L

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

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

- **Low Urine Osmolality**
  $< 300$ mmol/kg
  - Diabetes Insipidus

**Low Urine Volume**
$< 3$L/24 hours

- **Non-renal losses**
  - Decreased intake of water
    - Decreased level of consciousness
    - No access to water

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

**GI loss**
- Watery Diarrhea
Hyponatremia

Serum Sodium <135 mmol/L

Hypo-osmolar plasma
Posm < 280 mmol/kg

Impaired H2O Excretion
• Reduced GFR
• Diuretics

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

Syndrome of Inappropriate ADH
Euvolemic; no physiologic stimulus to ADH
• Pain/Post-op
• Neurologic trauma
• Drugs
• Pulmonary pathology
• Malignancy

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

True hypovolemia
• Bleeding
• GI losses
• Renal losses
(eespecially thiazide diuretics)

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

Hormonal changes
• Hypothyroidism
• Adrenal insufficiency
• Pregnancy

Artifactual

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

High Posm
>295mmol/kg
• Hyperglycemia*
• Mannitol

Intact H2O Excretion

Hyper-osmolar urine
Uosm < 100 mmol/kg
ADH suppression
• Primary polydipsia
• Insufficient osmole intake

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

• Bleeding
• GI losses
• Renal losses
(eespecially thiazide diuretics)

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

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

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

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

Essential (Primary) Hypertension

Secondary Hypertension

Cardiac Output
(Volume dependent)

Systemic Vascular Resistance
(Vasoconstrictive)

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

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

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

Anatomic Causes
- Aortic coarctation
- Unilateral RAS

Metabolic Causes
- Hyperthyroidism
- Hypercalcemia
- Pheochromocytoma

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

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

Intrinsic to Urinary Tract

Urinary Tract Infection
(See Dysuria scheme)

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

Extrinsic to Urinary Tract

Small volume bladder

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

Vulvovaginitis
Bladder compression/Pregnancy
Nephrolithiasis

Radio-opaque
Calcium-containing
90% of stones

Hard Stones
Calcium oxalate/phosphate
80% of stones

• Urinary tract infection

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

Soft Stones
Struvite Stones
10% of stones

Cysteine Stones
Non Calcium containing, but opaque

• Cystinuria

Soft Stones
10% of stones

Uric Acid Stones

• Hyperuricosuria
• High protein intake

Uric Acid Stones

Anatomical problem
• Medullary sponge kidney

Renal
### 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

#### Hypertonic Urine Following Water Deprivation Test

- Uosm unchanged or increased by <50%
  - Unresponsive Kidney
  - Nephrogenic Diabetes Insipidus

- Primary polydipsia
Proteinuria

Persistent Proteinuria

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

Tubular Proteinuria (Negative urine dip = no albuminuria)

Urine Protein Electrophoresis

Monoclonal protein

Overflow

• Multiple Myeloma
• MGUS

Poor reabsorption

• RTA
• Fanconi's syndrome
• Drugs

Glomerular Proteinuria (Positive urine dip = albuminuria)

Urine Microscopy

Active urine sediment

WBC/RBC casts

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

Bland urine sediment

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

Transient Proteinuria

• Exercise
• Fever
• UTI

Orthostatic Proteinuria

• Tall adolescents
Renal Mass

- Solid
  - 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

Benign
Anechoic on ultrasound
Well-demarked 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

Cystic

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

• Polycystic Kidney Disease
• Tuberous Sclerosis
• Von Hippel-Lindau Syndrome
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

Painless

Trans-illuminates
- Hydrocele
  - Communicating
  - Non-communicating
  - Traumatic/Reactive

Does Not Trans-illuminates
- Tumor
  - Solid = Tumor until proven otherwise
  - Germ cell
    - Seminoma, Teratoma, Mixed
  - Non-germ cell

Epididymal Cyst
- Spermatocele

Spermatic Cord
- Communicating hydrocele
- Indirect hernia

Varicocele
- Soft/“Bag of Worms”
Suspected Acid-Base Disturbance

Suspected Acid-Base Disorder

- Acidemia (pH < 7.35)
  - Metabolic Acidosis: \( \text{HCO}_3^- < 24 \text{mmol/L} \)
    - \( \text{CO}_2 / \text{HCO}_3^- = 12:10 \)
  - Non-Anion Gap
    - Methanol
    - Uremia
    - Diabetic Ketoacidosis
    - Propylene Glycol
    - Lactic Acidosis
    - Ethylene Glycol
    - Acetylsalicylic Acid
- Normal pH
- Alkalemia (pH > 7.45)
  - Metabolic Alkalosis: \( \text{HCO}_3^- > 28 \text{mmol/L} \)
    - \( \text{CO}_2 / \text{HCO}_3^- = 7:10 \)
  - Respiratory Alkalosis: \( \text{pCO}_2 < 35 \text{mmHg} \)

Appropriate Compensation:
- Ratio (CO\(_2\)/HCO\(_3^-\))
- Metabolic Acidosis: 12:10
- Metabolic Alkalosis: 7:10
- Acute Respiratory Acidosis: 10:1
- Chronic Respiratory Acidosis: 10:3
- Acute Respiratory Alkalosis: 10:2
- Chronic Respiratory Alkalosis: 10:4

Anion Gap = Na - (Cl + HCO\(_3^-\)) (normal AG ~12)

Diagnosis of Mixed Metabolic Disorders in Patients with Metabolic Acidosis:
- Anion Gap Not Increased
- Non-Anion Gap Acidosis Alone
- \( \Delta \text{Anion Gap} = \Delta \text{HCO}_3^- \) Anion Gap Acidosis Alone
- \( \Delta \text{Anion Gap} < \Delta \text{HCO}_3^- \) Mixed Anion Gap Acidosis + Non-Anion Gap Acidosis
- \( \Delta \text{Anion Gap} > \Delta \text{HCO}_3^- \) Mixed Anion Gap Acidosis + Metabolic Alkalosis
**Metabolic Acidosis**

Elevated Anion Gap

- Elevated Anion Gap (>12)
  - (Gain of H+)
  - Elevated serum creatinine
  - Excess acid addition
    - Elevated serum salicylate level
    - Salicylate poisoning
    - • Shock
    - • Drugs
    - • Inborn errors
  - Decreased NH₄ production and anion secretion
    - • AKI/CKD
  - Positive serum lactate
  - Lactic acidosis
  - • Diabetic ketoacidosis
  - • Starvation/alcoholic ketosis

- Normal Anion Gap (≤12)
  - (loss of HCO₃⁻)
  - Elevated osmolar gap
  - Toxic alcohol ingestion
    - • Ethylene/Propylene glycol
    - • Methanol
  - Other ingestion
    - • Paraldehyde, Iron, Isoniazid, Toluene, Cyanide

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

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

**Diagnosis of Mixed Metabolic Disorders in Patients with Metabolic Acidosis:**
- Anion Gap Not Increased
- Non-Anion Gap Acidosis Alone
- ΔAnion Gap = ΔHCO₃⁻, 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

Normal Anion Gap

Metabolic Acidosis

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

- Elevated Anion Gap (>14)
  Acid Gain
  - GI Tract Loss
    Negative urine net charge
    • Diarrhea
    • Fistula

- Normal Anion Gap (≤14)
  Loss of Bicarbonate

  History of diarrhea?

  • Renal Loss
    Direct Loss
    Negative U net charge
    High FE\textsubscript{HCO}_3
    • RTA Type II
    • Carbonic anhydrase inhibitor

  • Indirect Loss
    Positive U net charge

  • TTKG = (K\textsubscript{Urine} \times Osm\textsubscript{Serum})/(K\textsubscript{Serum} \times Osm\textsubscript{Urine})
  Urine net charge = U\textsubscript{Na} + U\textsubscript{K} - U\textsubscript{Cl}

  • Principal Cell Problem
    Low TTKG
    • RTA Type IV

  • α- Intercalated Cell Problem
    High TTKG
    • RTA Type I
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
- Barrter’s/Gitelman’s

High Renin
High Aldosterone
- Malignant Hypertension
- Renovascular Hypertension
- Renin-Secreting Tumor

Low Renin
High Aldosterone
- Aldosterone-secreting mass
- Adrenal hyperplasia
- Glucocorticoid remediable aldosteronism

Low Renin
Low Aldosterone
- Licorice
- Liddle’s Syndrome
- Enzyme deficiency

Renal Failure with Ingestion

- Milk-Alkali syndrome
- Bicarbonate ingestion

Transient

- IV Bicarbonate
- Acute correction of hypercapnia

Rule Out

Gastric Lower Bowel
- Villous adenoma
- Laxative abuse
- Chloridorrhea

- Penicillins

- Diuretics (loop/thiazide)
- Hypomagnesemia
- Barrter’s/Gitelman’s

- Licorice
- Liddle’s Syndrome
- Enzyme deficiency

- Malignant Hypertension
- Renovascular Hypertension
- Renin-Secreting Tumor

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

- Licorice
- Liddle’s Syndrome
- Enzyme deficiency
Urinary Incontinence

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

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

Established
Not easily reversible cause

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

Bladder Outlet Obstruction
Urinary Tract Obstruction

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

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

**CT KUB**

**Intraluminal**
- Retroperitoneal Fibrosis
- Cancer

**Extraluminal**
- Ureteropelvic junction obstruction

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

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

**Outflow Tract**
- BPH
- Prostate cancer
- Urethral stricture
- Posterior Urethral valves

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

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

**Intramural**
- Urothelial cell carcinoma
- Squamous cell carcinoma
Endocrinology

Abnormal Lipid Profile Combined & Decreased HDL ........................................................ 129
Abnormal Lipid Profile Increased LDL & Increased Triglycerides ........................................ 130
Abnormal Serum TSH ........................................................................................................ 131
Adrenal Mass Benign ........................................................................................................ 132
Adrenal Mass Malignant ..................................................................................................... 133
Amenorrhea ........................................................................................................................ 134
Breast Discharge ............................................................................................................... 135
Gynecomastia Increased Estrogen & Increased HCG ......................................................... 136
Gynecomastia Increased LH & Decreased Testosterone .................................................. 137
Hirsutism ............................................................................................................................ 138
Hirsutism & Virilization Androgen Excess ................................................................. 139
Hirsutism & Virilization Hypertrichosis ........................................................................... 140
Hypercalcemia Low PTH ............................................................................................... 141
Hypercalcemia Normal / High PTH ............................................................................... 142
Hypocalcemia High Phosphate ....................................................................................... 143
Hypocalcemia Low Phosphate ........................................................................................ 144
Hypocalcemia High / Low PTH ....................................................................................... 145
Hyperglycemia ................................................................................................................ 146
Hypoglycemia .................................................................................................................... 147
Hyperphosphatemia ........................................................................................................ 148
Hypophosphatemia .......................................................................................................... 149
Hyperthyroidism .............................................................................................................. 150
Hypothyroidism ................................................................................................................. 151
Hyperuricemia ................................................................................................................. 152
Male Sexual Dysfunction ..................................153
Sellar / Pituitary Mass ......................................154
Sellar / Pituitary Mass Size ...............................155
Short Stature ..................................................156
Tall Stature ......................................................157
Weight Gain / Obesity ....................................158
Historical Editors
Dr. Andrew Wade
Dr. Sophia Chou
Dave Campbell
Derrick Chan
Marc Chretien
Mollie Ferris
Kody Johnson
Becky Kennedy
Vera Krejcik
Keith Lawson
Vanessa Millar
Eric Sy
Maria Wu

Student Editors
Parul Khanna (Co-editor)
Patricia Wong (Co-editor)
Soreya Dhanji

Faculty Editor
Dr. Kevin McLaughlin
Abnormal Lipid Profile
Combined & Decreased HDL

Abnormal Serum Lipid Profile

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

Genetic Causes
- Familial Combined Hyperlipidemia
- Familial Dysbetalipoproteinemia

Secondary Causes
- Nephrotic Syndrome
- Drugs
- Diabetes
- Hypothyroidism

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

Secondary Causes
- Sedentary Lifestyle
- Smoking
- Androgens

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

**Abnormal Serum Lipid Profile**

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

- **Increased Triglycerides**
  - Genetic Causes
  - 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 LDL: palmar crease xanthoma, tuberous xanthoma
- Increased LDL: tendon xanthomata on Achilles tendon, knuckles
Abnormal Serum TSH

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

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

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

Most common neoplasm is Benign Non-Functioning Adenoma

Signs of Hormone Excess

Hyperplasia
- Often Bilateral

Androgen Excess
- Virilization/ Hirsutism

Estrogen Excess
- Feminization, Early Puberty, Heavy Menses

Glucocorticoid Excess
- Cushingoid Features

Aldosterone Excess
- Hypertension +/- Hypokalemia/Alkalosis

Positive 24-Hour Metanephrines + Nor-Metanephrines

Silent/Non-Functioning Mass

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

Normal DHEAS

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

Malignant

Malignant Adrenal Mass

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

Signs of Hormone Excess

Androgen Excess
Virilization/ Hirsutism

Estrogen Excess
Feminization, Early Puberty, Heavy Menses

Glucocorticoid Excess
Cushingoid Features

Aldosterone Excess
Hypertension +/- Hypokalemia/Alkalosis

Positive 24-Hour Metanephrines + Nor-Metanephrines

Silent/Non-Functioning Mass

High DHEAS

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

Normal DHEAS

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

No Signs of Hormone Excess

• Estrogen Releasing Carcinoma (High Plasma E₂ + Clinical Picture)

• Glucocorticoid Releasing Carcinoma (Positive Dexamethasone Suppression Test)

• Aldosterone Releasing Carcinoma (High Aldosterone: Renin Ratio)

• Pheochromocytoma (Paroxysmal Hypertension, Headache, Diaphoresis, Palpitations, Anxiety)

• Lymphoma Metastases (Often Bilateral) Adrenal Carcinoma

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

Rule Out Pregnancy

Low/Normal FSH

- Bleed With Progestin Challenge
  - Polycystic Ovarian Syndrome

- High Prolactin
  - Hyperprolactinemia

- Hypothalamic-Pituitary Axis

- 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
Breast Discharge

True Galactorrhea (on microscopy)

Abnormal TSH/ Prolactin

- Idiopathic

Normal TSH/ Prolactin

- Idiopathic

High Prolactin + Normal TSH

- Microprolactinoma
- Steroid Hormone Intake
- Chronic Renal Failure
- Stress (e.g. Pregnancy, Breast Stimulation, Trauma/Surgery)

High Prolactin + Normal/ Low TSH

- Pituitary Macroadenoma
- Dopamine Inhibition
- Pituitary Stalk Compression/Lesion

Autonomous Production

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

High Prolactin + High TSH

- Primary Hypothyroidism

Other Breast Discharge

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

Increased Estrogen & Increased HCG

Gynecomastia

True Gynecomastia

Pseudogynecomastia
Fat Deposition Only

Physiologic

• Newborns
• Pubescent/Adolescent
• Elderly

Normal Blood Work

• Idiopathic

Increased Estrogen

• Idiopathic

Increased HCG

No Testicular Mass on Ultrasound

• Adrenal Neoplasm
• Increased Extraglomerular Aromatase Activity
• Liver Disease

Testicular Mass on Ultrasound

• Leydig Cell Tumor
• Sertoli Cell Tumor

No Testicular Mass on Ultrasound

• 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
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

- 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

Hypertrichosis
Non-Androgen Distribution

Idiopathic Hirsutism
Normal Cycles and Androgen Levels
Hirsutism & Virilization

Hypertrichosis

Androgen Excess
Normally With Menstrual Irregularity

Hypothroidism
Anorexia Nervosa
Malnutrition
Porphyria
Dermatomyositis
Paraneoplastic Syndrome
Familial
Idiopathic

Medications

• Phenytoin
• Cyclosporine
• Minoxidil
• Penicillamine
• Diazoxide

Medical/Other
Hypercalcemia

Low PTH

- Normal/High PTH
- Drug Side Effects
  - Thiazide Diuretics
  - Lithium
  - Vitamin A/Isotretinoin
- Low PTH
  - Excess Calcium Intake (e.g. Milk Alkali)
  - Immobilization
  - Adrenal Insufficiency
  - Thyrotoxicosis
  - Paget’s Disease

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)

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

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

Measure In Fasting State

Normal/High PTH

- Adenoma
- Hyperplasia
- MEN 1 and 2A

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

Low PTH

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

Low Phosphate

Normal Creatinine

Low/Normal PTH
- Hypoparathyroidism (e.g. Acquired, Autoimmune, Idiopathic, Congenital, Infiltrative)
- Activating Mutation in Calcium Sensing Receptor (CaSR)
- Hypomagnesemia

High PTH
- PTH Resistance (Pseudo-hypoparathyroidism)
- Calcium Complexing
  - (Citrate Infusion, Pancreatitis)

High Phosphate

High Creatinine

Low PTH
- Hypoparathyroidism with Chronic Kidney Disease

High PTH
- Secondary Hyperparathyroidism
- Rhabdomyolysis
- Phosphate Poisoning

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

Total Corrected Serum Calcium < 2.10 mmol/L

Low Phosphate

- Severe Malnutrition with Hypomagnesemia

Low/Normal PTH

High PTH

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

High Phosphate

---

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

High / Low PTH

Hypocalcemia
Total Corrected Serum Calcium < 2.10 mmol/L

Low PTH
Hypoparathyroidism

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

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

High PTH

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

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

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

(> 6 mmol/L)

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

Endocrinopathy
- Cushing’s Syndrome
- Acromegaly

Medications
- Corticosteroids
- Thiazide diuretics
- β agonists
- Others

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

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

Hypophosphatemia
(< 0.8 mmol/L)

Transcellular Shift

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

Increased Excretion

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

Decreased Intake

- Dietary deficiency
- Anorexia
- Chronic Alcoholism
- Hyperparathyroidism
- Vitamin D Deficiency/Resistance
- Hypophosphatemic Rickets
- Oncogenic Osteomalacia
- Fanconi Syndrome
- Osmotic Diuresis
- Acute Volume Expansion
- Acetazolamide and Thiazide Diuretics

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

GI Renal

FePO4 > 5%
Hyperthyroidism

**Autoimmune Thyroid Disease**
- Grave’s Disease
- Positive anti-TSH Receptor Antibody

**Autonomous Thyroid Tissue**
- Toxic Adenoma
- Toxic Multinodular Goiter

**TSH/HCG Excess**
- TSH-Secreting Pituitary Adenoma
- Gestational Trophoblastic Neoplasm

**Subacute Thyroiditis**
- Granulomatous
- Lymphocytic
- Postpartum
- Amiodarone
- Radiation

**Low Radioiodine Uptake**
- Exogenous/Ectopic Hormone
  - Excessive Thyroid Drug
  - Struma Ovarii
Hypothyroidism

Central Hypothyroidism
- Isolated TSH Deficiency
- Panhypopituitarism

Primary Hypothyroidism

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

Iatrogenic

Thyroid Hormone Resistance

Temporary
- Thionamides
- Lithium
- Amiodarone
- Interferon
Hyperuricemia

Primary

Over-production
- Increased turnover of nucleotides

Under-excretion
- Lower uric acid clearance
- Starvation

Lymphoproliferative Disorders
- Acute lymphoblastic leukemia (ALL)
- Acute myeloid leukemia (AML)
- Chronic myeloid leukemia (CML)

Hemolytic Anemia
- See hemolysis scheme

Others
- Psoriasis
- Chemotherapy
- Drug-induced
- High purine diet

Secondary

Over-production

Endocrine
- Hyperparathyroidism
- Diabetic acidosis

Renal
- Chronic renal failure
- Sarcoidosis
- Hypercalcemia

Drug-Induced
- Antiuricosuric drugs
- ACE inhibitors
- Cyclosporine
- Diuretics
- Organic acids
- Ethambutol
- Alcohol
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

Desire Reduced/Absent
- Physiological
- Pharmacological
  - Anti-depressants
  - Narcotics
  - Anti-psychotics
  - Anti-androgens
  - Alcohol
  - Benzodiazepines
  - Hallucinogens
- 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)

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

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

Other
- Hypertension
- Dyspareunia
- Dialysis
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
- Vascular
  - Aneurysm
  - Infarction
- Hamartoma
- Neoplasm
  - Craniopharyngioma
  - Meningioma
  - Cyst
  - Glioma
  - Ependymoma
- Metastatic
- Infectious
  - Autoimmune
  - Giant Cell Granuloma
  - Langerhan’s Cell
  - Histiocytosis
  - Sarcoidosis

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

Non-Functioning Vascular Hamartoma Neoplasm Metastatic
Sellar / Pituitary Mass

Size

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

Pathological/Abnormal

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

Proportionate

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

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

No Dysmorphic Features

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

Deprivation
• Primary Malnutrition
• Psychosocial
• Deprivation

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

Treatment
• Glucocorticoids
• Radiation
• Chemotherapy
• Bone Marrow Transplant

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

Other
• Intrauterine Growth Retardation
• Bulimia Nervosa
• Anorexia Nervosa
• CNS Tumors (e.g. Craniopharyngioma)

Detailed History, Physical Exam, and Mid-Parental Target Height

<3rd Percentile

Normal Variant
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
  - Exogenous Obesity

- Early Puberty Onset
  - GH Excess
  - Hyperthyroidism

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

Accelerated Growth (BA>CA)

- Obese BMI
  - Exogenous Obesity

- Normal Puberty Onset
  - Constitutional
    - Constitutional Tall Stature (Early Bloomer)

Other Obvious Abnormalities/Stigmata

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

- Proportionate
  - Bechwith-Weidmann Syndrome (Normalizing growth after birth)
  - Weaver Syndrome
  - XYY Syndrome
  - Neurofibromatosis 1
  - Hyperthyroidism (Untreated/Severe)
<table>
<thead>
<tr>
<th>Neurologic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altered Level of Consciousness Approach</td>
<td>163</td>
</tr>
<tr>
<td>Altered Level of Consciousness GCS ≤ 7</td>
<td>164</td>
</tr>
<tr>
<td>Aphasia Fluent</td>
<td>165</td>
</tr>
<tr>
<td>Aphasia Non-Fluent</td>
<td>166</td>
</tr>
<tr>
<td>Back Pain</td>
<td>167</td>
</tr>
<tr>
<td>Cognitive Impairment</td>
<td>168</td>
</tr>
<tr>
<td>Dysarthria</td>
<td>169</td>
</tr>
<tr>
<td>Falls in the Elderly</td>
<td>170</td>
</tr>
<tr>
<td>Gait Disturbance</td>
<td>171</td>
</tr>
<tr>
<td>Headache Primary</td>
<td>172</td>
</tr>
<tr>
<td>Headache Secondary, without Red Flag Symptoms</td>
<td>173</td>
</tr>
<tr>
<td>Hemiplegia</td>
<td>174</td>
</tr>
<tr>
<td>Mechanisms of Pain</td>
<td>175</td>
</tr>
<tr>
<td>Movement Disorder Hyperkinetic</td>
<td>176</td>
</tr>
<tr>
<td>Movement Disorder Tremor</td>
<td>177</td>
</tr>
<tr>
<td>Movement Disorder Bradykinetic</td>
<td>178</td>
</tr>
<tr>
<td>Peripheral Weakness</td>
<td>179</td>
</tr>
<tr>
<td>Peripheral Weakness Sensory Changes</td>
<td>180</td>
</tr>
<tr>
<td>Spell / Seizure Epileptic Seizure</td>
<td>181</td>
</tr>
<tr>
<td>Spell / Seizure Secondary Organic</td>
<td>182</td>
</tr>
<tr>
<td>Spell / Seizure Other</td>
<td>183</td>
</tr>
<tr>
<td>Stroke Intracerebral Hemorrhage</td>
<td>184</td>
</tr>
<tr>
<td>Stroke Ischemia</td>
<td>185</td>
</tr>
<tr>
<td>Stroke Subarachnoid Hemorrhage</td>
<td>186</td>
</tr>
<tr>
<td>Syncope</td>
<td>187</td>
</tr>
<tr>
<td>Dizziness</td>
<td>188</td>
</tr>
<tr>
<td>Vertigo</td>
<td>189</td>
</tr>
</tbody>
</table>
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**
  - **Brain Involvement**
    - **Focal Lesions**
    - **Diffuse Lesions**
      - **Hemispheric**
      - **Brain Stem**
      - **Vascular**
      - **Infection**
      - **Other**
        - **Systemic Involvement**
          - **Excesses**
          - **Deficiencies**
          - **Drugs/Toxins**
            - Hemorrhage
            - Traumatic
            - Ischemia/Infarction
            - Neoplastic Abscess
            - Skull fracture
            - Subdural hematoma
            - Intracranial Bleeding
            - Hypertensive encephalopathy
            - Vasculitis
            - TTP
            - DIC
            - Hypoxemia
            - Multiple emboli
            - Meningitis
            - Encephalitis
            - Trauma/Concussion
            - Post-ictal
            - Liver/Renal Failure
            - Carbon Dioxide Narcosis
            - Metabolic Acidosis
            - Hypernatremia
            - Hypercalcemia
            - Hypermagnesemia
            - Hyperthermia
            - Thyroid Storm
            - Hypoxemia
            - Hypoglycemia
            - B12/Thiamine deficiency
            - Hyponatremia
            - Hypocalcemia
            - Hypomagnesemia
            - Hyperthermia
            - Myxedema Coma
            - Alcohols
            - Barbituates
            - Tranquilizers
            - Other

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

Fluent

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

Impaired Repetition

- Wernicke’s Aphasia

Intact Repetition

- Conduction Aphasia

Non-Fluent

- Agrammatic, hesitant, but substantive communication

Impaired Comprehension

- Transcortical Sensory Aphasia

Intact Comprehension

- Anomic Aphasia
Aphasia

Non-Fluent

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

Non-Fluent
Agrammatic, hesitant, but substantive communication

Impaired Repetition

Impaired Comprehension
• Global Aphasia

Intact Repetition

Intact Comprehension
• Broca’s Aphasia

Impaired Comprehension
• Mixed Transcortical Aphasia

Intact Comprehension
• Transcortical Motor Aphasia
Back Pain

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

Acute/Subacute + Red Flags < 6 weeks
- Fracture

Chronic/Acute After 6 weeks + No Red Flags > 6 weeks
- Tumor/Infection
- Cauda Equina Syndrome
- Unresolved Radicular Symptoms
- Myelopathic
- Spondyloarthropathies or Osteoarthritis

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

Dementia

Affecting Multiple Domains
- Depression
- Delirium

Decline in Instrumental Activities of Daily Living
- Amnestic Mild Cognitive Impairment
- Non-Amnestic Mild Cognitive Impairment

Subcortical Dementia

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

Rapidly Progressive
- Creutzfeldt-Jakob Disease
- Paraneoplastic disorder

Cortical Dementia

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

Early Language and Behavioral Dysfunction
- Fronto-temporal Dementia

Abrupt Onset, Stepwise Progression
- Vascular Dementia

Early Impairment of Recent Memory
- Alzheimer’s Dementia

Early Extrapyramidal Features
- Dementia with Lewy Bodies
Dysarthria

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

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

Ataxic (Cerebellar)
- Irregular Rhythm and Pitch

Extra-Pyramidal
- Rapid, Low Volume, Monotone Speech

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

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

Extrinsic Factors

Musculoskeletal
- Arthritis

Drugs
- Polypharmacy
  - esp. >4 medications
- Psychotropics

Environment
- Rugs
- Stairs
- Lighting
Gait Disturbance

Movement Disorder

Sensory Ataxia
- Vestibular
- Visual
- Proprioceptive

Cerebellar Ataxia

Progressive/ Degenerative

X-Linked/ Mitochondrial
- Fragile X

Dominant
- Spinocerebellar Ataxia

Recessive
- Friedrich’s Ataxia
- Telangiectasia

Intermittent
- Hyperammonemia
- Aminoaciduria
- Pyruvate/Lactic Acid

Catalytic Deficiency (Childhood)

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

Hereditary

See Movement Disorder schemes

Chronic Progressive
- Tay-Sachs Disease
- Niemann-Pick Disease
Headache

Primary

Secondary

 Usually episodic

 Usually constant

No pattern

Primary

Secondary

Unilateral

Bilateral

Other

In Clusters

Primary Cough Headache
Primary Exertional Headache
Primary Stabbing Headache

Autonomic Cephalgias

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

Cluster Headache
(Orbital, Sharp, Autonomic Dysfunction)

Hemicranial Continua

Other

Last for seconds, separated by minutes to hours

Trigeminal Neuralgia
(Shooting, stabbing)

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

Migraine
(Throbbing/Pulsating)
Headache
Secondary, without Red Flag Symptoms

Primary
Usually episodic

With 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

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

Chronic
Drugs
- Analgesic Induced Headache
- Substance Withdrawal
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
  - Asterognosia
  - Seizures
  - Personality Changes
  - Cognition/Confusion, Dementia
  - +/- Sensory Loss

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

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

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

- **Nociceptive**: Tissue Damage
  - Somatic
    - Deep: Less well-localized, dull, longer duration
    - Superficial: Well-localized, sharp, short duration
  - Visceral: (From organ/cavity lining) Poorly localized, crampy, diffuse, deep sensation

- **Mixed**: Nociceptive/Neuropathic
  - Central Nervous System
    - Deafferentation: Loss of sensory input
  - Peripheral Nervous System
    - Sympathetic: Complex regional pain syndrome
    - Post-Herpetic Neuralgia
    - Neuroma
    - Neuropathy

- **Neuropathic**: Burning, shooting, gnawing, aching, lancinating
  - Post-stroke
  - Spinal injury

- **Somatic**: Poorly localized, crampy, diffuse, deep sensation
Movement Disorder

Hyperkinetic

Hyperkinetic
Examples listed not exhaustive for all causes

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

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

Stereotypies

Myoclonus
• Epilepsy
• Toxic/metabolic

Chorea
• Huntington’s Disease

Athetosis

Ballism

Tremor

Bradykinetic
Movement Disorder

Tremor

- Hyperkinetic
- Tremor
- Bradykinetic

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

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

Weakness

Objective Weakness

Upper Motor Neuron
Increased tone and reflexes
Babinski Reflex

Lower Motor Neuron
Decreased tone and reflexes
No Babinski reflex

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

Sensory Changes

No Sensory Changes

No Objective Weakness

-Cardio-pulmonary disease
-Anemia
-Chronic Infection
-Malignancy
-Depression
-Deconditioning
-Arthritis
-Fibromyalgia
-Endocrine Disease

Motor Neuron and Motor Neuropathy
Atrophy, Fasciculations, Hyperreflexia

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

Neuromuscular Junction
Fatigability, Variability, Oculomotor

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

Myopathy
Proximal muscle involvement, elevated CK

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

See Peripheral Weakness: Sensory Changes scheme
Peripheral Weakness

Sensory Changes

Objective Lower Motor Neuron Weakness

Sensory Changes

Follows Distribution

Radiculopathy
- Disc
- Spondylosis
- Tumor
- Infection

Mono-neuropathy

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

Compress
- Carpal Tunnel
- Ulnar
- Peroneal
- Radial

Other
- Trauma
- Tumor
- Ischemia

No Sensory Changes

Does Not Follow Distribution

Mononeuritis Multiplex
- Vasculitis
- Diabetes

Plexopathy
- Brachial neuritis
- Diabetes
- Tumor

Poly-Radiculopathy
- Spondylosis
- Chronic Inflammatory Demyelinating Polyneuropathy
- Neoplasm
- Infection
Spell / Seizure

Epileptic Seizure

Unprovoked Recurrence
Epileptic Seizure

Unprovoked Recurrence
Focal Seizure

Unclassified

Evolving to Bilateral Convulsive Seizure

Provenked Recurrence
Non-epileptic organic seizure/other

Provoked Recurrence
Generalized

Non-Convulsive
• Absence
• Atonic

Convulsive
• Myoclonic
• Clonic
• Tonic
• Tonic-Clonic

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

Unprovoked Recurrence (Primary)
Epileptic Seizure

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

Other

Secondary Organic

Febrile
- Sepsis
- Encephalitis
- Meningitis

Infection

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

Vascular
- Intracerebral hemorrhage
- Subarachnoid hemorrhage
- Subdural hemorrhage

Degenerative
- Dementia

Structural
- Congenital abnormality
- Neoplasm
- Arteriovenous malformation

Pregnancy
- Eclampsia
Spell / Seizure

Other

- Unprovoked Recurrence (Primary)
  - Epileptic Seizure

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

- Other

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

- Cardiovascular
  - Syncope

- Psychogenic
  - Panic Disorder
  - Conversion Disorder
  - Pseudoseizures
Stroke

Intracerebral Hemorrhage

Ischemia

Subarachnoid Hemorrhage

Hypertension

Vessel Disease

Other

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

• Amyloid Angiopathy
• Vascular Malformation
• Aneurysm
• Vasculitis

• Trauma
• Bleeding diathesis
• Hemorrhage into tumors
• Hemorrhage into infarct
Stroke

Ischemia

Stroke

Intracerebral Hemorrhage

Thrombosis
Atherosclerosis, Arterial Dissection, Fibromuscular Dysplasia

Large Vessel

Small Vessel

• Lacunar

Ischemia

Emboli

Unknown

Heart

• Left Ventricle
• Left Atrium
• Valvular
• Atrial fibrillation
• Bacterial endocarditis
• Myocardial infarction

Ascending Aorta

Systemic Hypoperfusion

Pump Failure

• Cardiac arrest
• Arrhythmias

Cardiac Output Reduction

• Myocardial infarction
• Pulmonary embolus
• Pericardial effusion
• Shock

Subarachnoid Hemorrhage
Stroke

Subarachnoid Hemorrhage

Intracerebral Hemorrhage

Ischemia

Subarachnoid Hemorrhage

Vessel Disease
- Aneurysm
- Vascular Malformation

Other
- Bleeding Diathesis
- Trauma
- Drug Use
# 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**
  - Dehydration
  - Hypovolemia
  - Medications

## Central
- Emotional

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

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

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

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

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

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

- True Vertigo
  - Illusion of Rotary Movement

- Dizziness
  - Lightheaded, unsteady, disoriented

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

- Infection
  - Meningitis
  - Cerebellar/Brainstem Abscess

- Trauma
  - Cerebellar Contusion

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

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

Inflammatory
- Multiple sclerosis

Intoxication
- Barbiturates
- Ethanol

Neurologic
# Obstetrical & Gynecological

Intrapartum Abnormal Fetal HR Tracing
- Variability & Decelerations ..............................................193

Intrapartum Abnormal Fetal HR Tracing
- Baseline ...........................................................................194

Abnormal Genital Bleeding ..................................................195

Acute Pelvic Pain .................................................................196

Chronic Pelvic Pain ...............................................................197

Amenorrhea Primary .............................................................198

Amenorrhea Secondary ..........................................................199

Antenatal Care .....................................................................200

Bleeding in Pregnancy < 20 Weeks .....................................201

Bleeding in Pregnancy 2nd & 3rd Trimester
  ..........................................................................................202

Breast Disorder ......................................................................203

Growth Discrepancy Small for Gestational Age / Intrauterine Growth Restriction ....204

Growth Discrepancy Large for Gestational Age .........................................................205

Infertility (Female) ................................................................206

Infertility (Male) .....................................................................207

Intrapartum Factors that May Affect Fetal Oxygenation ..............................................208

Pelvic Mass ...........................................................................209

Ovarian Mass .......................................................................210

Pelvic Organ Prolapse ...............................................................211

Post-Partum Fever ................................................................212

Post-Partum Hemorrhage .......................................................213

Recurrent Pregnancy Loss .......................................................214

Vaginal Discharge ..................................................................215
Historical Editors
Dr. Heather Baxter
Dr. Dorothy Igras
Dr. Clinton Chow
Dr. Calvin Greene
Dr. Magali Robert
Dr. Maire Duggan
Dr. Barbara Walley
Vera Krejcik
Shaina Lee
Mia Steiner
Maria Wu
Danny Chao
Neha Sarna

Student Editors
Neha Chadha (Co-editor)
Angela Deane (Co-editor)

Faculty Editor
Dr. Ronald Cusano
Intrapartum Abnormal Fetal HR 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
- Marked Variability ≥ 25 bpm
  - Mild hypoxia
- Sinusoidal Pattern
  - Severe fetal anemia (Hgb < 70)
  - Tissue hypoxia in fetal brain stem

Baseline Abnormality

Decelerations
- Absent Accelerations
  - Hypoxic acidemia
  - Fetal abnormality

Early decelerations
- Fetal head compression (mirror contractions)

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

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

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

Baseline

Abnormal Fetal Heart Rate Tracing

Abnormal Variability

Baseline Abnormality

Decelerations

Bradycardia

Tachycardia

Maternal

Fetal

Maternal

Fetal

- Hypotension
- Drug response
- Maternal position
- Connective tissue disease with congenital heart block (e.g. SLE)
- Umbilical cord occlusion
- Fetal hypoxia/acidosis
- Vagal stimulation (e.g. chronic head compression)
- Fetal cardiac conduction or structural defect
- Fever
- Infection
- Dehydration
- Hyperthyroidism
- Endogenous adrenaline or anxiety
- Drug response
- Anemia
- Infection
- Prolonged fetal activity or stimulation
- Chronic hypoxemia
- Cardiac abnormalities
- Congenital anomalies
- Anemia

Bradycardia

< 110 bpm

Tachycardia

> 160 bpm
Abnormal Genital Bleeding

Pregnant

See Bleeding in Pregnancy Scheme

Non Pregnant

Gynecologic

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

Non-Gynecologic

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

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

Vagina
• Atrophy
• Vulvovaginitis
• Neoplasm
• Infection
• Trauma

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

**Gynecologic**
- Ectopic pregnancy**
- Placental abruption**
- Spontaneous abortion
- Labour
- Molar pregnancy

**Non-Gynecologic**
- Genitourinary (Infection, Stone)
- Gastrointestinal (Appendicitis, Gastroenteritis, Diverticulitis, IBD)
- Musculoskeletal

**Pregnant**
- Extrauterine
- Intrauterine

**Non-Pregnant**
- 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

> 6 months in duration

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

Non-Gynecologic

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

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

Genitourinary
- Interstitial cystitis
- Urinary retention
- Neoplasm

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

Primary

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

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

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

Central
- Low FSH
- Low Estrogen

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

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

Secondary

Absence of menses for 3 cycles or 6 months

Congenital Outflow Tract Anomalies
- Imperforate hymen
- Transverse vaginal septum
- Vaginal agenesis (Mayer-Rokitansky-Küster-Hauser syndrome)
- Cervical stenosis

Obstetrical
Amenorrhea

Secondary

Primary
No onset of menarche by age 16

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

Rule out pregnancy (β-hCG)

Ovarian

Hypothalamic
Negative progesterone challenge, Low FSH, Low estrogen

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

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

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

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

Outflow Tract Obstruction
• Asherman’s syndrome
• Cervical stenosis

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

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

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

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

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

< 20 Weeks

Bleeding in Pregnancy

Hemodynamically Unstable – Do ABCDEs

< 20 Weeks

Second / Third Trimester

Bleeding from the Os

Not Bleeding from the Os

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

Cervix Open

Cervix Closed

Passing Tissue and Clots

• Complete abortion
• Incomplete abortion
• Ectopic pregnancy

Not Passing Tissue and Clots

• Missed abortion
• Inevitable abortion
• Cervical insufficiency

IUP on Transvaginal U/S

No IUP on Transvaginal U/S

Ectopic Pregnancy on U/S

No Ectopic Pregnancy on U/S

β-hCG < 1500

β-hCG not doubled in 72h
Viable pregnancy – monitor for ectopic or IUP (implantation bleed)

β-hCG > 1500
Ectopic likely

β-hCG not doubled in 72h
Ectopic pregnancy or failed pregnancy
Bleeding in Pregnancy
2nd & 3rd Trimester

Bleeding in Pregnancy

Hemodynamically Unstable – Do ABCDEs

< 20 Weeks

Second / Third Trimester

Do NOT perform digital examination until the placental location is known

Bleeding from the Os

Not Bleeding from the Os

Painful

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

Painless

• Placenta previa
• Vasa previa

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

Breast Disorders

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

- Breast Mass
  - Malignant
  - Benign

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

- Solid
  - Fibroadenoma

- Cystic
  - Gross cyst
  - Galactocele
  - Fibrocystic

- Non-Invasive
  - Ductal carcinoma
    - in situ
  - Lobular carcinoma
    - in situ

- Invasive
  - Ductal carcinoma
  - Lobular carcinoma
  - Tubular carcinoma
  - Medullary carcinoma
  - Papillary carcinoma
  - Mucinous carcinoma
Growth Discrepancy
Small for Gestational Age / Intrauterine Growth Restriction

- **Large for Gestational Age** (Growth > 90th percentile for GA)
  - Maternal Factors
  - Fetal Factors
  - Placental Factors
- **Small for Gestational Age** (Growth < 10th percentile for GA)
  - TORCH Infections
  - Multiple Gestation
  - Chromosomal Abnormalities
    - Trisomy 13, 18, 21
    - Turner syndrome, 45X
  - Placental Ischemia/Infarction
    - Placenta previa
    - Chronic insufficiency
  - Placental Abruption
  - Placental Malformations
  - Confined Placental Mosaicism (Rare)
    - Vasa previa
  - 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
Growth Discrepancy
Large for Gestational Age

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)

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)

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

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%)

Uterus
HSG or SHG or hysteroscopy
- Fibroids/polyps
- Asherman's syndrome
- Congenital anomalies
- Adenomyosis
- Unfavourable cervical mucous
- Cervical stenosis

Decreased FSH

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

Fallopian Tube
HSG or SHG or laparoscopy
- Pelvic inflammatory disease
- Endometriosis
- Adhesions
- Previous tubal pregnancy
- Congenital Anomalies

Normal FSH

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

Increased FSH

Ovary
Ovulation confirmation: mid-luteal serum progesterone
Ovarian reserve: Day 3 FSH +/- Estradiol
- Premature ovarian failure
- Premenopausal changes
- Turner's syndrome

Unexplained (15%)

Female (50%)

• Hypothyroidism
• Hyperprolactinemia
• Tumors (e.g. Prolactinoma)
Infertility (Male)

**Infertility**

Failure to conceive following > 1 year of unprotected sexual intercourse

- **Male (35%)**
  - Sperm Production (Non-obstructive azoospermia)
    - Low testosterone
  - Pre-Testicular (Hypogonadotrophic hypogonadism)
    - Low FSH/LH
    - Kallmann syndrome
    - Suppression of gonadotropins (e.g. hyperprolactinemia, hypothyroidism, drugs, tumor, infection, trauma)
    - Anabolic steroids
  - Antibodies from infection

- **Sperm Motility**
  - Abnormal semen analysis

- **Sperm Transport**
  - Vasectomy
  - Cystic fibrosis gene mutation
  - Post-infectious obstruction
  - Ejaculatory duct cysts (e.g. prostate)
  - Kartagener syndrome

- **Female (50%)**
  - Sperm Production (Problem)
    - High FSH/LH
  - Testicular (Sperm production problem)
    - Genetic abnormality (e.g. Klinefelter’s)
    - Cryptorchidism
    - Varicocele
    - Mumps orchitis
    - Radiation, Infection, drugs, trauma, torsion

- **Sexual Dysfunction**
  - See Sexual Dysfunction Scheme

- **Unexplained (15%)**

Female (50%)
Factors affecting fetal oxygenation

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

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

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

Benign Neoplasms
- Polycystic ovary
- Endometrioid cyst

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

Functional
- Corpus lutein cyst
- Theca lutein cyst

Malignant Neoplasms

Epithelial
- Serous cystadenoma
- Mucinous cystadenoma

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

Sex Cord Stromal
- Fibroma
- Thecoma
- Granulosa cell tumor

Metastases
- Krukenberg tumor (gastrointestinal metastasis)
- Breast

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

Germ Cell
- Dysgerminoma
- Immature teratoma
- Yolk Sac

Sex Cord Stromal
- Granulosa cell tumor
- Sertoli Cell
- Sertoli - Leydig
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
  - Rectocele (posterior prolapse)
Post-Partum Fever

6 W's for causes of PPF
Wind: pneumonia, atelectasis
Water: UTI
"Woobies": mastitis
Womb
Wound: cellulitis, vulvas incision, endomyometritis
Walking: DVT

Post Partum Fever (Puerperal)

< 6 Weeks Post-partum

Infectious

Non-Infectious

Respiratory

Uterine

Thrombotic

• Atelectasis
• PE

• DVT
• Septic Pelvic Thrombophlebitis

Respiratory

• Pneumonia

Uterine

• Endometritis
• Retained Products of Conception

Breasts

• Mastitis
• Abcess

Urinary

• UTI
• Pyelonephritis

Wound

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

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

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

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

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

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

Post-Partum Hemorrhage

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

- 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)
Vaginal Discharge

- Infectious
  - Sexually Transmitted Infection
    - *Chlamydia trachomatis*
    - *Neisseria gonorrhoeae*
  - Toxic Shock Syndrome
  - Vulvovaginitis
- Inflammatory
  - Systemic
    - Crohn’s disease
    - Collagen vascular disease
    - Dermatologic
  - Local
    - Chemical irritant
    - Douching
    - Atrophic vaginitis
    - Foreign body
    - Lichen planus
- Neoplastic
  - Endometrium
  - Cervix
  - Vulva
  - Vagina
Dermatologic

Burns ................................................................. 221
Dermatoses in Pregnancy Physiologic
  Changes ................................................................ 222
Dermatoses in Pregnancy Specific Skin
  Conditions .......................................................... 223
Disorders of Pigmentations
  Hyperpigmentation ........................................... 224
Disorders of Pigmentations
  Hypopigmentation ............................................. 225
Genital Lesion ...................................................... 226
Hair Loss (Alopecia) Diffuse ............................... 227
Hair Loss (Alopecia) Localized ............................ 228
Morphology of Skin Lesions Primary Skin
  Lesions ............................................................. 229
Morphology of Skin Lesions Secondary Skin
  Lesions ............................................................. 230
Mucous Membrane Disorder Oral Cavity .... 231
Nail Disorders Primary Dermatologic Disease
  ............................................................................... 232
Nail Disorders Systemic Disease ...................... 233
Nail Disorders Systemic Disease - Clubbing
  ............................................................................... 234
Pruritus No Primary Skin Lesion ..................... 235
Pruritus Primary Skin Lesion ............................. 236
Skin Rash Eczematous ........................................ 237
Skin Rash Papulosquamous ............................... 238
Skin Rash Pustular .............................................. 239
Skin Rash Reactive .............................................. 240
Skin Rash Vesiculobullous............................241
Skin Ulcer by Etiology ...............................242
Skin Ulcer by Location Genitals ..................243
Skin Ulcer by Location Head & Neck ..........244
Skin Ulcer by Location Lower Legs / Feet ...245
Skin Ulcer by Location Oral Ulcers ..........246
Skin Ulcer by Location Trunk / Sacral Region 247
Vascular Lesions .....................................248
Historical Editors
Danny Guo
Rachel Lim
Dave Campbell
Joanna Deboz
Safiya Karim
Beata Komierowski
Natalia Liston
Arjun Rash
Jennifer Rodrigues
Sarah Surette
Yang Zhan

Student Editors
Noelle Wong (Co-editor)
Heena Singh (Co-editor)

Faculty Editor
Dr. Laurie Parsons
Burns

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

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

Parkland formula for fluid resuscitation:
\[ 4 \text{cc} \times \text{Weight (kg)} \times \% \text{TBSA burn} \]
Dermatoses in Pregnancy

Physiologic Changes

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

- Other
  - Melasma
  - Linea Nigra

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

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

- Mucous Membranes
  - Chadwick’s sign (bluish discoloration of cervix/vagina/vulva)
Dematoses in Pregnancy

Specific Skin Conditions

Dermatoses in Pregnancy

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

Primary Skin Lesion

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

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 Pigmentations

Hypopigmentation

- Hypopigmentation
  - Localized
    - Congenital
      - Tuberous sclerosis (white “ash leaf” macules)
    - Acquired
      - Generalized hypopigmentation of hair, eyes, skin
      - Phenylketonuria
      - Albinism
      - Piebaldism
  - Diffuse
    - Acquired
      - Vitiligo

- Hyperpigmentation
  - Acquired
    - Vitiligo
    - Post-Inflammatory hypopigmentation

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

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

- Depressed
  - Papules/Plaques
    - Infectious
      - Molluscum contagiosum
      - 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

- Erosions/Ulcers
  - Painful
    - Herpes simplex
    - Haemophilus ducreyi (chancroid)
    - Behçet’s syndrome
    - Pemphigus vulgaris
    - Lichen Sclerosis
    - Erosive Lichen Planus
  - Painless
    - Scabies
    - Pubic lice

- Excoriations
  - Infectious
    - Primary syphilis (chancre)
    - Granuloma Inguinale
    - Lymphogranuloma venereum
  - Non-Infectious
    - Squamous cell carcinoma (can be in situ)
    - Melanoma

- Lichen planus
- Psoriasis
Hair Loss (Alopecia)

Diffuse

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

**Localized**

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

**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**

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

**Secondary Skin Lesion**

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

- Elevate
- Flat

**Skin Lesion**

- 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.

**Primary Skin Lesion**

- 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
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

Oral Cavity

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

- Discolouration
  - Psoriasis
  - Alopecia Areata

- Pitting
  - Psoriasis
  - Onychomycosis
  - Onychogryphosis

- Thickening
  - Psoriasis

- Onycholysis
  - Psoriasis
  - Onychomycosis

- Nail Plate Abnormality

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

- Inflammation
  - Erythema, Swelling, Pain

- Telangiectasia
  - SLE
  - Scleroderma
  - Dermatomyositis

- Oil Drop Sign
  - Psoriasis

- Fungal Culture
  - Onychomycosis

- White/Yellow-Brown
  - Onychomycosis

- Green
  - Pseudomonas infection

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

- Lateral Only
  - Ingrown Nail

- Nail Fold Abnormality

- Discolouration

- Pitting

- Thickening

- Onycholysis

- Telangiectasia
Nail Disorders

Systemic Disease

- SLE
- Scleroderma
- Dermatomyositis

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)

Clubbing

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

White Discoloration

Red Discoloration
  Splinter hemorrhages (dark red, thin lines, usually painful)

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

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

Muehrcke’s Lines
  Transverse lines
  - Nephrotic syndrome

Nail Plate Abnormality

Nail Fold Abnormality

Nail Bed Abnormality

Medications
- Wilson’s disease
- Silver poisoning
- Cyanosis

Liver cirrhosis
- Congestive heart failure
- Diabetes Mellitus

Chronic renal failure
- Uremia

Nephrotic syndrome

Bacterial endocarditis
- Trauma
Nail Disorders
Systemic Disease - Clubbing

Nail Disorder

Primary Dermatologic Disease

Nail Plate Abnormality
- Koilonychia
  - Spoon-Shaped

Nail Fold Abnormality
- Onycholysis
  - Plate Separating from Bed
- Beau's Lines
  - Horizontal Grooves

Nail Bed Abnormality
- Clubbing

Systemic Disease

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

Cardiovascular Disease
- Cyanotic Heart Disease

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

Endocrine Disease
- Hyperthyroidism (Grave's Disease)

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

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
- Myelodisplastic syndrome

Psychiatric Disease
- Delusions of parasitosis
Pruritus

Primary Skin Lesion

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

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

- Wheals/Hives
  - Urticaria
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
Skin Rash

Papulosquamous

Eczematous
Pruritic/Scaly/Erythematous lesions Usually poorly demarcated

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)

Papulosquamous
Erythematous or violaceous papules & plaques with overlying scale

Vesiculobullous
Blisters containing non-purulent fluid

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

Pustular
Blisters containing purulent fluid

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

Koebner’s phenomenon

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

Skin Rash

Reactive
Reactive erythematous with various morphology
Dermatologic

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

- **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

**Infectious**

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

Reactive

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

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

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

- **Pustular**
  - Blisters containing purulent fluid

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

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

  - **Erythema Nodosum**
    - Tender or painful red nodules on shins

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

Vesiculobullous

Eczematous
Pruritic/Scaly/Erythematous
lesions Usually poorly
demarcated

Papulosquamous
Erythematous or violaceous
papules & plaques with
overlying scale

Vesiculobullous
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
erythematosus

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

Reaction to
Agent
• Phototoxic
drug
eruption
Skin Ulcer by Etiology

**Physical**
- Trauma
- Pressure
- Radiation

**Vascular**
- Arterial Insufficiency
- Venous insufficiency
- Vasculitis

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

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

**Neurological**
- Pyoderma gangrenosum
- Diabetic dermopathy
- Necrobiosis lipoidica

**Infectious**
- Sickle cell anemia
- Thalassemia
- Cryoglobulinemia
- Leishmaniasis
- Herpes simplex
- Tuberculosis
- Syphilis
- Chlamydia trachomatis
- Klebsiella granulomatis
- Histoplasmosis
- Coccidiodomycosis
- Cryptococcosis

**Metabolic**
- Pyoderma gangrenosum
- Diabetic dermopathy
- Necrobiosis lipoidica

**Drugs**
- Coumadin
- Heparin
- Bleomycin
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 & 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

- 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

Oral

Head/Neck

Trunk/Sacral Region

Genitals

Lower Legs/Feet
Skin Ulcer by Location

Oral Ulcers

Skin Ulcer

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

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

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

Multiple Recurrent Ulcers
- Aphthous stomatitis
- Herpes simplex infection

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

Trunk / Sacral Region

- 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

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

Acute Joint Pain Vitamin CD ........................................ 251
Chronic Joint Pain ....................................................... 252
Bone Lesion ..................................................................... 253
Deformity / Limp ............................................................ 254
Infectious Joint Pain ....................................................... 255
Inflammatory Joint Pain ................................................... 256
Vascular Joint Pain ........................................................ 257
Pathologic Fractures ......................................................... 258
Soft Tissue ......................................................................... 259
Fracture Healing ................................................................. 260
Osteoporosis BMD Testing .................................................... 261
Tumour .............................................................................. 262
Myotomes Segmental Innervation of Muscles
................................................................................................. 263

Guide to Spinal Cord Injury ................................................. 264
Historical Editors
Dr. Marcia Clark
Dr. Sylvain Coderre
Dr. Mort Doran
Dr. Henry Mandin
Graeme Matthewson
Katy Anderson
Tara Daley
Jonathan Dykeman
Kate Elzinga
Bikram Sidhu

Student Editors
Angie Karlos (Co-editor)
Ryan Iverach (Co-editor)

Faculty Editor
Dr. Carol Hutchison
Acute Joint Pain

Vitamin CD

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

**Musculoskeletal**

- **Chronic/Degenerative Change**
  - **Peri-Articular**
    - **Bone**
      - Stress Fracture
      - Charcot Joint
    - **Articular Cartilage**
      - Osteoarthritis
      - Chondromalacia
    - **Joint Capsule**
      - Baker Cyst
      - Ganglion Cyst
      - Adhesive Capsulitis
    - **Synovium**
      - Monoarthritis
      - Polyarthritis
  - **Intra-Articular**
    - **Bursa**
      - Aseptic Bursitis
    - **Epiphysitis/Apophysitis**
      - Slipped Epiphysis
      - Apophysitis (Osgood-Schlatter Disease)
    - **Tendon**
      - Enthesitis
      - Tendinopathy
      - Tendon Rupture
      - Impingement
      - Tenosynovitis
      - Ganglion Cyst
    - **Bone**
      - Stress Fracture
      - Charcot Joint
      - Pathologic Fracture
      - Periostitis
      - Epicondylitis
    - **Skin/Fascia**
      - Fascitis (e.g., Myofascial Pain, Iliotibial Band Friction, Plantar Fasciitis
    - **Muscle**
      - Delayed Onset Muscle Soreness
      - Fibromyalgia
      - Myositis
      - Ossificans
Musculoskeletal

Bone Lesion

Bone Lesion on X-ray

Rule Out Osteomyelitis & Secondary Metastases

Non-aggressive

Aggressive

Exostotic

Narrow, <1mm margin
Reactive bone formation

Broad or Indistinct Margin
&/or Soft Tissue Invasion

Multiple Lytic Lesions

Exostotic

Osteochondroma

Asymptomatic &/or Non-
Active Bone Scam

• Unicameral Bone Cysts
• Aneurysmal Bone Cysts
• Non-ossifying Fibroma

Symptomatic &/or Active
Bone Scan

Benign
No Bone Mineralization

Malignant
Bone Mineralization,
Constitutional Symptoms,
Codman’s Triangle, Excessive
Scalloping & Destruction of
Cortical Bone

Inflammatory Appearance

• Osteoid Osteoma (“Nidus”
appearance)
• Osteoblastoma (may be
malignant or sclerotic in
appearance)

Not Inflammatory Appearance

• Chondroblastoma
• Chondromyxoid Fibroma

• Multiple Myeloma

• Enchondroma (can calcify
&/or turn malignant)
• Giant Cell Tumor (“Soap
Bubble” appearance)

• Osteosarcoma (Codman’s
Triangle)
• Chondrosarcoma (“Popcorn”
appearance)
• Ewing’s Sarcoma
Deformity / Limp

Always check neurological and vascular status one joint below the injury.

**Infection**
- Septic Arthritis
- Cortical Hypertrophy
- Osteomyelitis

**Inflammation**
- Rheumatoid Arthritis
- Toxic Synovitis
- Reactive Arthritis

**Other Causes**
- Osteoarthritis
- Osteomalacia
- Rickets

**Hip Joint**
- Hip Dysplasia
- Slipped Capital Femoral Epiphysis
- Legg-Calve-Perthes Disease

**Knee Joint**
- Patellofemoral Syndrome (Chondromalacia Patellae)
- Osgood-Schlatter Disease
- Patella (e.g., Tendon Rupture, Dislocation, Subluxation)

**Spine/Stature**
- Osteoporosis
- Scoliosis/Spinal Curvature
- Dwarfism
Infectious Joint Pain

Fever/Chills/Myalgia
Constant Pain
Increased Heat and Swelling
Signs & Symptoms of Viral Infection e.g., Rhinitis/Cough)

Polyarticular

• Viral Myalgia
• Viral Arthritis
• Disseminated Gonococcal Infection
  (Dermatitis, Migratory Arthralgia &
  Tenosynovitis)
• Secondary Syphilis (Red/Copper Papules &
  Mucosal Lesions)
• Fifth Disease (Erythema Infectiosum &
  Symmetrical Rash)
• Rubella (Measles-like rash)
• Primary HIV Infection
• Endocarditis

Monoarticular

Articular

• Cellulitis
• Necrotizing Fascitis
• Septic Bursitis
• Abscess
• Osteomyelitis
• Lymphadenitis
• Warts

Peri-Articular

Acute Onset

• Septic Arthritis

Insidious Onset

• Fungal tuberculosis
• Lyme Disease (Erythema Migrans)
Inflammatory Joint Pain

**Monoarticular**
- Gout (Podagra, Tophi)
- Pseudogout
- Early Rheumatic Disease
- Reactive (e.g. Genitourinary Infection)

**Oligoarticular (1-4 joints)**
- Gout
- Psoriatic (Nail Changes, Plaques)
- Enteropathic (e.g. Inflammatory Bowel Disease)
- Reactive
- Rheumatic Fever (recent Pharyngitis, Carditis)
- Lyme Disease (Tick bite, Migratory red Macules)

**Polyarticular (>4 joints)**

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

**Peripheral & Axial**
- Insidious Monoarticular
  - Symmetric (Polymyositis/Dermatomyositis)
  - Asymmetric (Psoriatic Arthritis)

- Migratory
  - Rheumatic Fever

- Acute Onset
  - Reactive

- Insidious Onset
  - Ankylosing Spondylitis
  - Enteropathic (e.g. Inflammatory Bowel Disease)
  - Psoriatic Arthritis
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/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

Paget’s Disease
Skull/Spine/Pelvis
Positive Alkaline Phosphatase
Secondary
Renal Osteodystrophy
Secondary to Chronic Renal Failure
Osteomalacia/Ricketts
Diffuse Pain/Proximal Muscle Weakness

• Vitamin D Deficiency
• Mineralization Defect
• Phosphate Deficiency
Soft Tissue

- Septic
  - Septic Bursitis
  - Necrotizing Fasciitis
  - Septic Tenosynovitis
  - Cellulitis
- Aseptic
  - Intra-articular
    - Ligament
      - Sprain
      - Dislocation (3rd Degree Sprain)
    - Articular Cartilage
      - Osteochondritis Dissecans
      - Bone Contusion
      - Chondromalacia
    - Synovium
      - Traumatic Synovitis
      - Monoarthritis
      - Polyarthritis
      - Synovial Osteochondromatosis
  - Periarticular
    - Fibrous Cartilage
      - Meniscal Injury
      - Labral Injury
      - SLAP Lesion
    - Bone
      - Fracture
      - Spontaneous Osteonecrosis
  - Septic Bursa
    - Aseptic Bursitis
  - Ligament
    - Sprain
    - Dislocation (3rd Degree Sprain)
  - Tendon/Muscle
    - Tendon Rupture
    - Muscle Strain
    - Confusion
  - Bone
    - Fracture
  - Skin/Fascia
    - Laceration
    - Contusion
    - Fat Pad Contusion
Fracture Healing

Delayed Union (3 – 6 months)
- Tobacco / nicotine
- NSAIDS
- Ca²⁺ /Vitamin D deficiency

Non-Union (after 6 months)
- Septic (R/O First)
  - Hypertrophic (adequate blood flow)
    - Mechanical failure
    - Excessive motion
    - Excessive bone gap
  - Atrophic (inadequate blood flow)
    - Tobacco / nicotine
    - NSAIDS
    - Medications
    - Allergies
    - Biologic Failure

Malunion
- Functional
  - Small deviations from normal axis
- Non Functional
  - Inadequate immobilization/reduction
  - Misalignment before casting
  - Premature cast removal

RED FLAGS (life threatening)
- Multi-trauma
- Pelvic Fracture
- Femur Fracture
- High Cervical Spine Fracture

Operative Fractures:
- Open
- Unstable
- Displaced
- Intra-articular

Non-Operative Fractures
- Closed
- Stable
- Undisplaced
- Extra-articular

Inflammation → Soft Callus → Hard Callus → Remodelling
- Hours- Days
- Days- Weeks
- Weeks- Months
- Years
Osteoporosis

BMD Testing

Osteoporosis

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

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

OSTEOPOROSIS-BMD testing

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

2010 Clinical Practice Guidelines for the Diagnosis and Management of Osteoporosis in Canada
Metastatic - Most common tumour in adults

- Breast
- Prostate
- Thyroid
- Lung
- Renal

Primary

Benign

- Osteochondroma
- Osteoid osteoma
- Chondroblastoma
- Fibroxanthoma
- Fibrous Dysplasia
- Non-ossifying fibroma
- Chondromyxoid Fibroma
- Periosteal Chondroma

Aggressive, Non-Malignant

- Giant Cell Tumour
- Enchondroma
- Aneurysmal Bone Cyst

Malignant 66% of adult tumours

- Multiple Myeloma - most common
- Osteosarcoma
- Chondrosarcoma
- Ewing’s Sarcoma
- Fibrosarcoma
- Liposarcoma
- Rhabdomyosarcoma
- Leiomyosarcoma
- Malignant Fibrous Histiocytoma
### Myotomes

Segmental Innervation of Muscles

<table>
<thead>
<tr>
<th>Muscle Group</th>
<th>Action</th>
<th>Myotome</th>
<th>Peripheral Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>Abduction</td>
<td>C5</td>
<td>Axillary Nerve</td>
</tr>
<tr>
<td></td>
<td>Adduction</td>
<td>C6-C8</td>
<td>Thoracodorsal Nerve</td>
</tr>
<tr>
<td>Elbow</td>
<td>Flexion</td>
<td>C5</td>
<td>Musculocutaneous Nerve</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>C7</td>
<td>Radial Nerve</td>
</tr>
<tr>
<td>Wrist</td>
<td>Extension</td>
<td>C6</td>
<td>Radial Nerve</td>
</tr>
<tr>
<td>Fingers</td>
<td>Flexion</td>
<td>C8</td>
<td>Median Nerve</td>
</tr>
<tr>
<td></td>
<td>Abduction</td>
<td>T1</td>
<td>Ulnar Nerve</td>
</tr>
<tr>
<td>Hip</td>
<td>Flexion</td>
<td>L2</td>
<td>Nerve to Psoas</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>S1</td>
<td>Superior Gluteal Nerve</td>
</tr>
<tr>
<td></td>
<td>Abduction</td>
<td>L5</td>
<td>Superior Gluteal Nerve</td>
</tr>
<tr>
<td>Knee</td>
<td>Flexion</td>
<td>L5</td>
<td>Tibial Nerve</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>L3</td>
<td>Femoral Nerve</td>
</tr>
<tr>
<td>Ankle</td>
<td>Dorsiflexion</td>
<td>L4</td>
<td>Deep Peroneal Nerve</td>
</tr>
<tr>
<td></td>
<td>Plantarflexion</td>
<td>S1</td>
<td>Tibial Nerve</td>
</tr>
</tbody>
</table>

N.B. There is considerable overlap between myotomes for some actions. The myotomes listed are the dominant segments involved.
## Guide to Spinal Cord Injury

<table>
<thead>
<tr>
<th>Spinal Root</th>
<th>Sensory</th>
<th>Motor</th>
<th>Reflex</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4</td>
<td>Acromioclavicular Joint</td>
<td>Respiration</td>
<td>None</td>
</tr>
<tr>
<td>C5</td>
<td>Radial Antecubital Fossa</td>
<td>Elbow Flexion</td>
<td>Biceps Reflex</td>
</tr>
<tr>
<td>C6</td>
<td>Dorsal Thumb</td>
<td>Wrist Extension</td>
<td>Brachioradialis Reflex</td>
</tr>
<tr>
<td>C7</td>
<td>Dorsal Middle Finger</td>
<td>Elbow Extension</td>
<td>Triceps Reflex</td>
</tr>
<tr>
<td>C8</td>
<td>Dorsal Little Finger</td>
<td>Finger Flexion</td>
<td>None</td>
</tr>
<tr>
<td>T1</td>
<td>Ulnar Antecubital Fossa</td>
<td>Finger Abduction</td>
<td>None</td>
</tr>
<tr>
<td>T7-12</td>
<td>See Dermatomes</td>
<td>Abdominal Muscles</td>
<td>Abdominal Reflex</td>
</tr>
<tr>
<td>L2</td>
<td>Anterior Medial Thigh</td>
<td>Hip Flexion</td>
<td>Cremasteric Reflex</td>
</tr>
<tr>
<td>L3</td>
<td>Medial Femoral Condyle</td>
<td>Knee Extension</td>
<td>None</td>
</tr>
<tr>
<td>L4</td>
<td>Medial Malleolus</td>
<td>Ankle Dorsiflexion</td>
<td>Knee Jerk Reflex</td>
</tr>
<tr>
<td>L5</td>
<td>First Web Space (1st/2nd MTP)</td>
<td>Big Toe Extension</td>
<td>Hamstring Reflex</td>
</tr>
<tr>
<td>S1</td>
<td>Lateral Calcaneus</td>
<td>Ankle Plantarflexion</td>
<td>Ankle Jerk Reflex</td>
</tr>
<tr>
<td>S2</td>
<td>Popliteal Fossa</td>
<td>Anal Sphincter</td>
<td>Bulbocavernosus</td>
</tr>
<tr>
<td>S3/S4</td>
<td>Perianal Region</td>
<td>Anal Sphincter</td>
<td>None</td>
</tr>
</tbody>
</table>

N.B. There is considerable variability in spinal cord levels for motor and reflex testing. Always test the level above and below the suspected injury.
Psychiatric

Anxiety Disorders Associated with Panic.... 267
Anxiety Disorders Recurrent Anxious Thoughts .......................................................... 268
Trauma & Stressor Related Disorders ........ 269
Obsessive-Compulsive & Related Disorders .................................................................. 270
Personality Disorder ....................................................................................................... 271
Mood Disorders Depressed Mood .......... 272
Mood Disorders Elevated Mood ............... 273
Psychotic Disorders .............................................................. 274
Somatoform Disorders .................................................. 275
Historical Editors
Dr. Jason Taggart
Dr. Lauren Zanussi
Dr. Lara Nixon
Haley Abrams
Daniel Bai
Kaitlin Chivers-Wilson
Carmen Fong
Leanne Foust
Aravind Ganesh
Leena Desai
Qasim Hirani

Student Editors
Lundy Day (Co-editor)
Michael Martyna (Co-editor)
Emily Donaldson

Faculty Editor
Dr. Aaron Mackie
Anxiety Disorders

Associated with Panic

Excessive Anxiety, Fear, Avoidance, and/or Increased Arousal

Rule out Anxiety Disorder due to General Medical Condition (e.g. hyperthyroidism, anemia, CHF), Another Mental Disorder, or Substance/Medication-Induced Anxiety Disorder

Associated with Panic and/or Physical (Autonomic) Symptoms

Associated with Specific Situation/Avoidance of the Specific Situation

Specific Trigger (e.g. water, heights, animals, etc.)
Specific Phobia

Separation From Attachment Figure
Separation Anxiety Disorder

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

Public Setting Where a Negative Evaluation May Occur
Social Anxiety Disorder

Recurrent, Unexpected Panic Attacks
Panic Disorder

Associated with Recurrent Anxious Thoughts

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

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

- 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

Associated with Recurrent Anxious Thoughts

- Specific Worries
- 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 & 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

Adjusted Disorder

Associated with a Traumatic Event

< 1 Month Post-Event

Acute Stress Disorder

> 1 Month Post-Event

Post-Traumatic Stress Disorder

NB: If the symptoms are clinically significant but do not meet the criteria for a specific Trauma- and Stressor-Related Disorder consider Other Specified Trauma- and Stressor-Related Disorder or Unspecified Trauma- and Stressor-Related Disorder

Obsessive-Compulsive & Related Disorders

Recurrent, Persistent Thoughts, Urges or Images Associated with Repetitive Behaviours

Rule out Obsessive-Compulsive and Related Disorder due to Another Medical Condition (e.g. hyperthyroidism, anemia, CHF), Another Mental Disorder, or Substance/Medication-Induced Obsessive-Compulsive and Related Disorder

Non-Specific Obsessions and/or Compulsions

Specific Obsessions or Compulsions Associated with:

Intrusive/ Inappropriate/ Distressing Thoughts With Repetitive Behaviour Meant to Neutralize Anxiety

Preoccupation with Perceived Physical Appearance

Hair Pulling

Skin Picking

Difficulty Discarding Possessions

*Obsessive Compulsive Disorder*  
*Body Dysmorphic Disorder*  
*Trichotillomania*  
*Excoriation Disorder*  
*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*
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
- Paranoiac - irrational suspicion or mistrust
- Schizoid - emotional detachment, lack of interest in social relationships
- Schizotypal - Odd beliefs

Cluster B: Dramatic, Emotional, or Social
- Antisocial - disregard for social norms, the law, and rights of others
- Borderline - instability of identity, relationships, and behaviour
- Histrionic - attention-seeking, exaggerated emotional expression
- Narcissistic - grandiosity, need for admiration, lack of empathy

Cluster C: Anxious or Fearful
- Avoidant - social inhibition, inadequacy, hypersensitivity
- Dependent - psychological dependence on others
- Obsessive-Compulsive - rigid, inflexible conformity to rules, order, and codes

Mood Disorders

Depressed Mood

Medical Conditions:
- Neurological: C.V.A, Parkinson’s, MS
- Viral: Mononucleosis, HIV, Hepatitis
- Endocrine: Cushing’s, Hyper/hypothyroid
- Other: Cancer, B12 deficiency

Drugs of Abuse:
- Amphetamines
- Alcohol
- Cocaine

Medications:
- Corticosteroids
- Antihypertensives
- Antipsychotics
- Oral contraceptives

Depressed or Elevated Mood

Rule out depressed or elevated mood disorder due to substances and/or general medical condition

Elevated Mood +/- Depressed Mood

- 2 week period, depressed mood nearly everyday
- *Major Depressive Disorder

Depressed Mood
- 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

Prevalence = 3% over lifetime

Depressed Mood Only

- Depressed mood more days than not for > 2 years
- *Persistent Depressive Disorder

Prevalence = 5% Hospitalized patients

Depressed mood in context of specific stressor < 6 months

*Adjustment Disorder with Depressed Mood

Depressed mood in context of personal loss < 2 months

* Bereavement

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

• Bipolar I

Manic Episode (may have hx of ≥ 1 MDE)

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

2 Years Hypomanic Episodes and Depressed Mood

• Cyclothymia

Symptoms without clear mood episode

Medical Conditions:
Neurological: C.V.A, Parkinson’s, MS
Viral: Mononucleosis, HIV, Hepatitis
Endocrine: Cushing’s, Hyper/hypothyroid
Other: Cancer, B12 deficiency

Drugs of Abuse:
Amphetamines
Alcohol
Cocaine

Medications:
Corticosteroids
Antihypertensives
Antipsychotics
Oral contraceptives
Psychotic Disorders

- Delusions
  - 1 or more (1 must be 1-3):
    1) Delusions
    2) Hallucinations
    3) Disorganized speech
    4) Grossly disorganized or catatonic behaviour

- Psychotic symptoms also present outside of mood episodes
  - \( \geq 6 \text{ months} \)

- Psychotic symptoms limited to non-bizarre delusions only
  - \( \geq 1 \text{ month, no decline in functioning, behaviour is not odd} \)

- Delusions developed in context of close relationship with a person with already established similar delusion

- Non-bizarre delusions
  - \( \geq 1 \text{ month, no decline in functioning, behaviour is not odd} \)

- Delusional disorder

- 1 or more:
  - 1) Delusions
  - 2) Hallucinations
  - 3) Disorganized speech
  - 4) Grossly disorganized or catatonic behaviour

- Duration of illness
  - \( \leq 1 \text{ month} \)
  - \( 1-6 \text{ months} \)
  - \( \geq 6 \text{ months} \)

- Criteria: see schizophrenia

- \( \text{Suicide} = 10\% \)

- 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
- Amphetamines: Opiates (rare), PCP
- Hallucinogens

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

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

- \( \geq 6 \text{ months} \)

Psychotic symptoms present exclusively during major mood syndrome

- Delusional disorder
  - \( \leq 1 \text{ month} \)

Psychotic symptoms also present outside of mood episodes

- Schizoaffective disorder
  - \( \geq 1 \text{ month, no decline in functioning, behaviour is not odd} \)

Psychotic symptoms not limited to delusions

- Schizophreniform disorder
  - Duration of illness: \( 1-6 \text{ months} \)

Psychotic symptoms limited to non-bizarre delusions only

- Schizophrenia
  - Duration of illness: \( \geq 6 \text{ months} \)

Delusions developed in context of close relationship with a person with already established similar delusion

- Shared psychotic disorder (Folie a Deux)

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

- \( \geq 1 \text{ month, no decline in functioning, behaviour is not odd} \)
Somatoform Disorders

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

Hearing Loss Conductive ........................................... 279
Hearing Loss Sensorineural ..................................... 280
Hoarseness Acute ..................................................... 281
Hoarseness Non-Acute ............................................. 282
Neck Mass ............................................................... 283
Otaligia ................................................................. 284
Smell Dysfunction .................................................. 285
Tinnitus Objective ................................................... 286
Tinnitus Subjective .................................................. 287
Hearing Loss

Conductive

Hearing Loss

Otoscopy, Tuning Fork,
Confirm with Audiogram

Conductive Hearing Loss

Sensorineural Hearing Loss

Normal Otoscopy

Abnormal Otoscopy

Middle Ear

External Ear

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

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

• Otitis Media
• Tympanic Membrane
  Perforation
• Cholesteatoma
• Trauma (barotrauma)
• Tumors (Glomus,
  Adenoma)
• Eustachian Tube
  Dysfunction
Hearing Loss

Sensorineural

Hearing Loss

Otoscopy, Tuning Fork, Confirm with Audiogram

Conductive Hearing Loss

Sensorineural Hearing Loss

Symmetric

Asymmetric

- Neoplastic (Vestibular Schwannoma)
- Retrocochlear Tumor
- Iatrogenic (Radiation, Surgery)
- Idiopathic Unilateral Sensorineural Hearing Loss

Congenital

- Hereditary
  - Mondini dysplasia
  - Atresia
- Non-hereditary:
  - Developing Cochlear Insults: CMV, Rubella, Toxoplasmosis, HIV, Syphilis, Hepatitis
  - Teratogenic drugs, Alcohol

Neurogenic (Central)

- Infection (Meningitis)
- Cardiovascular Ischemia
- Multiple Sclerosis

Cochlear (Inner-Ear)

- Presbycusis
- Loud Noise/ Trauma
- Cochleitis
- Otoxic Drugs (Oral Aminoglycosides, etc.)
- Meniere’s Disease
- Autoimmune (Cogan’s Syndrome)
Hoarseness

Acute

If Hoarseness persists > 3 months, Refer to ENT

Acute < 3 weeks

- 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

If Hoarseness persists > 3 months, Refer to ENT

Acute
< 3 weeks

Constant

Infectious
- Bacterial Infection
- Fungal Infection (Monilia)

Inflammatory
- Chronic Laryngitis
- GERD
- Smoking

Trauma
- External
- Internal (Surgery, Intubation)

Benign Mucosal Changes
- Nodules
- Polyp
- Granuloma Cysts
- Reinke's Edema

Non-Acute
> 3 weeks

Variable

- Functional

Neoplastic
- Malignancy: Squamous Cell Carcinoma
- Benign: Papilloma (HPV 6 & 11)
- Dysplasia: Leukoplakia

Neurological
- Vocal Cord Paralysis
- Spasmodic Dysphonia
- Tremor

HOARSENESS:
- Non-Acute
  - Functional

Constant

Variable

Infectious

Inflammatory

Trauma

Benign Mucosal Changes

Neoplastic

Neurological
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
- Primary
  - Lymphoma
  - Thyroid Neoplasm
  - Neoplasm of Salivary Glands
  - Neurogenic Neoplasm
    - Schwannoma
    - Neuroblastoma
    - Ganglioneuroma
  - Paragangliomas
    - Carotid Body Tumors
- Metastatic
  - Squamous Cell Carcinoma
  - Thyroid (Spread to Cervical Lymph Nodes)
  - Melanoma
  - Distant site (Stomach, etc.)
Otalgia

- Increased Pain With Pinna Manipulation
  - External Auditory Canal
    - Otitis Externa
    - Osteomyelitis of Temporal Bone
    - Herpes Simplex
    - Zoster (Ramsay Hung Syndrome if Facial Nerve Paralysis)
    - Furunculosis
  - Mastoid
    - Mastoiditis
  - Auricle
    - Cellulitis/Perichondritis
    - Trauma (Frostbite, Auricular Hematoma)
    - Autoimmune (Relapsing Polychondritis)
- Pain Unchanged With Pinna Manipulation
  - Abnormal Tympanic Membrane
    - Acute Otitis Media
    - Barotrauma
    - Traumatic Perforation
  - Ulceration/Abnormal Tissue Growth
    - Squamous Cell Carcinoma
    - Sarcoma
    - Cholesteatoma (Typically Otorrhea)

Referred

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

Periauricular

- TMJ Pathology
- Parotiditis
Smell Dysfunction

ENT History, Physical Exam, Anterior Rhinoscopy
Sensory Testing, CT/MRI to Rule Out Neoplasms, Fractures & Congenital abnormalities

Nasal Obstruction/ URTI
- Septal Deviation
- Allergic Rhinitis
- Bacterial/ Viral Infection (Influenza)

Trauma
- Foreign Body
- Nasal Surgery
- Base of Skull Fracture
- Nasal Fracture

Endocrine/ Metabolic
- Alcoholism
- Diabetes Mellitus
- Adrenal Hypofunction
- Adrenal Hyperfunction
- Vitamin B12 Deficiency
- Zinc Deficiency
- Malnutrition

Neoplastic
- Nasal Polyps
- Juvenile Nasopharyngeal Angiofibroma

Toxins and other Factors
- Smoking
- Drugs
- Radiation
- Toxin Exposure
Tinnitus

Objective

Subjective (90%)

Objective Pulsatile or Rhythmic (10%)

Vascular Potentially Auscultated

Muscular

Arterial

• Atherosclerosis
• Idiopathic Intracranial Hypertension
• Acute Exacerbation of Systemic Hypertension
• Developmental Anomaly
• Blood flow in normal artery near ear
• Persistent Stapedial Artery
• Glomus Tympanicum

Venous

• AV Shunt
• High Jugular Bulb
• Glomus Jugulare
• Hyperthyroidism

• Myoclonus of Stapedius/Tensor Tympani/Palatal Muscles
• Degenerative Disease of the Head and Neck
• Eustachian Tube Dysfunction
Tinnitus

Subjective

Unilateral
On Audiogram
Perform MRI to rule out RC Lesion
- Acoustic Neuroma
- Lesion of Cochlear or Auditory Nerve
- Brainstem Lesion
- Multiple Sclerosis
- Infarction
- Ménière's Disease

Subjective
Heard only by patient (Common)

Objective
Heard by others (Rare)

Bilateral
On Audiogram

No Hearing Loss

Hearing Loss
- Metabolic Causes:
  Thyroid Dysfunction,
  Vitamin A, B, Zinc Deficiency.
- Psychogenic, Anxiety, Depression
- Drugs (Salicylates, Quinidine, Indomethacin)
- Idiopathic

Conductive Hearing Loss
- Lesion of External or Middle Ear
- Impacted Cerumen
- Otitis Media
- Otosclerosis

Sensorineural Hearing Loss
- Noise Induced
- Ototoxicity
- Presbycusis
- Drugs (Propranolol, Levodopa, Loop Diuretics)
- Congenital

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

Somatic Hearing Loss

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

Psychogenic,
Anxiety,
Depression

Drugs (Salicylates,
Quinidine, Indomethacin)

Idiopathic

Idiopathic

Conductive Hearing Loss

Sensorineural Hearing Loss

Somatic

Hearing Loss

No Hearing Loss

Subjective
Heard only by patient (Common)

Objective
Heard by others (Rare)
Ophthalmologic

Cross Section of the Eye & Acronyms...........291
Approach to an Eye Exam..........................292
Acute Vision Loss Bilateral.......................293
Acute Vision Loss Unilateral....................294
Chronic Vision Loss Anatomic....................295
Amblyopia.............................................296
Diplopia................................................297
Pupillary Abnormalities Isocoria...............298
Pupillary Abnormalities Anisocoria............299
Red Eye Atraumatic...............................300
Red Eye Traumatic..................................301
Strabismus Ocular Misalignment...............302
Neuro-Ophthalmology Visual Field Defects
........................................................................303
Historical Editors
Dr. John Huang
Dr. Ying Lu
Anastasia Aristakhova
Jagdeep Doulla
Kathleen Moncrieff
Micah Luong
Nazia Panjwani
Stephanie Yang
Vikram Lekhi

Student Editors
Prima Moinul
Jessica Ruzicki

Senior Editor
Dr. Monique Munro

Faculty Editor
Dr. Patrick Mitchell
Cross Section of the Eye & Acronyms

Ophthalmology Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOM</td>
<td>Extra ocular movements</td>
</tr>
<tr>
<td>IOL</td>
<td>Intraocular Lens</td>
</tr>
<tr>
<td>IOP</td>
<td>Intraocular Pressure</td>
</tr>
<tr>
<td>OD</td>
<td>Oculus Dexter (right eye)</td>
</tr>
<tr>
<td>OS</td>
<td>Oculus Sinister (left eye)</td>
</tr>
<tr>
<td>OU</td>
<td>Oculus Uterque (both eyes)</td>
</tr>
<tr>
<td>PERRLA</td>
<td>Pupils Equal, Round, Reactive to Light &amp; Accommodation</td>
</tr>
<tr>
<td>RAPD</td>
<td>Relative Afferent pupillary defect</td>
</tr>
<tr>
<td>SLE</td>
<td>Slit Lamp Exam</td>
</tr>
<tr>
<td>VA</td>
<td>Visual Acuity</td>
</tr>
</tbody>
</table>
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

Unilateral

Complete/ Partial Homonymous Hemianopia
- Infarct
- Intracranial Hemorrhage
- Tumor

Bilateral

Chronic

Other

Clinical Pearl:
- Patients with bilateral acute vision loss should have a CT.
Acute Vision Loss

Unilateral

Bilateral

Painful

Optic Nerve

Retina Visible

• Visual Cortex Infarction

Painless

Cornea

• Keratopathy

Abnormalities of the Optic Nerve

Abnormalities of the Optic Nerve

• Temporal Arteritis
• Demyelination
• MS
• Idiopathic
• Glaucoma

Retina Not Visible

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

Retina

Visual Cortex Infarction

Vitreous

• Retinal Hemorrhage
• Vitreous Hemorrhage

Clinical Pearls:
- Optic neuritis causes pain with EOM
- Temporal arteritis causes temporalis pain and pain with mastication
- Acute angle closure glaucoma causes high intraocular pressure, unilateral eye pain, mid-dilated pupil and n/v
- Retinal detachment can present as a veil over the vision and with flashes and floaters.
- TIA, vein or artery occlusion requires stroke work-up
Chronic Vision Loss

Anatomic

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**
- 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 Anisometropia (Unequal Refractive Error)
- Hyperopia
- Astigmatism

Strabismic
Abnormal Binocular Interaction

See Strabismus scheme

Clinical Pearl:
- Congenital cataracts and retinoblastoma’s cause leukocoria and a decreased red reflex

* Can cause permanent visual impairment if not treated urgently in infancy
Diplopia

Clinical Pearls:
- Diplopia is almost always binocular.
- CN VI palsy is a red flag for intracranial masses.
- Look for ptosis with CN III palsy.
- Examine both eyes to determine which is affected.
- Neurologic symptoms suggest a mass as the cause.
- Myasthenia Gravis is fatiguable.
- Migraine is a diagnosis of exclusion.

**Monocular**
- Refractive Error
- Cataract/Lens Dislocation
- Functional
- Corneal Distortion/Scarring
- Vitreous Abnormalities

**Binocular**

**Neuromuscular Junction**
- Myasthenia Gravis

**Neuronal**
- Strictly Horizontal
  (Cranial Nerve VI problem)
  Cannot Abduct

**Extraocular Muscle Restriction/Entrapment**
- Orbital Inflammation
- Orbital Tumor
- Orbital Floor Fracture

**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

**Grave’s Ophthalmopathy**
- Hyperthyroidism
Pupillary Abnormalities

Isocoria

Pupillary Abnormality

Equal (Isocoria)

Relative Afferent Pupil Defect

- Optic Neuritis
- Ischemic Optic Neuropathies
- Optic Nerve Tumor
- Retinal detachment
- Traumatic/Compressive Optic Neuropathy

Bilateral Impairment

Dilated Pupils (Mydriasis)

- Syphilis (light-near dissociation)
- Pharmacologic (e.g. Opioids, Alcohol)

Constricted Pupils (Miotic)

Dorsal Midbrain (Parinaud’s Syndrome)

- Tumor
- Hemorrhage
- Hydrocephalus

Neuromuscular Junction Dysfunction

- Botulism

Pharmacologic

- Atropine
- LSD
- Cocaine
- Amphetamines
Pupillary Abnormalities

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.

Pupillary Abnormality

Equal (Isocoria)
- Pathological
  - Impaired Constriction
    - Parasympathetic dysfunction
      - Anisocoria greater in light
        - Large pupil abnormal

Unequal (Anisocoria)
- Pathological
  - Impaired Constriction
    - Sympathetic dysfunction/Horner’s Syndrome:
      - Miosis, anhydrosis, ptosis
      - Anisocoria greater in dark
      - Small pupil abnormality

- Physiological
  - Anisocoria equal in light and dark, 10% cocaine: pupils dilate symmetrically
  - Simple Anisocoria (<0.5mm)

- Preganglionic
  - Ptosis, ophthalmoplegia
    - Constriction with 0.1% pilocarpine
      - Oculomotor Nerve/Fascicle (Other CN III Findings)

- Postganglionic
  - Constriction with 0.1% pilocarpine
    - Tonic (Adie’s) Pupil (Ciliary Ganglion Lesion)

Neuromuscular Junction
- No constriction with 0.1% pilocarpine
  - Pharmacologic
    - Factitious

- Preganglionic
  - No dilation with 0.125% adrenaline
    - Idiopathic
    - Trauma
    - Tumor (Lung, Breast, Thyroid)

- Postganglionic
  - Dilation with 0.125% adrenaline
    - Cluster Headache
    - Carotid Dissection
    - Trauma
    - Idiopathic

Fixed Pupil

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

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

Traumatic

- Corneal Abrasion
- Ultraviolet Keratitis
- Chemical (Acid, alkali)

Surface Injury

- Orbital Rim/Mid-facial Fracture
- Orbital Floor Fracture
- Orbital Apex Injury/
  Retrobulbar Fracture**

** Urgent lateral canthotomy

Globe Penetrating Injury

- Hyphema, history of trauma/high velocity impact, reduced visual acuity

Associated Injury

- Lids: Swelling, Laceration
- Conjunctiva: Subconjunctival hemorrhage
- Cornea: Abrasion
- Iris: Laceration, iritis, iridodialysis
- Pupil: Traumatic mydriasis
- Lens: Cataract, dislocation
- Vitreous hemorrhage
- Retina: Tear, hemorrhage, choroidal rupture
- Glaucoma
- Optic Neuropathy

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

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

- **Horizontal and/or vertical**
  - (Eso/exotropia, hyper/hypotopia, mixed)
  - CN III Problem (eye is depressed and abducted, ptosis, large/unreactive pupil)
  - CN IV Problem (eye cannot depress when looking medially)
  - 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)

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

Visual Field Defects

Optic Nerve Lesion
(Monocular vision loss)

Optic Chiasm Lesion
(bitemporal hemianopia)
- Pituitary/metastatic tumor
- Craniopharyngioma
- Meningioma
- Optic nerve glioma
- Aneurysm
- Infection
- MS
- Sarcoidosis

Optic Tract Lesion
(Incongruous right homonymous hemianopia)

Lateral Geniculate Nucleus Lesion
(Right homonymous horizontal sectroanopia)

Meyer’s Loop Lesion
(Incongruous superior homonymous quadrantanopia)

Right Parietal Lobe Lesion
(Inferior homonymous hemianopia)
Pediatric

Developmental Delay ................................................ 311
School Difficulties ..................................................... 312
Small for Gestational Age ........................................ 313
Large for Gestational Age ........................................... 314
Congenital Anomalies ................................................ 315
Headache ..................................................................... 316
Failure to Thrive Adequate Calorie Consumption ........ 317
Failure to Thrive Inadequate Calorie Consumption .... 318
Hypotonic Infant (Floppy Newborn) ......................... 319
Acute Abdominal Pain ............................................... 320
Chronic Abdominal Pain ............................................. 321
Pediatric Vomiting ..................................................... 322
Neonatal Jaundice: Approach to Indirect Hyperbilirubinemia .................................................. 323
Neonatal Jaundice: Approach to Indirect Hyperbilirubinemia .................................................. 324
Pediatric Diarrhea ...................................................... 325
Constipation: Pediatric ................................................ 326
Mouth disorder: Pediatric ............................................ 327
Depressed/Lethargic Newborn ................................. 328
Cyanosis in the Newborn ........................................... 329
Limp .......................................................................... 330
Respiratory Distress in the Newborn ...................... 331
Pediatric Dyspnea ..................................................... 332
Noisy Breathing: Pediatric wheezing ...................... 333
Noisy Breathing: Pediatric Stridor ......................... 334
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pediatric Cough: Acute</td>
<td>335</td>
</tr>
<tr>
<td>Pediatric Cough: Chronic</td>
<td>336</td>
</tr>
<tr>
<td>Respiratory Distress in the Newborn:</td>
<td></td>
</tr>
<tr>
<td>Tachypnea</td>
<td>337</td>
</tr>
<tr>
<td>Sudden Unexpected Death in Infancy</td>
<td>338</td>
</tr>
<tr>
<td>Enuresis</td>
<td>339</td>
</tr>
<tr>
<td>Apparent Life Threatening Event</td>
<td>340</td>
</tr>
<tr>
<td>Pediatric Fractures</td>
<td>341</td>
</tr>
<tr>
<td>Salter Harris Classification</td>
<td>342</td>
</tr>
<tr>
<td>Sudden Paroxysmal Event</td>
<td>343</td>
</tr>
<tr>
<td>Non-Epileptic Paroxysmal Event</td>
<td>344</td>
</tr>
<tr>
<td>Pediatric Epilepsies</td>
<td>345</td>
</tr>
<tr>
<td>Pediatric Seizures</td>
<td>346</td>
</tr>
</tbody>
</table>
Pediatric

Febrile Seizures .......................................................... 347
Pediatric Mood and Anxiety Disorders ............. 348
Abdominal Mass .............................................................. 349
Shock ........................................................................... 350
Hypoglycemia ................................................................. 351
Altered Level of Consciousness .................................. 352
Bleeding/Bruising ............................................................ 353
Thrombocytopenia ............................................................ 354
Long PT (INR), Long PTT .............................................. 355
Long PT (INR), Normal PTT .......................................... 356
Normal PT (INR), Long PTT ........................................... 357
Dehydration ................................................................. 358
Hyponatremia ................................................................. 359
Hypernatremia ................................................................. 360

Global Developmental Delay/Intellectual Disability .......................................................... 361
Fever (Age <1 Month) ......................................................... 362
Fever (Age 1-3 Months) .................................................... 363
Fever (Age >3 Months) ....................................................... 364
Failure to Thrive .............................................................. 365
Short Stature ................................................................. 366
Murmur in the Newborn (<48 Hours) ....................... 367
Murmur in the Newborn Beyond Neonatal Period .......................................................... 368
Preterm Infant Complications ........................................
  (<34 Weks) ................................................................. 369
Preterm Infant Complications ........................................
  (34-36 Weeks) ............................................................. 370
Anemia by Mechanism..............................................371
Anemia by MCV.........................................................372
Microcytic Anemia.....................................................373
Paediatric Infectious Skin Rash............................374
Skin Lesion (Primary Skin).................................375
Skin Lesion (Secondary Skin).............................376
Rash (Eczematous)....................................................377
Rash (Papulosquamous)............................................378
Rash (Vesiculobullous).............................................379
Rash (Pustular)............................................................380
Rash (Reactive)..........................................................381
Proteinuria.................................................................382
Hematuria.................................................................383
Acute Renal Failure..................................................384
Chronic Kidney Disease ........................................385
Edema.................................................................386
Dysuria.................................................................387
Increased Urinary Frequency.............................388
Scrotal Mass.............................................................389
Lymphadenopathy...............................................390
Otalgia (Earache)......................................................391
Sore Throat/Sore Mouth.........................................392
**Historical Editors**

- Dr. Pamela Veale
- Dr. Susan Bannister
- Dr. Kelly Millar
- Dr. Mary Ann Thomas
- Dr. Andrei Harabor
- Dr. Jean Mah
- Dr. Henry Mandin
- Dr. Leanna McKenzie
- Dr. Ian Mitchell
- Dr. Katherine Smart
- Dr. Sylvain Coderre
- Jaskaran Singh
- Christopher Skappak

**Student Editors**

- Debanjana Das
- Cody Flexhaug
- Carmen Fong
- Carly Hagel
- Rebekah Jobling
- Beata Komierowski
- Anuradha Surendra
- Shahbaz Syed
- Gilbert Yuen

**Faculty Editor**

- Dr. Marielena Dibartolo
Developmental Delay

(Development at least 2 Standard Deviations below expected for age)

Detailed medical and developmental history
Physical Examination
Developmental Observations
Consider social/environmental impacts

Developmental Delay
No loss of milestones

Delay in 2 or more domains

Delays in 2 or more domains include:
1. Motor (fine and/or gross motor)
2. Language
3. Social

See "Development/Behavioural/Learning Problems: Clinical approach to Global Developmental Delay /Intellectual Disability"

Motor Delay (Gross Motor and/or Fine Motor)*
- Cerebral Palsy*
- Developmental Coordination Disorder
- Benign Congenital Hypotonia
- Neuromuscular disorder

Developmental Delay
Loss of milestones

- Metabolic disease*
- Malignancy (Eg. Brain tumor*)
- Neurodegenerative disease

Delay in single domain

Speech/Language Delay*
- Hearing impairment*
- Isolated speech delay
- Selective Mutism
- Mechanical (e.g. dental, cleft palate)

Social Delay

- Autism Spectrum Disorder* (Note that can often present with an associated speech delay as well)
- Genetic disease
School Difficulties

School Difficulty
- Detailed history
- Review of school records
- Detailed physical exam

Environmental
- Neglect*
- Physical abuse* and Domestic violence*
- Sexual abuse*
- Sleep issues*
- Nutrition and feeding issues* (Eg. malnutrition)
- Socio-economic /cultural /home /environment issues*
- Bullying

Mental Health
- Anxiety*
- Depression*
- Behavioural disorders (Eg. Conduct/Oppositional Defiance Disorder)
- Substance use and abuse*

Neurodevelopmental
- Intellectual disability/Global delay*
- Specific learning disability*
- Attention Deficit Hyperactivity Disorder*
- Autism Spectrum Disorder*

Medical
- Hearing impairment*
- Visual changes*
- Neurologic disease (Eg. tumor*, seizures*, head injury*, neurodegenerative disease)
- Sleep issues* (Eg. Obstructive sleep apnea)
- Hypothyroidism
- Iron deficiency*
Small for Gestational Age

Constitutionally Small
- Maternal Illness
  - Chronic Maternal Disease (E.g. Maternal hypertension, Renal insufficiency, pulmonary disease, chronic anemia, Type 1 Diabetes Mellitus, autoimmune disease, etc.)
  - Gestational hypertension
  - Anatomical uterine abnormalities
- Maternal Lifestyle
  - Malnutrition
  - Smoking
  - Drug use
  - Alcohol
- Iatrogenic
  - Drugs (E.g. Ace inhibitors, phenytoin, etc.)
- Infection
  - Congenital infections* (E.g. TORCH infections)
- Genetic
  - Chromosomal disorders (E.g. Trisomy 21*)
  - Genetic disorders
  - Congenital anomalies
  - Multiple gestation
  - Metabolic disorders

Placental Factors
- Placental insufficiency
- Placental abnormalities (placental abruption, placental infarction, hemangioma, chorioangioma)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Large for Gestational Age
(Growth > 90th percentile for GA)

Detailed history
Detailed physical exam

Maternal Factors
- Genetic/ethnic predisposition
- Maternal diabetes or hyperinsulinism

Fetal factors
- Prolonged gestation (>41 weeks)
- Genetic disorder (e.g. Sotos syndrome, Beckwith-Wiedemann syndrome)
- Normal variation

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

FETAL COMPLICATIONS
- Shoulder dystocia
- Birth injury (brachial plexus injury, clavicular fracture)
- Cerebral palsy secondary to hypoxia
- Hypoglycemia
- Polycythemia
- Perinatal asphyxia
- Hyperbilirubinemia
**Congenital Anomalies**

- **Embryonic** development failure or inadequacy (often multifactorial)
- **Destruction/Breakdown** of previously normal tissue (e.g., ischemia)
- **Chromosomal**
- **Single** Gene
- **Teratogenic**
- **Association** (e.g., VACTERL)

**Malformation**
- Abnormal mechanical forces distorting otherwise normal structures (e.g., exoligohydramnios)

**Deformation**

**Disruption**
- Destruction/Breakdown of previously normal tissue (e.g., ischemia)

**Association of Anomalies (Syndromic)**
- Chromosomal
- Single Gene
- Teratogenic
- Association (e.g., VACTERL)

**Things to Consider:**
- **History** – Prenatal: maternal health, exposures, screening, ultrasounds; delivery; neonatal
- **Family History** – Three Generations: prior malformations, stillbirths, recurrent miscarriages, consanguinity
- **Physical Exam** – Variants, minor anomalies, major malformation
- **Diagnostic Procedures** – Chromosomes, molecular/DNA, radiology, photography, metabolic
- **Diagnostic Evaluations** – Prognosis, recurrence, prenatal diagnosis, surveillance, treatment
Headache

Evaluate for Red Flags

**Primary**

- **History:** Consistent with primary headache. No red flags
- **Physical Exam:** Normal. No red flags

**Secondary**

- **History:** Fever, drugs, trauma
- **Physical Exam:** Decreased Level of consciousness, increased intracranial pressure, fever, focal neurological deficits

**Migraine***

- Aura, severe, throbs, front/temporal, nausea and vomiting.
- Photo/phonophobia

**Tension***

- Mild-moderate pressure, diffuse/bilateral, no nausea or vomiting, usually short (min-hrs)

**Other**

- Primary exertional headache
- Trigeminal autonomic cephalgias

**Infection**

- Fever, OLOC, meningeal signs, focal neuro signs
- Meningitis*
- Encephalitis*
- Brain Abscess

**Vascular**

- Sudden onset, may have ICP, focal neuro signs
- Hemorrhagic or ischemic stroke
- Ruptured AVM
- Immune mediated vasculitis
- Metabolic disease causing stroke

**Mass/Structural**

- Morning HA, worse valsalva signs, ICP, focal neuro signs
- Brain tumor*
- Hydrocephalus

**Trauma**

- History of head trauma [may not have a clear history if non-accidental trauma]
- Primary head/neck trauma (Eg. Abusive head trauma*)
- Concussion*

**Other**

- Sinusitis*
- Idiopathic Intracranial Hypertension
- Medication overuse

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Failure to Thrive

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

Failure to Thrive

Adequate Calorie Consumption

Inadequate Calorie Consumption

Organic Illness
- Chronic Renal Failure
- Esophagitis
- Congenital Heart Defect
- Structural Dystrophies

Protein-Energy Malnutrition
- Kwashiorkor (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***

- Detailed history
- Detailed physical exam

**Neurological**
- Upper Motor Neuron
  - Decreased LOC, low to normal strength, normal reflexes

**Lower Motor Neuron**
- Profound weakness, muscle atrophy, fasciculations, absent reflexes
- Weakness distal > proximal, reduced reflexes, may have sensory changes, may have autonomic changes

**Systemic Illness**
- Sepsis
- Metabolic Disease
- Hypoglycemia
- Hypothyroidism

**Brain**
- Chromosomal (e.g., Trisomy 21*)
- Genetic (e.g., Prader Willi)
- Head injury* or Birth Trauma* (e.g., hypoxic-ischemic encephalopathy, intracranial hemorrhage)
- Intracranial infection (e.g., meningitis, encephalitis*)
- Increased intracranial pressure*
- Congenital intracranial structural anomalies
- Benign congenital hypotonia

**Anterior Horn Cell**
- Spinal muscular atrophy
- Trauma
- Hematoma
- Abscess

**Nerves**
- Hereditary sensory autonomic neuropathy
- Guillain Barre Syndrome

**Neuromuscular Junction**
- Congenital Myasthenia Gravis
- Infantile Botulism
- Drugs

**Muscle**
- Congenital muscular dystrophies
- Congenital myotonic dystrophies
- Metabolic Disease*

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Acute Abdominal Pain

Pediatric Acute Abdominal Pain

Evaluate for Surgical/Acute Abdomen:
History and physical exam
Labs
Imaging (X-ray, ultrasound)

Focal

Generalized

- Metabolic (Eg. Diabetic Ketoacidosis*)
- Henoch Schonlein Purpura*
- Sickle cell disease
- Gastroenteritis*
- Functional*

Upper Abdominal Pain

Biliary/Hepatic
- Biliary Colic
- Cholecystitis
- Choledocholithiasis
- Hepatitis

Upper GI tract
- Gastroesophageal reflux/gastroesophageal reflux disease*
- Malrotation/Volvulus*
- Gastroenteritis*
- Peptic Ulcer

Pancreatic
- Pancreatitis

Periumbilical/
Lower Abdominal Pain

GI tract
- Acute Abdomen*
- Appendicitis*
- Intussusception*
- Malrotation/Volvulus*
- Incarcerated Hernia
- Obstruction
- Constipation*
- Gastroenteritis*

Genitourina
- Pregnancy*/Ectopic pregnancy
- Ovarian/Testicular Torsion*
- Dysmenorrhea
- Sexually transmitted infections* (Eg. Pelvic Inflammatory Disease)
- Urinary tract infection*
- Renal Colic

Spleen
- Splenic rupture
- Acute splenic enlargement (Eg. Infectious, sequestration)

Other
- Functional*
- Musculoskeletal injury
Chronic Abdominal Pain

Assess for Red Flags:
History of pain waking from sleep, bloody stools, systemic symptoms (fever, weight loss/FTT, rash, joint swelling)
Labs: CBC, BUN, Creat, Albumin, CRP, ALT, GGT, Celiac Imaging: Ultrasound

Upper Abdominal Pain

- Hepatitis/Gallbladder disease
- Chronic Pancreatitis
- Gastritis/Duodenitis Ulcer
- Gastroesophageal reflux/Gastroesophageal reflux disease*

Lower Abdominal Pain

- Celiac Disease*
- Lactose Intolerance/Dietary
- Constipation*
- Functional*/Irritable Bowel Syndrome
- Inflammatory Bowel Disease*
Pediatric Vomiting

Vomiting

- Bilious emesis (green emesis): Red Flag*

Evaluate for Surgical/Acute Abdomen:
- History and physical exam

Bilious (Surgical/Acute Abdomen)
- Malrotation/Volvulus*
- Intussusception*
- Obstruction (Eg. Intestinal atresia*)

Non-Bilious

Acute

- Gastrointestinal Disease
  - Appendicitis*
  - Obstruction (Eg. Pyloric stenosis*, intestinal atresia*, etc.)
  - Intussusception*
  - Gastroenteritis*
  - Gastroparesis/ileus
  - Hepatitis
  - Pancreatitis
  - Cholecystitis

- Other Systemic Disease
  - Infection (Eg. Meningitis*, encephalitis*, sepsis*, urinary tract infection*, pneumonia*)
  - CNS disease (Eg. Head injury*, concussion*, increased intracranial pressure*, brain tumor*, abusive head trauma*, migraine*)
  - Middle ear disease (Eg. Otitis media*)
  - Endocrine (Eg. Diabetic ketoacidosis/Diabetes mellitus*)

Chronic

Evaluate for Red Flags:
- Bloody emesis, morning emesis, weight loss/failure to thrive, systemic symptoms (fever, unwell, etc.)

Red Flags present

Gastrointestinal Disease
- Inflammatory bowel disease* (Eg. Crohn’s Disease)
- Peptic ulcer

Other Systemic Disease
- CNS disease (Increased intracranial pressure*, brain tumor*)
- Renal Disease (Eg. Renal failure*)
- Endocrine (Eg. Diabetes mellitus*, Addison’s disease, thyroid disease)
- Metabolic disease*

Gastroesophageal reflux disease*
- Cyclic Vomiting Syndrome

No Red Flags

Gastrointestinal Disease
- CNS disease (Eg. Head injury*, concussion*, migraine*)
- Respiratory (Eg. Asthma*)
- Middle ear disease (Eg. Otitis media*)
- Drugs/Toxins (Eg. Substance use and abuse*, poisoning/intoxication*, antibiotics)
- Psychiatric (Eg. Disordered eating*, rumination)
- Endocrine (Eg. Pregnancy*)
Neonatal Jaundice

Approach To Indirect Hyperbilirubinemia

Onset within first week of life, never in first 24 hours
Clinically well

Indirect (unconjugated) hyperbilirubinemia

Pre-hepatic
- Physiologic*
- Pathologic
  - Onset anytime within first week of life
  - Red flags: Onset first 24 hours of life, clinically unwell, risk factors present

Physiologic*

<20% direct

Direct (conjugated) Hyperbilirubinemia

>20% direct

Increased bilirubin production
- Non-hemolytic
  - Cephalohematoma
  - Polycythemia
- Hemolytic*
  - Extrinsic
    - Immune mediated
    - Isoimmunization (ABO, Rh disease)
    - Sepsis* (bacteremia, UTI, meningitis, other)
  - Intrinsic
    - Membrane (spherocytosis, elliptocytosis)
    - Enzyme (G6PD, pyruvate kinase deficiency)

Decreased bilirubin clearance
- Breast milk Jaundice*
- Gilbert’s
- Criglar Najar

Increased enterohepatic circulation
- GI obstruction
- Breast feeding jaundice/dehydration*
Neonatal Jaundice
Approach To Direct Hyperbilirubinemia

- Check bilirubin
  (If > 2 weeks, check total AND direct)

<20% direct

- Indirect (unconjugated) hyperbilirubinemia

See “Neonatal Jaundice: Approach to Indirect Hyperbilirubinemia”

>20% direct

- Direct (conjugated) Hyperbilirubinemia:
  - Direct hyperbilirubinemia is NEVER normal, and requires further workup
  - Hepatic
    - Infectious (TORCH, hepatitis virus, bacterial sepsis*, UTI*)
    - Genetic (Cystic fibrosis*, Alagille Syndrome)
    - Metabolic (Inborn errors of metabolism, alpha-1-antitrypsin deficiency)
    - Endocrine (Hypothyroid, hypopituitarism)
    - Iatrogenic (TPN, other drugs)
    - Neoplastic (hepatoblastoma)

  - Post hepatic
    - Biliary atresia*
    - Other obstructive (choledochal cyst, mass, intestinal obstruction)
**Diarrhea (Pediatric)**

**Pediatric Diarrhea**

- History and physical exam

**Acute (< 2 weeks)**

- **Dietary**
  - High sugar load
  - Lactose intolerance

- **Infectious**
  - Viral (Gastroenteritis*)
  - Bacteria (Eg. *E. coli*, *Salmonella*, *Yersinia*, *Campylobacter*, *Shigella*)
  - Parasitic (Eg. *Giardia*, *E histolytica*)

- **Drugs**
  - Antibiotics
  - Laxatives

**Chronic (> 2 weeks)**

- **Non-Bloody**
  - Red flags: Night time awakening, systemic symptoms (fever, weight loss/FTT, rash, joint swelling)

  - **Red flags present**
    - Celiac Disease*
    - Inflammatory Bowel Disease* (Crohn's Disease)
    - Pancreatic Insufficiency
    - Secretory neoplasm

  - **No red flags**
    - Celiac Disease*
    - Constipation* with overflow diarrhea
    - Lactose Intolerance
    - Bacterial Overgrowth
    - Carbohydrate malabsorption
    - Drugs/Toxins
    - Hyperthyroid
    - Irritable bowel syndrome

- **Bloody (Red Flag)**
  - Inflammatory bowel Disease* (Crohn's disease, Ulcerative Colitis)
  - *C Difficile
  - Drugs (Eg. Antibiotics, laxatives)
Constipation (Pediatric)

Constipation


Neonate/Infant
- Dietary/Functional
  - Insufficient intake/
    Nutrition and feeding
    issues*
- Anatomic
  - Intestinal Atresia*
  - Cystic Fibrosis*
  - Imperforate Anus
  - Anal Atresia
  - Intestinal Stenosis
- Systemic Disease
  - Hypothyroidism

Older Child
- Dietary/Functional
  - Insufficient intake/
    Nutrition and feeding
    issues*
  - Withholding
  - Painful (e.g. Fissures)
  - Drugs (Narcotics,
    Psychotropics)
- Neurologic
  - Hirschsprung’s Disease
  - Hypothyroidism
  - Celiac disease*
  - Bowel Obstruction
  - Pseudo-obstruction
  - Spinal Cord Lesions
  - Guillain-Barré Syndrome
  - Neglect*/Physical abuse*/Sexual Abuse*
Mouth Disorders (Pediatric)

- Teeth
  - Teething

- Mucous Membranes
  - Non-Painful

- 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)
  - 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

Pediatric

**Cyanosis (<48 hrs)**

- **SaO2 low**
  - Cyanosis of mouth, tongue, face, core
- **Detailed pregnancy and delivery history**
  - Detailed physical exam
  - Check SaO2
- **Otherwise appears well**
  - SaO2 normal
  - Cyanosis of hands, feet, perioral

**Central Cyanosis**

- **Apply oxygen**
- **Chest x-ray**

**Peripheral Cyanosis**

- **Acrocyanosis** (often normal in otherwise healthy newborns)

**Cardiovascular**

- **Congenital Heart Disease**
  - Transposition of the Great Arteries
  - Truncus Arteriosus
  - Total Anomalous Pulmonary Venous Return
  - Tricuspid Atresia
  - Tetralogy of Fallot
  - Pulmonary Atresia
  - Ebstein's anomaly

**Respiratory**

- **Upper Airway**
  - Congenital upper airway obstruction (Eg. Atresia, laryngomalacia)
  - Airway compression (Eg. Congenital neck mass, mediastinal mass)

- **Lower Airway**
  - Pneumonia
  - Pneumothorax
  - Meconium aspiration/meconium pneumonitis
  - Congenital lung anomalies

**Other**

- Sepsis
- Hematologic (Eg. Anemia, Hemoglobinopathies, Polycythemia)
- Metabolic disease
- Persistent Pulmonary Hypertension
- Disordered control of breathing (Eg. Seizure, birth trauma causing intracranial injury, peripartum maternal narcotics)

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Limp

Detailed History and Physical exam

Acute

May have history of trauma
Usually painful
Usually afebrile

MSK/Traumatic

- Trauma/injury* (Eg. Physical abuse*, fracture, sprain, overuse injuries, etc)
- Slipped Capital Femoral Epiphysis*
- Legg-Calve-Perthes* (ie. Avascular Necrosis)
- Growing pains*
- Osgood Schlatter Disease*

Usually febrile
Usually painful
Systemic symptoms often present

Infectious/Post-infectious

- Septic Arthritis*
- Osteomyelitis* 
- Cellulitis*
- Transient Synovitis*
- Post-infectious Reactive Arthritis*
- Rheumatic Fever*

May be febrile or afebrile
Usually painful
Systemic symptoms usually present

Rheumatological

- Juvenile Idiopathic Arthritis*
- Inflammatory Bowel Disease*
- Systemic Lupus Erythematosus
- Drug reaction

May be febrile or afebrile
Usually painful
Systemic symptoms usually present

Malignant

- Bone tumour* (Eg. Osteosarcoma, Ewing’s Sarcoma)
- Leukemia*
- Lymphoma*
- Bone Metastasis

Limp often noticed at age of walking
Usually painless

Chronic

- Developmental Dysplasia of the Hip*
- Cerebral Palsy*
- Leg length inequality
- Talipes equinus
- Other neuromuscular disease

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Respiratory Distress In The Newborn

Respiratory Distress in the Newborn (<48 hrs)

Detailed pregnancy and delivery history
Detailed physical exam

Respiratory

Upper Airway
- Congenital upper airway obstruction (Eg. Choanal atresia, laryngomalacia)
- Airway compression (Eg. Congenital neck mass, mediastinal mass)

Lower Airway
- Pneumonia*
- Transient tachypnea of the newborn
- Respiratory distress syndrome
- Pneumothorax
- Meconium aspiration/meconium pneumonitis
- Congenital lung anomalies

Cardiovascular

Congenital Heart Disease*
- Cyanotic heart lesions
- Truncus Arteriosus
- Total Anomalous Pulmonary Venous Return
- Tricuspid Atresia
- Transposition of the Great Arteries
- Tetralogy of Fallot
- Hypoplastic Left Heart Syndrome
- Pulmonary Atresia

Acyanotic heart lesions
- Coarctation of the Aorta
- Critical Aortic Stenosis
- Large AVSD

Neuromuscular

(May present with irregular breathing rather than respiratory distress)
- Seizure*
- Birth trauma* (Eg. Hypoxic brain injury, CNS bleed, birth asphyxia)
- Congenital CNS malformation
- Drugs: Narcotics/Sedatives
- Chest wall deformities
- Genetic neuromuscular disease (Eg. Congenital myotonic dystrophy, spinal muscular atrophy, congenital myopathies)

Other

- Sepsis*
- Hypoglycemia*
- Metabolic disease*
- Gastrointestinal (Eg. Diaphragmatic hernia)
- Hypothermia or hyperthermia
- Persistent Pulmonary Hypertension

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Pediatric Dyspnea

- **Stridor**
  - Croup
  - Foreign Body
  - Tracheitis
  - Epiglottitis
  - Laryngospasm

- **Wheeze**
  - Asthma
  - Bronchiolitis
  - Foreign Body
  - Viral Induced Wheeze

- **Crackles**
  - Pneumonia
  - Congestive Heart Failure
  - Bronchiolitis
  - Foreign Body

- **Decreased Air Entry**
  - Pneumonia
  - Asthma
  - Bronchiolitis
  - Foreign Body
  - Pleural Effusion
  - Atelectasis
  - Pneumothorax

- **Normal Breath Sounds**
  - Pneumonia
  - Foreign Body
  - Heart Disease
  - Diabetic Ketoacidosis
  - Pulmonary Embolism
Noisy Breathing
Pediatric Wheezing

Wheezing in a Child

CXR Non Specific
- Relief With Beta-Agonist
  - Asthma*
- Positive Sweat Chloride
  - Cystic Fibrosis
- Wheeze With Feeding
  - Aspiration
  - GE Reflux
  - H-Type Esophageal Fistula

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

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

* Denotes acutely life-threatening causes
Noisy Breathing
Pediatric Stridor

Stridor in a Child

Present Since Infancy

No Respiratory Distress
- Laryngomalacia

Respiratory Distress
- Laryngomalacia
- Laryngeal Web
- Hemangioma
- Vocal Cord Dysfunction
- Subglottic Stenosis

Not Present Since Infancy

Non-Acute Onset
- Hemangioma
- Vocal Cord Dysfunction
- Subglottic Stenosis
- Laryngeal Papillomatosis

Acute Onset

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

Afebrile

Barking Cough
- Croup
- Atypical Croup

Partially-Treated Bacterial Tracheitis

* Denotes acutely life-threatening causes
Pediatric Cough

Acute

Acute Cough (< 3 weeks)

Detailed history
Respiratory physical exam

Respiratory

Stridor on inspiration
Increased work of breathing (indrawing, nasal flare, head bobbing, paradoxical breathing)
Reduced SaO2 and reduced air entry are red flags for impending respiratory failure

Upper Respiratory

Infectious
- Viral URTI*
- Sinusitis*
- Croup*
- Epiglottitis*
- Pertussis*
- Tracheitis*

Foreign body
- Anaphylaxis*

Wheeze on expiration, asymmetric breathsounds,
Increased work of breathing (indrawing, nasal flare, head bobbing, paradoxical breathing)
Crackles, bronchial breath sounds, focal respiratory findings
SaO2 reduced

Lower Respiratory

Infectious
- Pneumonia*
- Bronchiolitis*

Asthma*
- Anaphylaxis*
- Foreign body*

Non-Respiratory

Cardiac (E.g. Congestive heart failure*)
Neurological (E.g. Aspiration)
Gastrointestinal (E.g. Gastroesophageal reflux*)
Other (E.g. Habit cough)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Pediatric Cough

Chronic

Chronic Cough
(> 3 weeks)

Detailed history
Assess growth
Respiratory physical exam

Respiratory

Non-Respiratory

Cardiac (E.g. Congestive heart failure*)
Neurological (E.g. Chronic aspiration)
Gastrointestinal (E.g. Gastroesophageal reflux*, tracheoesophageal fistula)

Stridor on inspiration
Increased work of breathing
(indrawing, nasal flare, head bobbing, paradoxical breathing)

Upper Respiratory

Infectious (E.g. Sinusitis*)
Mass/tumour*

Wheeze on expiration, increased work of breathing
(indrawing, nasal flare, head bobbing, paradoxical breathing)
Crackles, bronchial breath sounds, focal respiratory findings
SaO2 may be reduced

Lower Respiratory

Infectious (E.g. Atypical pneumonia*)
Asthma*
Cystic Fibrosis*
Foreign body
Immunodeficiency

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Respiratory Distress In The Newborn

Tachypnea

Respiratory Distress

Check Respiratory Rate (RR)

Normal RR, irregular RR or Bradypnea

See "Respiratory distress: Approach to Normal RR, irregular RR or Bradypnea"

Wheeze on expiration
Increased work of breathing (indrawing, nasal flare, head bobbing, paradoxical breathing)
Crackles, bronchial breath sounds, focal respiratory findings
SaO2 reduced

Stridor on inspiration
Increased work of breathing (indrawing, nasal flare, head bobbing, paradoxical breathing)
Reduced SaO2 and reduced air entry are red flags for impending respiratory failure

Tachypnea

Respiratory physical exam

No increased work of breathing
Normal SaO2

Tachypnea with no increased work of breathing

Upper Airway (extra-thoracic obstruction present)

V/Q Mismatch
- Bronchiolitis
- Asthma/Status Asthmaticus
- Foreign body
- Pneumonia
- Atelectasis
- Pleural effusion
- Pneumothorax

Diffusion Problem
- Interstitial lung disease
- Acute respiratory distress syndrome
- Pulmonary Edema

Lower Airway (intra-thoracic obstruction present)

R → L Shunt

Congestive Heart Failure
- Pulmonary AVM
- Pulmonary Hypertension

* Indicates Key Condition
This is not an exhaustive list of medical conditions.
Sudden Unexpected Death In Infancy (SUDI)

**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)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Pediatric Fractures

Non-Accidental Trauma (indication of child abuse)
  Distal Radius
    • Torus (junction of metaphysis)
    • Green stick (bone bent at convex side)
    • Complete (spiral, oblique, transverse)
  Scapular # Without Traumatize Hx

Accidental Trauma
  Tibia Fibular Fracture
  • Supra condylar
  • Lateral supracondylar
  Elbow
    • < 2 y.o.
  Toddlers Fracture
  Transverse Fractures <3 y.o.
    • Femur
    • Humerus
    • Tibia
    • Ribs
    • Radius
    • Skull
    • Spine
    • Ulna
    • Fibula

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
# Salter Harris Physeal Injury Classification

<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></td>
<td></td>
<td>Fracture line goes below the physis through the epiphysis, and into the joint</td>
</tr>
<tr>
<td>III</td>
<td>Older Children (75%)</td>
<td>рис. 1 Схематическое представление типов повреждений физой в соответствии с классификацией Салтера и Харриса</td>
</tr>
<tr>
<td>IV</td>
<td>Fracture Line through the metaphysis, physis and epiphysis</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Compression fracture of the growth plate</td>
<td></td>
</tr>
</tbody>
</table>

- **S**: Straight through
- **A**: Above
- **L**: Lower
Enuresis

Rule in/out age-appropriate enuresis
Day time continence age 4
Night time continence age 5

Nocturnal Enuresis

Primary Nocturnal Enuresis
Urinary Control Never Achieved

Secondary Nocturnal Enuresis
> 6 Month Continence Prior

Diurnal Enuresis

Bladder function
- Overactive bladder
- Dysfunctional voiding
- Voiding postponement
- Giggle incontinence
- Vaginal voiding

Behavioural
- Behavioural/Psychogenic (Child Abuse*)
- Anxiety

Medical
- Constipation*
- Diabetes mellitus*
- Diabetes insipidus
- Urinary tract infection*
- Renal failure*
  (Chronic kidney disease)
- Neurologic (Cerebral palsy*, seizure*, spinal cord pathology)
- Structural (ectopic ureter, posterior urethral valve)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.

(considered variation in the development of normal bladder control)
Apparent Life Threatening Event

Based on History from Parent
(Extent of investigations based on initial examination)

Acute Illness

Witnessed Choking Spell

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

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Sudden Paroxysmal Event

A: Is this a seizure?
Clues: Non supressible, decreased LOC, rhythmic movements, eye deviation, post-ictal, incontinence

Yes

Seizure

B: Is this seizure SYMPTOMATIC of something else?

Yes

Symptomatic

No

Non-Symptomatic

Non-epileptic paroxysmal event

See "Seizures/Paroxysmal Events: Approach to non-epileptic paroxysmal events"

C. If not a symptomatic seizure:
1. What kind of seizure? (See ILAE Classification of Seizure types)
2. What is the age of the child?
3. Are they developmentally normal or abnormal?

***Epilepsy is TWO unprovoked seizures

See "Seizures/Paroxysmal Events: Approach to Pediatric Epilepsies"

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Non-Epileptic Paroxysmal Event

**Neonates and Infants**
- Cardiac
  - Arrhythmia*
- Behavioral/Developmental
  - Benign Sleep Myoclonus
  - Infantile Colic*
  - Gratification disorder (infantile masturbation)
  - Shuddering attacks
- Gastrointestinal
  - Gastroesophageal Reflux/Reflux Disease* (aka. Sandifer Syndrome)

**Older Infants and Toddlers**
- Cardiac
  - Arrhythmia*
- Behavioral/Developmental
  - Benign Sleep Myoclonus
  - Breath-holding spells*
  - Gratification disorder (infantile masturbation)
  - Night terrors*
  - Tic disorder
- Other neurological
  - Benign Paroxysmal Torticollis
  - Benign Paroxysmal Vertigo

**Childhood and Adolescents**
- Cardiac
  - Arrhythmia*
  - Syncope* (vaso-vagal, other)
- Behavioral/Developmental
  - Daydreaming
  - Panic attack
  - Tic disorder
- Other neurological
  - Migraine* and migraine variants
  - Sleep issues* (narcolepsy, cataplexy)
  - Transient Ischemic Attack
  - Other movement disorders (Eg. Chorea)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Pediatric Epilepsies

Infantile
- Benign Focal Epilepsy of infancy
- West Syndrome

Generalized Epilepsies
- Childhood Absence Epilepsy
- Juvenile Absence Epilepsy
- Juvenile Myoclonic Epilepsy
- Lennox Gastaut Syndrome

Childhood

Focal Epilepsies
- Self-limited epilepsy with centrectemporal spikes
- Remote symptomatic epilepsy

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Pediatric Seizures

**Acute symptomatic seizures** occurring at time of systemic insult or in close association (< 1 week) with documented brain insult

- Metabolic – hypoglycemia, hypo/hypernatremia, hypocalcemia
- Trauma
- Bleed
- Masses
- Drugs/Toxin/Withdrawal
- Autoimmune
- CNS Infection
- Febrile Seizures

**Epilepsy**

≥ 2 unprovoked seizures, or 1 unprovoked seizure and high (>60%) risk to have further seizures (e.g. abnormal EEG)

**Single Unprovoked Seizure**

1st seizure + Normal EEG [10% of population have one]

**Remote Symptomatic**

- Remote Brain Injury
- Cortical Malformation
- Genetic/Metabolic Syndrome
- Infectious (HIV, parasite)
- Known Epilepsy Gene

**Idiopathic/genetic**

- No known cause, presumed genetic predisposition (i.e. no specific gene but twin/family studies suggest genetic link)

Epilepsies can be classified into more than one etiological category, E.g. Tuberous Sclerosis = genetic and structural

Some epilepsies can be classified into more specific epilepsy syndromes

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Febrile Seizures

1. Age 6 mo to 6 yr
2. Temp 38.5°C
3. Neurologically normal exam before and after seizure

* If < 6 mo, not a febrile seizure -> LP

* If neuro deficits or lethargic on exam need to rule out CNS infection -> CT, LP

Simple Febrile Seizures

1. Generalized
2. < 15 min
3. 1 seizure in 24 hours

1. No investigations for seizure
2. Work-up source of fever (e.g., exam, consider urinalysis and culture, CBC)

1. 1/3 risk of having future febrile seizure
2. No significant increased risk of epilepsy
3. No brain damage, no impact on intelligence

Complex (Atypical) Febrile Seizures

1. Focal
2. >= 15 min
3. > 1 seizure in 24 hours

1. ~1/3 risk of having future febrile seizure
2. Slightly increased risk of epilepsy (4-6%)
3. No brain damage from short (<15 min) seizure

1. EEG
2. Consider CT/MRI, especially if focal features
3. Consider LP (clinical decision; higher threshold to do if prolonged seizure, age 6-12 mo, or focal features)
4. Work up source of fever

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
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
Abdominal Mass

- Liver: Hepatomegaly
- Kidney: Hydronephrosis, Congenital cystic disease
- Bowel: Constipation, Appendicitis, Meckles
- Spleen: Splenomegaly, Splenic rupture
- Genitourinary: Ovarian cyst, Pregnancy

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Shock

Defined as inadequate oxygen delivery to meet metabolic demands.

Stabilize:
A- Airway
B- Breathing
C- Circulation
D- Disability (Glasgow coma scale)
D- Dextrose check
History and physical exam

Cardiogenic Shock
- Congenital Heart Disease *
- Acquired Heart Disease (E.g. Kawasaki Disease* with infarction, cardiomyopathy, myocarditis)
- Arrhythmia

Distributive Shock
- Often warm to extremities with poor perfusion
- May have bounding pulses

Obstructive Shock
- Cool to extremities with poor perfusion
- May have normal or abnormal breath sounds
- May have pulsus paradoxus

Hypovolemic Shock
- Usually has history of blood/fluid loss
- Cool to extremities with poor perfusion

- Dehydration*
- Vomiting*
- Diarrhea*
- Bleed/Trauma*

Refer to corresponding Clinical Approaches

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Hypoglycemia

Suspect in any child who is unwell, and with decreased level of consciousness
Neonates <2.6 mmol/L
Beyond neonatal period <4.0 mmol/L

Decreased Substrate
- Prolonged fast (Eg. Malnutrition*, Neglect*, Disordered Eating*)
- Prematurity*
- Small for Gestational Age*

Endocrine
- Hyperinsulinism
- Decreased Counter-regulation
  - Panhypopituitarism
  - Growth hormone deficiency
  - ACTH deficiency
  - Hypothyroid
  - Adrenal insufficiency

Metabolic
- Metabolic Disease*

Increased Demand
- Sepsis*
- Congestive Heart Failure*
- Renal Failure*
- Shock*
- Poisoning/Intoxication* (Eg. Insulin, Sulfonylurea drugs)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Altered Level Of Consciousness

**Drugs**
- Poisoning/intoxication* (Eg. Opioids, beta blockers, diabetes medications, alcohol etc.)
- Bacterial (Eg. Meningitis*, intracranial abscess, sepsis*)
- Viral (Eg. Encephalitis*)

**Infection**
- Signs or symptoms suggestive of infection such as fever
- May or may not have focal findings on neurological exam
- May have signs of increased intracranial pressure

**Metabolic**
- Hypoglycemia*
- Hypernatremia*
- Hyponatremia*
- Metabolic disease*

**Structural**
- Trauma/head injury*
- Abusive head trauma*
- Brain tumor*
- Increased intracranial pressure* (Eg. hydrocephalus, space occupying lesions, idiopathic, drugs)
- Vascular (Eg Stroke, arteriovenous malformation, aneurysm)
- Concussion*

**Other**
- Seizure/status epilepticus*
- Cardiac (Eg. Arrhythmia)
- Syncope*
- Migraine* (atypical presentation)
- Immune-mediated encephalitis

*Indicates Key Condition
This is not an exhaustive list of medical conditions.

Stabilize:
A- Airway
B- Breathing
C- Circulation
D- Disability (Glasgow coma scale)
D- Dextrose check

History and physical exam
Bleeding/Bruising

**Pediatric**

---

**Bleeding/Bruising**

- Detailed history and physical exam
- Rule out purpura
  - Consider Non-accidental Injury
  - Check CBC, INR and PTT

**Platelets**

- History of mucosal bleeding
  - Petechiae and bruising on exam
    - Low platelets
    - Normal INR, normal PTT

**Thrombocytopenia**

- See Bleed and Bruising: Approach to Thrombocytopenia

**Disordered Platelet Function**

- Congenital disorders of platelet function
- Drugs (Eg. Ibuprofen, aspirin)

**Vascular System**

- Normal platelets
  - Normal INR, normal PTT

**Disorders of Coagulation**

- May have history of prolonged bleed,
  - Hemarthrosis positive family history
  - Normal platelets
  - Increased INR and/or PTT

- Connective Tissue Disorders
- Inflammatory/vasculitis
- Drugs

See Bleed and Bruising: Approach to Disorders of Coagulation

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
**Thrombocytopenia**

Low Platelet Count

- Decreased Production
  - Decreased Megakaryopoiesis
    - Marrow displacement (e.g. Leukemia*, lymphoma*, neuroblastoma*, other tumour*)
    - Marrow Failure (Eg. Aplastic Anemia)
    - Toxic Damage (e.g. Chemotherapy)
  - Ineffective Megakaryopoiesis
    - B12 Deficiency
    - Folate Deficiency
    - Drugs

- Increased Sequestration
  - Splenomegaly
  - Thrombus

- Increased Destruction
  - Immune
    - Immune Thrombocytopenia Purpura*
    - Lupus
    - Alloimmune destruction
    - Drugs
  - Non-Immune
    - Hemolytic Uremic Syndrome*
    - Thrombotic Thrombocytopenia Purpura
    - Disseminated Intravascular coagulation
    - Infection/sepsis*
    - Foreign Surface (e.g. Prosthetic Heart Valve)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Long PT (INR), Long PTT

- **Factor Deficiency**
  - Congenital
    - Factor X
    - Factor V
    - Factor II
    - Fibrinogen
  - Acquired
    - Disseminated Intravascular Coagulation

- **Inhibitor**
  - Heparin

- **Vitamin K Problem**
  - Vitamin K deficiency *
  - Vitamin K antagonist (Eg. Coumadin)

- **Liver Disease**

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)
Long PT (INR), Normal PTT

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

- Insufficient Vitamin K
  - Vitamin K Deficiency
    - Hemorrhagic Disease of the Newborn
    - Antibiotics use
    - Poor Nutrition
    - Fat Malabsorption
  - Vitamin K Antagonist
    - Coumadin (Warfarin) use

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Normal PT (INR), Long PTT

- **Bleeding Tendency**
  - **Congenital**
    - Hemophilia*
      - Factor VIII Deficiency (Hemophilia A)
      - Factor IX Deficiency (Hemophilia B)
    - Factor XI Deficiency
    - von Willebrand's Disease with a low Factor VIII
  - **Acquired**
    - Factor VIII Inhibitor
    - Heparin
    - Other Factors (rare)

- **No Bleeding Tendency**
  - **Congenital**
    - (Intrinsic Pathway Factor Deficiency)
  - **Acquired**
    - Factor XII
    - Prekallikrein (Fletcher Factor)
    - High Molecular Weight Kininogen (Fitzgerald Factor)
    - Antiphospholipid Antibodies (APLA)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Dehydration

History and Physical exam

Clinical assessment of dehydration severity

- Slightly decreased urine output
- Slightly increased thirst
- Slightly dry mucous membrane
- Normal to Slightly elevated heart rate
- Normal blood pressure
- Normal skin turgor

Mild Dehydration*
- Infant 5%
- Child 3%

- Decreased urine output
- Moderately increased thirst
- Dry mucous membrane
- Elevated heart rate
- Normal blood pressure
- Decreased skin turgor
- Sunken eyes
- Sunken anterior fontanelle

Moderate Dehydration*
- Infant 10%
- Child 6%

- Markedly decreased or absent urine output
- Greatly increased thirst
- Very dry mucous membrane
- Greatly elevated heart rate
- Hypotension
- Decreased skin turgor
- Very sunken eyes
- Very sunken anterior fontanelles
- Cold extremities
- Lethargy, altered level of consciousness

Severe Dehydration*
- Infant >15%
- Child >9%

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Hyponatremia

Is this TRUE hyponatremia? Check plasma osmolality

True Hyponatremia

Is ADH appropriately suppressed? Check urine osmolality

Urine osmolality <100

ADH suppressed

• Polydipsia
• Decreased osmolar intake
  • Abuse/neglect*
  • Inappropriate formula
• Water intoxication
  • Abuse/neglect*
  • Inappropriate formula
  • Iatrogenic

Hypovolemic

• Renal (UNa >20, FENa >1%)
  • Osmotic diuresis (Eg. Diabetic Ketoacidosis*)
  • Hypoaldosteronism
  • Diuretics
• Polyuric Acute Tubular Necrosis
  • Extra renal (UNa<10, FENa <1%)
  • GI losses (gastroenteritis*, pyloric stenosis*)
  • Insensible losses (Cystic Fibrosis*, Burns*)

Euvolemic

• SIADH
• Endocrinopathies
• Adrenal insufficiency

Pseudo-Hyponatremia

• Hyperglycemia
• Hypertriglyceridemia

ADH present

Why is ADH present? Check clinical volume status

Urine osmolality >100

Hypervolemic

Low intravascular volume (↓EABV)

• Congestive heart failure*
• Nephrotic syndrome*
• Nephritis syndrome*
• Sepsis* with capillary leak

High intravascular volume (↑EABV)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Hypernatremia

Pediatric

Hyponatremia

Hypervolemic/Euvolemic

Check clinical volume status

Hypovolemic

Salt Excess

Exogenous
Abuse/Neglect*
Iatrogenic
Inappropriate formula preparation

Endogenous
Hyperaldosteronism

Water Deficit

Fluid losses

Reduced intake

Uosm >600

Abuse/Neglect*
Brain Tumour*

Hypothalamic dysfunction

Renal Loss

Osmotic Diuresis

Uosm > Posm, Uosm 300-600

Diabetic Ketoacidosis* (Glucosuria)
Mannitol
Post-obstructive diuresis
Polyuric Acute Tubular Necrosis

Diabetes Insipidus

Uosm < Posm
FeNa > 1%
U Na <10

Nephrogenic Diabetes Insipidus
Central Diabetes Insipidus

GI Loss

Gastroenteritis*

Burns*
Sweat
Respiratory losses

Insensible Loss

Uosm >600

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Global Developmental Delay/Intellectual Disability

Delays in 2 or more domains including:
1. Motor (fine and/or gross motor)
2. Language
3. Social

Detailed medical and developmental history
Physical Examination
Developmental Observations
Consider social/environmental impacts

Prenatal

Intrinsic
- Genetic (Eg. Trisomy 21*, Fragile X, Rett syndrome, 22q11 deletion)
- Metabolic disease*
- CNS malformations
- Congenital hypothyroidism

Extrinsic
- Teratogens/Toxins (Eg. alcohol, drugs, medications)
- Congenital infections* (Eg. TORCH infections)

Perinatal
- Prematurity*
- Birth trauma* (Eg. intracranial hemorrhage, asphyxia/Hypoxic ischemic encephalopathy)
- Neonatal complications

Postnatal
- Trauma and brain injury (hypoxia, abusive head trauma*, accidental trauma, etc.)
- CNS infection (Eg. Meningitis*, encephalitis*)
- Neglect*
- Toxins (Eg. lead)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Fever (Age <1 Month)

Detailed History and Physical Exam

Rule out sepsis: CSF, blood and urine cultures Always consider and treat for bacterial sepsis, until proven otherwise

Non infectious
Extremely rare. Always consider and treat for bacterial sepsis first

Infectious

Bacterial
- Urinary Tract Infection*
- Meningitis*
- Occult bacteremia/sepsis*
- Skin and soft tissue infections (Osteomyelitis*, septic arthritis*)
- Pneumonia*

Viral*
- Encephalitis* (Herpes Simplex Virus)
- Respiratory viruses

Other
Extremely rare. Seen mostly in immunodeficiency. Always consider and treat for bacterial sepsis first
- Fungal
- Parasites

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Fever (Age 1-3 Months)

1. Fever Age 1-3 months
2. Detailed History and Physical Exam
3. Consider both Clinical approach to Fever in the <1 month old, AND Clinical approach to Fever in the >3 month old
Fever (Age >3 Months)

Fever: Age >3 months

Detailed History and Physical Exam

Clinical features and investigations not suggestive of infection
Often acute onset

Infectious

Bacterial
- Pneumonia*
- Otitis Media*
- Urinary Tract Infection*
- Occult bacteremia/sepsis*
- Meningitis*/Meningococccemia*
- Skin and soft tissue infections (Osteomyelitis*, septic arthritis*)
- Bacterial respiratory tract infections (Pharyngitis*, pertussis*, tracheitis*, pertonsillar abscess*, retropharyngeal abscess/cellulitis*, cervical adenitis*)

Viral
- Respiratory viruses (Eg. Influenza, RSV, rhinovirus, enterovirus, adenovirus, etc.)
- Mononucleosis*
- Gastroenteritis*

Other
- Extremely rare. Seen mostly in immunodeficiency, or occasionally acquired while travelling
  - Fungal
  - Protozoa (eg. malaria)
  - other parasites

Non infectious

Malignancy
- Leukemia*
- Lymphoma*
- Neuroblastoma*
- Brain tumor*
- bone tumor*

Autoimmune/Inflammatory
- Kawasaki disease*
- Inflammatory Bowel Disease*
- Systemic Lupus Erythematous
- Juvenile Idiopathic Arthritis

Other
- Acute abdomen* (Eg. appendicitis*)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Failure To Thrive

- Weight <3%ile OR
  - Weight falls over TWO major percentile lines, OR
  - Body mass index-for-age or weight-for-length < 3%ile

- Careful history including food intake
- Careful physical exam
- Obtain all growth records

Intake reduced

- Non-organic causes/contributors
  - Neglect*
  - Decreased breast milk supply
  - Inappropriate formula mixing
  - Poverty
  - Disturbed Parent-Child Relationship
  - Disordered Eating*
  - Oral aversion

- Organic causes
  - Gastroesophageal Reflux/Reflux Disease*
  - Neuromuscular disease with poor feeding
  - Anatomical issues (Eg. Cleft lip, etc.)
  - Dysphagia

- Decreased intake

Intake Normal or High

- Height and Head Circumference often preserved initially

Increased Losses

- Vomiting*
- Gastroesophageal Reflux/Reflex Disease*
- Renal Tubular Acidosis
- Malabsorption (Eg. Celiac Disease*, Cystic Fibrosis*, Inflammatory Bowel Disease*, short bowel syndrome, infectious/post-infectious diarrhea)

- Failure to Utilize
  - Metabolic Disease*

Increased Demands

- Congestive Heart Failure*
- Chronic Respiratory Distress (Eg. Cystic Fibrosis*, chronic aspiration)
- Malignancy (Eg. Leukemia*)
- Endocrinopathies (Eg. Hyperthyroidism)

- Decreased growth potential

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Short Stature

Concerning symptoms:
Low weight, dysmorphic, delayed puberty

Pathological

Disproportionate
- Skeletal Dysplasias (Eg. Achondroplasia)
- Rickets

Proportionate

Dysmorphic
- Trisomy 21*
- Turner Syndrome*
- Prader-Willi Syndrome
- Russell-Silver Syndrome

Non-Dysmorphic

Bone Age = Chronological Age
Familial Short Stature*

Bone Age < Chronological Age
Constitutional Delay*

Weight disproportionately low (<3rd %)

Psychosocial
- Nutrition and Feeding issues*
- Neglect*
- Disordered Eating*

Chronic Disease
- GI (i.e. Celiac Disease*, IBD*)
- Renal (Eg. Renal failure*)
- Cardiopulmonary (i.e. Cystic Fibrosis*, Congestive Heart Failure*)

Weight appropriate for height

Iatrogenic
- Chronic steroid use
- Radiation and Chemotherapy
- Bone Marrow Transplant

Endocrinopathy
- Hypothyroidism*
- Cushing’s Disease
- Growth Hormone Deficiency
- Congenital Adrenal Hyperplasia
- Panhypopituitarism

Intrauterine Insults
- Intrauterine Growth Retardation/Small for Gestational Age*
- Fetal Alcohol Spectrum Disorder*

Otherwise well

Assess bone age
Murmur In The Newborn (<48 Hours)

- Detailed history and physical exam

  - Harsh or diastolic murmur
  - Cyanosis or hypoxia
  - Abnormal or absent pulses
  - Upper limb blood pressure >20 mmHg above lower limb BP
  - Clinically unwell or unstable
  - Sudden deterioration

- Yes
  - Pathological murmur
    - Cyanotic Congenital Heart Disease*
      - Transposition of the Great Arteries
      - Truncus Arteriosus
      - Total Anomalous Pulmonary Venous Return
      - Tricuspid Atresia
      - Tetralogy of Fallot
      - Pulmonary Atresia
      - Ebstein’s anomaly
      - Hypoplastic left heart
    - Acyanotic Congenital Heart Disease*
      - Atrial septal defect
      - Ventricular septal defect
      - Coarctation of the Aorta
      - Aortic stenosis
      - Pulmonary stenosis
      - Arteriovenous malformation

- No
  - Benign murmur*
    - Peripheral Pulmonic Stenosis
    - Pulmonary flow murmur

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Murmur In The Newborn Beyond Neonatal Period

Murmur beyond neonatal period

Detailed history and physical exam

Normal S2
- Early systole, no diastolic component
- Low intensity
- Increases intensity with fever, anxiety
- Changes with position and Valsalva
- No family history of sudden death

Benign
- Pulmonary flow murmur
- Still murmur
- Venous hum
- Non-cardiac murmur (Eg. Anemia, hyperthyroidism)

Exercise intolerance
- Syncope with exertion
- Cyanosis
- Abnormal S1 or S2
- Loud or harsh murmur
- Diastolic, continuous, pansystolic or late systolic
- Ejection click
- Displaced apex
- Palpable heave/thrill
- Abnormal pulses
- Symptoms suggestive of congestive heart failure or shock

Pathological

Congenital Heart Disease*
- Rheumatic heart disease
- Bacterial endocarditis
- Tricuspid insufficiency
- Mitral insufficiency
- Mitral valve prolapse
- Cardiomyopathy/myocarditis

See Approach to Murmur: Murmur in the Newborn (<48 hrs)

Acquired Heart Disease
- See Approach to Murmur: Murmur in the Newborn (<48 hrs)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Preterm Infant Complications (<34 Weeks)

Complications Associated with the Extreme Preterm Infant (<34 weeks Gestational Age)

- Neurologic
  - Intraventricular Hemorrhage (IVH)
  - Retinopathy of Prematurity (ROP)
  - Neurodevelopmental Impairments (NDI)
  - Apnea of Prematurity (AOP)

- Respiratory
  - Respiratory Distress Syndrome (RDS)
  - Chronic Lung Disease (CLD)
  - Pulmonary Hypertension

- Cardiovascular
  - Congenital heart disease* (Eg. Persistent Ductus Arteriosis)

- Gastrointestinal
  - Necrotizing Enterocolitis (NEC)
  - Oral Aversion and other feeding difficulties
  - TPN cholestasis

- Renal
  - Nephrocalcinosis
  - Electrolyte disturbances
  - Hypertension

- Hematology
  - Anemia*

- Metabolic
  - Hypoglycemia*
  - Metabolic bone disease

- Infectious Diseases
  - Sepsis*

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Preterm Infant Complications (34-36 Weeks)

Complications Associated with the Late Preterm Infant (34-36 weeks Gestational Age)

- Neurologic
  - Apnea of Prematurity (AOP)

- Respiratory
  - Transient Tachypnea of the Newborn

- Gastrointestinal
  - Feeding difficulties

- Hematology
  - Neonatal Jaundice

- Metabolic
  - Hypoglycemia
  - Temperature instability

- Infectious Diseases
  - Sepsis

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Anemia By Mechanism

- **Normocytic, normochromic RBCs**
  - Increased reticulocytes
  - If chronic may have: Decreased Reticulocytes, MCV, MCH, MCHC, Serum Iron, Ferritin
  - Increased TIBC, Hypochromic RBCs

- **Blood Loss**
  - Acute bleed
  - Chronic bleed

- **Decreased RBC Production**
  - Iron Deficiency*
  - Leukemia*
  - B12/Folate Deficiency
  - Aplastic Anemia
  - Anemia of Chronic Disease

- **Hemolysis*/ Increased RBC Destruction**
  - Increased Reticulocytes, Increased Unconjugated Bilirubin, decreased haptoglobin, increased LDH, Spherocytes on Smear

- **Consumption/Sequestration**
  - Hypersplenism/
  - Splenomegaly
  - Thrombus

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Anemia By MCV

**Low Mean Corpuscular Volume for age**
- Iron Deficiency*
- Thalassemia*
- Lead Poisoning
- Anemia of Chronic Disease
- Sideroblastic anemia
- Anemia of Chronic Disease (Eg. Juvenile idiopathic arthritis*, IBD*, Chronic Infection, etc.)

**Normal Mean Corpuscular Volume for age**
- Bleeding*
- Hemolysis*
- Marrow Failure/infiltration (Eg. Leukemia*, Lymphoma*, Neuroblastoma*)
- Consumption/sequestration
- Anemia of Chronic Disease (e.g. Renal Disease, Liver Disease, Endocrinopathy, Chronic Inflammation, Chronic Infection)

**High Mean Corpuscular Volume for age**
- B12 Deficiency
- Folate Deficiency
- Drugs
- Reticulocytosis
- Liver Disease
- Hypothyroidism

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Microcytic Anemia

- Ferritin decreased, serum iron decreased, TIBC increased
  - Fe/TIBC <18%
  - MCV/RBC >13
- Ferritin normal/increased, serum iron decreased, TIBC normal/decreased
  - Fe/TIBC >18%
- Ferritin normal/increased, Serum iron normal, TIBC Normal
  - MCV/RBC <13,
  - +/- basophilic stippling,
  - +/- increased reticulocytes

Iron Deficiency*
- Reduced dietary intake (over consumption of cow’s milk)
- Malabsorption (Eg. Celiac disease*, Inflammatory Bowel Disease*)
- Chronic Blood Loss

Anemia of Chronic Disease
- Chronic inflammation (Eg. Juvenile Idiopathic Arthritis*, Inflammatory Bowel Disease*, Lupus, etc.)

Hemoglobinopathies*

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

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Paediatric Infectious Skin Rash

- **Bacterial**
  - Erythematous, poorly demarcated, non-palpable, blanchable rash
  - Pustules with overlying thick honey-yellow crusts. Occurs in clusters
  - Erythematous sand-paper like rash over trunk, extremities, cheeks. Strawberry tongue. Spares palms and soles. Pastia lines
  - Widespread erythroderma, involving the face, diaper, and intertriginous areas. Desquamation and crusting present. Nikolsky sign.
  - Purpuric, non blanchable rash over full body

- **Viral**
  - Cellulitis*
  - Impetigo*
  - Scarlet Fever*
  - Staph Scaled Skin
  - Meningococcemia*

- **Other**
  - Measles
  - Parvovirus
  - Roseola
  - Molluscum Contagiosum
  - Varicella

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Skin Lesion (Primary Skin)

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

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

Solid
- No Deep Component
  - Papule (≤ 1 cm diameter)
  - Plaque (> 1 cm diameter)
  - Firm/Edematous
- Deep Component
  - Nodule (1-3 cm diameter)
  - Tumor (> 3 cm diameter)
  - Transient/Itchy

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

Elevated

Fluid-Filled OR Semi-Solid-Filled
- Cyst

Fluid-Filled
- Purulent
  - Pustule
  - Vesicle (≤ 1 cm diameter)
  - Bulla (> 1 cm diameter)

Non-Purulent Fluid
- No Deep Component
  - Plaque (> 1 cm diameter)
  - Firm/Edematous
- Deep Component
  - Nodule (1-3 cm diameter)
  - Tumor (> 3 cm diameter)
  - Transient/Itchy

Wheals/Hives

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Skin Lesion (Secondary Skin)

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)

* Indicates Key Condition

This is not an exhaustive list of medical conditions.
Rash (Eczematous)

Skin Rash

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

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

- Blisters containing non-purulent fluid
  - Pustular

- Blisters containing purulent fluid
  - Reactive rash with various morphology

- Reactive

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

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

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

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

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

- Erythematous papules and vesicles distributed over hands and skin folds. Burrow may be present
  - Scabies

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Rash (Papulosquamous)

Skin Rash

- Pruritic/Scaly/Erythematous lesions. Usually poorly demarcated
- Erythematous or violaceous papules & plaques with overlying scale
- Blisters containing non-purulent fluid
- Blisters containing purulent fluid
- Reactive rash with various morphology

Eczematous

Papulosquamous

Vesiculobullous

Pustular

Reactive

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

Psoriasis

Purple, pruritic, polygonal, planar (flat-topped) papules on wrists/ankles/genitals

Lichen Planus

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)

Pityriasis Rosea

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

Tinea (Ring Worm)

Scarring and/or atrophic red/purple plaques with white adherent scales on sun-exposed area

Discoid Lupus Erythematosus

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Rash (Vesiculobullous)

Skin Rash

- Pruritic/Scaly/Erythematous lesions. Usually poorly demarcated

  Eczematous

- Erythematous or violaceous papules & plaques with overlying scale

  Papulosquamous

- Blisters containing non-purulent fluid

  Vesiculobullous

- Blisters containing purulent fluid

  Pustular

- Reactive rash with various morphology

  Reactive

Inflammatory

- Inflammatory pemphigoids
- Dermatitis herpetiformis
- Bullous systemic lupus erythematosus

Infectious

- Viral*
  - Varicella zoster (chickenpox)
  - Herpes zoster (shingles)
  - Herpes simplex
  - Impetigo* (Bullous form)

Reaction to Agent

- Contact dermatitis
- Drug eruptions*

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Rash (Reactive)

Skin Rash

- Pruritic/Scaly/Erythematous lesions. Usually poorly demarcated
  - Eczematous
  - Variable pattern and color
  - Ecchymosis
    - Trauma*
    - Physical abuse*
    - Thrombocytopenia (eg. Immune thrombocytopenia purpura*, leukemia*, etc)
    - Hemophilia*
  - Purpura
    - Meningococcemia*
    - Henoch Schonlein Purpura*
    - Immune thrombocytopenia purpura*
- Erythematous or violaceous papules & plaques with overlying scale
  - Papulosquamous
  - Deep red or purple, non-blanchable markings
- Blisters containing non-purulent fluid
  - Vesiculobullous
  - Firm/edematous papules & plaques that are transient & itchy. Usually lasts <24hrs
- Blisters containing purulent fluid
  - Pustular
  - Tender or painful red nodules on shins
- Reactive rash with various morphology
  - Reactive
  - Target lesions possibly with macules, papules, vesicles &/or bullae on palms soles and mucous membranes
  - Erythema Multiforme
    - Drug eruption*
    - Post infectious reaction
    - Stevens Johnson Syndrome
  - Erythema Nodosum
    - Inflammatory Bowel Disease*
    - Other autoimmune conditions
  - Urticaria
    - Allergy/anaphylaxis*
    - Drug eruption*
    - Viral induced urticaria

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Proteinuria

Persistent Proteinuria

Urine dip negative, but tubular proteins present (Alpha 1 microglobulin). May have Glucosuria, aminoaciduria, acidosis

Tubular Proteinuria

Primary
- Genetic/Metabolic disease* (Eg. Renal Fanconi’s, Wilsons disease)
- Drugs
- Heavy metals
- Nutritional

Secondary

Glomerular Proteinuria

Urine Microscopy

Active Sediment: RBC cells and casts, WBC casts

See “Edema: Clinical approach to Hematuria”

Primary
- Minimal Change Disease
- Focal Segmental Glomerular Sclerosis
- Membranous Nephropathy
- Mesangiproliferative Glomerulonephritis
- Genetic

Secondary
- Infection (Hepatitis virus, HIV, Malaria, Syphilis)
- Drugs (Penicillin, NSAIDs)
- Immune/Allergic disorders (Bee sting, Food allergies)
- Malignancy (Lymphoma, Leukemia)
- Diabetic nephropathy

Orthostatic Proteinuria

First morning urine x 3

Transient Proteinuria

Negative

Repeat testing

Exercise
Fever
Hematuria

Extraglomerular
- Vascular (Thrombosis, vascular malformations) Nutcracker syndrome
- Infectious (Pyelonephritis*, UTI*)
- Traumatic (Perineal irritation, vulvovaginitis*, trauma)
- Neoplasm (Wilms Tumor*)
- Renal calculi/hypercalciuria
- Sickle cell disease
- Bleeding diathesis (Eg. Hemophilia*, Immune Thrombocytopenia Purpura*)

Glomerular
- Isolated Hematuria with Benign Sediment
  - IgA nephropathy*
  - Thin basement membrane
  - Alports
  - Benign Familial Hematuria
  - Henoch Schonlein Purpura*

Hematuria with Active Sediment
- C3
  - Normal/high C3
    - Antibody mediated (anti-GBM antibodies)
      - Anti GBM/ Goodpastures
      - Pauci-immune (+ANCA)
      - Granulomatosis with polyangiitis
      - Polyarteritis Nodosa
      - Henoch Schonlein Purpura*
      - Hemolytic Uremic Syndrome*
  - Low C3
    - Immune Complex mediated
      - Post-infectious glomerulonephritis*
      - Membranoproliferative glomerulonephritis
      - Lupus nephritis

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Acute Renal Failure

Acute decrease in Glomerular Filtration Rate (GFR)

Pre-Renal
(FeNa < 1%, bland urine sediment)
- Shock* (Eg. Hypovolemia, decreased cardiac output, etc.)
- Renovascular Thrombi/Emboli
- Hepatorenal syndromes

Renal
(FeNa > 2%)

Urinalysis, urine microscopy, CBC

Post-Renal
(Obstruction/hydronephrosis on U/S)
- Constipation*
- Tumor (Eg. Wilms Tumor*)
- Congenital defects (Eg. Posterior Urethral valve)
- Urolithiasis
- Blocked foley catheter

Tubular/Interstitial

Sterile pyuria, eosinophiluria, epithelial casts

Glomerular

Active sediment: RBC casts, dysmorphic RBCs, proteinuria

- Immune-complex deposition (IgA nephropathy*, post-infectious*, lupus)
- Antibody mediated (anti-GBM antibodies)
  - Anti GBM/ Goodpastures
- Pauci-immune (+ANCA)
  - Granulomatosis with polyangitis
  - Polyarteritis Nodosa
- Henoch Schonlein Purpura*
- Hemolytic Uremic Syndrome*

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Chronic Kidney Disease

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

Pre-Renal
(Evidence of Renovascular disease)
- Renal artery stenosis
- Drugs (Eg. NSAIDs)
- Chronic hypoperfusion

Renal
(Abnormal urinalysis: proteinuria/pyuria)

Post-Renal
(Obstruction/hydronephrosis on U/S)
- Obstructive uropathy
- Reflux nephropathy
- Constipation*

Tubular/Interstitial
- Urinary Tract Infection* (chronic or recurrent pyelonephritis)
- Congenital abnormalities of the kidney and urinary tract (Eg. Polycystic kidney disease)
- Immune (sarcoid, Sjögren)
- Hypercalciuria/nephrolithiasis
- Drugs (NSAIDs, analgesics)

Glomerular
- Nephrotic Syndrome* (steroid resistant)
- Glomerulonephritis*
- Hemolytic Uremic Syndrome*
- Diabetes*

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Edema

Clinical history
Clinical fluid assessment

Altered Starlings Forces

Increased Interstitial Oncotic Pressure
- Hypothyroid (Myxedema)

Increased Capillary Hydrostatic Pressure
- Renal
  - Renal failure*
  - Glomerulonephritis*

  Cardiac
  - Congestive heart failure*
  - Constrictive pericarditis

  Other
  - Pregnancy
  - Portal Hypertension

Low serum albumin due to loss or impaired synthesis
- Nephrotic syndrome*
- Nephritic syndrome*
- Liver failure/Cirrhosis
- Protein losing enteropathy
- Burn*
- Malnutrition

Increased Capillary Oncotic Pressure

Increased Capillary Permeability
- Sepsis*
- Vasculitis/inflammation (eg. Henoch Schönlein Purpura, Kawasaki disease*, Systemic Lupus Erythematosus)
- Burn*
- Anaphylaxis*

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Dysuria

Detailed history of physical exam
Urinalysis
Urine cultures

Normal Genitourinary exam

Urine Culture positive

*Urinary Tract Infection

Fever, other systemic symptoms

Upper Urinary Tract Infection/Pyelonephritis
- Bacterial
- Candida
- Sexually Transmitted Infections*

No fever, otherwise well

Lower Urinary Tract Infection/Cystitis
- Bacterial
- Candida
- Sexually Transmitted Infections*

Urine Culture negative

Further urine studies warranted

- Viral infection
- Inflammatory (Eg. Kawasaki Disease*)
- Nephrolithiasis

Vesicles or Ulcers

- Sexually Transmitted Infections*
- Infectious (Eg. HSV, CMV)
- Systemic inflammatory illness (Eg. Steven-Johnson syndrome)
- Autoimmune conditions (Eg. Inflammatory bowel disease*, Becets disease)

No vesicles or ulcers

- Vulvo-vaginitis* (Eg. Group A Streptococcus infection, candida infection, irritation)
- Balanitis*
- Phimosis*
- Labial adhesions
- Anatomic (Eg. Trauma, chemical irritation, foreign body)
- Dermatologic (Contact dermatitis, lichen planus, psoriasis, inflammatory skin conditions)

* Indicates Key Condition

This is not an exhaustive list of medical conditions.
Increased Urinary Frequency

Detailed history and physical exam

u/o<7mL/kg/hr, and u/o appropriate for intake

No polyuria

 Urinalysis
 Urine Culture

Urine culture positive

 Urinary Tract Infection
 See "Genitourinary Complaints: Clinical approach to Dysuria"

Urine culture negative

 Urinary obstruction (Eg. Nephrolithiasis)
 Small volume bladder
 Detrusor hyperactivity
 Vulvovaginitis*
 Bladder compression
 Constipation*
 Mass
 Pregnancy

Other

Polyuria

u/o>7mL/kg/hr, or inappropriately high for intake

Check serum and urine osmolality

Urine Osmolality > Serum Osmolality

Osmotic Diuresis

• Diabetes Mellitus*
• Renal Failure* (high output)
• Iatrogenic (Mannitol, NaCl)

Water Diuresis

Urine Osmolality < Serum Osmolality

Water deprivation test

Hypotonic urine

Diabetes Insipidus

• Central Diabetes Insipidus
• Nephrogenic Diabetes Insipidus

Hypertonic Urine

Primary polydipsia

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Scrotal Mass

- Painful
  - Sudden Onset
    - Testicular Torsion*
    - Torsion of the Testicular Appendix
    - Trauma
    - Incarcerated Hernia
  - Gradual Onset
    - Acute Epididymitis
    - Epididymo-orchitis
    - Trauma (Eg. Hematoma)
- Painless
  - Trans-illuminates
    - Hydrocele
    - Indirect hernia
  - Does Not Trans-illuminates
    - Tumor (Eg. Leukemia*)

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
Lymphadenopathy

Detailed history and Physical exam

Reactive

Inflammatory
• Systemic Lupus Erythematosus
• Juvenile Idiopathic Arthritis*
• Kawasaki Disease*

Infectious
• Viral (Eg. Viral URTI, EBV, CMV)
• Bacteria (Eg. Pharyngitis*, cervical adenitis*, Tuberculosis)

Other
• Acne
• Allergy
• Insect Bites

Neoplastic
• Leukemia*
• Lymphoma*

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Otalgia (Earache)

Non-infectious
- Foreign body
- Trauma

Infectious
- Otitis Media *
- Otitis Externa *

Referred pain
- Neurological (neuralgias, migraine*)
- Skull (mastoiditis, TMJ)
- Teeth (dental disease*, abscesses)
- Throat (pharyngitis*, peritonsillar abscess*, retropharyngeal abscess/cellulitis*, stomatitis* )
- Neck (cervical adenitis*, reactive lymphadenopathy* )
- Skin and soft tissue (cellulitis*, eczema*)

*Indicates Key Condition
This is not an exhaustive list of medical conditions.
Sore Throat/Sore Mouth

**Referred**
- Neurological (neuralgias, migraine*)
- Skull (mastoiditis, TMJ)
- Ear (otitis media*, otitis externa*)
- Teeth (dental disease*, abscesses)
- Neck (cervical adenitis*, reactive lymphadenopathy*)
- Skin and soft tissue (cellulitis*, eczema*)

**Throat/mouth**

**Stomatitis (Non-Infectious)**
- Canker sores
- Inflammatory (SLE, Crohn’s Disease*, Kawasaki Disease*)
- Drugs* (Steven Johnson, Mucositis)
- Allergy
- Trauma

**Infectious**

**Bacterial**
- Pharyngitis* (Group A Streptococcal, other)
- Retropharyngeal abscess/cellulitis*
- Peritonsillar abscess*
- Epiglottitis*

**Other**
- Viral* (EBV, CMV, HSV, Coxsackie Virus, other viral)
- Fungal (oral thrush*)

*Indicates Key Condition

This is not an exhaustive list of medical conditions.
General Presentations

Fatigue................................................................. 395
Acute Fever......................................................... 396
Fever of Unknown Origin / Chronic Fever. 397
Hypothermia......................................................... 398
Sore Throat / Rhinorrhea.................................... 399
Historical Editors
Dr. Heather Baxter
Dr. Harvey Rabin
Dr. Ian Wishart
Brittany Weaver
Geoff Lampard
Harinee Surendra
Kathy Truong

Student Editors
Adrianna Woolsey
Fatima Pirani

Senior Editor
Dr. Monique Munro

Faculty Editor
Dr. Sylvain Coderre
Fatigue

Exclude Sleep Disturbance/Lifestyle Issues/Pregnancy

Organic Etiologies

Endocrine/Metabolic
- Anemia
- Malignancy

Neoplastic/Hematologic
- Endocarditis
- Tuberculosis
- Epstein-Barr Virus
- Hepatitis
- HIV

Infectious
- Hepatitis
- HIV

Chronic Disease
- Hypnotics
- Anti-hypertensives
- Anti-Depressants
- Drug Abuse (e.g. Alcohol)
- Drug Withdrawal

Pharmacologic
- Anxiety
- Somatization Disorder
- Malnutrition/Drug Addiction

Psychogenic
- Chronic Fatigue Syndrome

Idiopathic

No Organic Etiologies

Endocrine
- Hypo/Hyper-thyroidism
- Diabetes
- Pituitary Insufficiency
- Adrenal Insufficiency

Metabolic
- Renal Failure
- Liver Failure
- Hypercalcemia

Autoimmune/Inflammatory
- Rheumatoid Arthritis
- Celiac Disease
- SLE
- Polymyalgia Rheumatica

Cardio-pulmonary
- Congestive Heart Failure
- Chronic Obstructive Pulmonary Disease

Neurologic
- Depression
- Multiple Sclerosis
- Stroke
- Parkinson’s
- Myasthenia Gravis
Acute Fever

Fever (acute onset)

Infectious

Viral
- Rhinovirus
- Influenza Virus
- Parainfluenza Virus
- Adenovirus
- Enterovirus
- Coronavirus
- HIV

Bacterial
- Fungal
- Protozoa (eg. malaria)
- Other parasites

Other

Inflammatory
- PE
- Thrombophlebitis
- DVT
- Pancreatitis

Iatrogenic
- Transfusion reaction
- Malignant Hyperthermia
- Neuroleptic malignant syndrome

Endocrine
- Thyroid storm
- Acute Adrenal Insufficiency

Other
- Heat stroke
- Sickle Cell disease
- Drug fever
- MI

Non-infectious

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

- **Infection**
  - *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

- **Organ Specific Infection**
  - • Infectious endocarditis
  - • Osteomyelitis
  - • Occult abscess
  - • Sinusitis
  - • Cholangitis
  - • UTI
  - • Meningitis

- **Non-organ specific**
  - • Brucellosis
  - • Q-fever
  - • Salmonella
  - • Yersinia
  - • Tuleremia
  - • Septic Phlebitis
  - • Rheumatic fever
  - • Lyme disease
  - • TB
  - • Whipple’s disease

- **Viral**
  - • HIV
  - • EBV
  - • CMV
  - • Viral hepatitis
  - • Enterovirus

- **Other**
  - • Fungal
    - • Protozoa (eg. malaria)
  - • other parasites
Hypothermia

- Environmental
  - Immersion
  - Non-Immersion

- Acute Illness

- Body Heat Loss
  - Drugs/Toxins
  - Iatrogenic
  - Burns

- Lack of Body Heat Generation
  - Hypothyroidism
  - Adrenal Insufficiency
  - Hypoglycemia
  - Malnutrition

- Improper Thermoregulation
  - Cerebrovascular Accident
  - Central Nervous System Trauma
  - Multiple Sclerosis
  - Drugs/Toxins

- Other
  - Trauma
  - Sepsis
  - Vascular Insufficiency
  - Uremia
Sore Throat / Rhinorrhea

Common viral pathogens:
Rhinovirus, Coronavirus, Influenza virus, Parainfluenza Virus, Adenovirus, Herpes Simplex Virus, Enterovirus (Coxsackie, Echo), Epstein Barr Virus, Cytomegalovirus, HIV
Most common bacterial pathogen:
Group A Beta Hemolytic Streptococcus pyogenes (GABHS)

Predominantly Rhinorrhea
- Acute
  - Acute Viral Sinusitis
  - Acute Bacterial Sinusitis
  - Acute Head Cold Syndrome
- Chronic
  - Allergic/Vasomotor/Drug Rhinitis
  - Nasal Polyposis
  - Chronic Sinusitis
  - Nasopharyngeal Cancer

Predominantly Sore Throat
- Acute
  - Acute Viral Pharyngitis
  - Acute Influenza
  - Acute Viral Laryngotracheitis
  - Acute Viral Tracheobronchitis
  - Acute Infectious Mononucleosis
  - Herpangina
- Chronic
  - GERD
  - Environmental
  - Trauma
  - Foreign Body
  - Neoplasm
  - Streptococcal Tonsillitis/Pharyngitis
  - Peritonsillar Abscess
  - Ludwig’s Angina
Historical Executive Student Editors

2016-2017    Joshua Nicholas, Peter Rogers & Scott Belyea
2015-2016    Jared McCormick & Hai (Carlos) Yu
2014-2015    Jared McCormick & Hai (Carlos) Yu
2013-2014    Yang (Steven) Liu & Brian Glezerson
2012-2013    Neha Sarna & Sarah Sy
2011-2012    Katrina Kelly & Harinee Surendra
2010-2011    Jonathan Dykeman & Kathy Truong
2009-2010    Lucas Gursky & Ting Li
2008-2009    Linnea Duke & Mustafa Hirji
2007-2008    Brett Poulin (Founder of the Calgary Black Book Project)
Scheme Creators

Students
M. Abouassaly
A. Aristarkhova
M. Broniewska
P. Chen
M. Chow
R. Cormack
P. Davis
L. Duke
J. Evinu
A. Geist
F. Girgis
A. Hicks
J. Hodges
G. Ibrahim
C. Johannes
D. Joo
S. Khan
L. Kimmet
M. Klassen
J. Lawrence
J. Laxton
K. Leifso
J. McCormick
V. Lekhi
S. Lipkewich
C. Lu
L. Luft
A. Lys
D. McDougall
B. McLane
J. McMann
J. Nadeau
B. Poulin
V. Prajapati
N. Ramji
K. Sahi
R. Schachar
P. Schneider
R. Simms
A. Skinn
U. Unligil
C. Verenka
H. Waymouth
P. Zareba
K. Swicker
V. David

Faculty
K. Burak
D. Burback
K. Busche
S. Casha
M. Clark
S. Coderre
M. Doran
P. Federico
K. Fraser
S. Furtado
N. Hagen
J. Huang
N. Jette
A. Jones
G. Klein
S. Kraft
A. Mahalingham
H. Mandin
J. Mannerfeldt
K. McLaughlin
D. Miller
L. Parsons
D. Patry
A. Peets
G. Pineo
M-C. Poon
H. Rabin
T. Remington
B. Ruether
A. Smithee
O. Suchowersky
P. Veale
B. Walley
L. Welikovitch
R.C. Woodman
L. Zanussi

Missing a credit?
If you are the creator of a scheme currently used in the Blackbook and believe you have not been credited appropriately, please contact us at blackbk@ucalgary.ca
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>Abdominal Aortic Aneurysm</td>
</tr>
<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>
</tr>
<tr>
<td>ARB</td>
<td>Angiotensin Receptor Blocker</td>
</tr>
<tr>
<td>ARF</td>
<td>Acute Renal Failure</td>
</tr>
<tr>
<td>ARPKD</td>
<td>Autosomal Recessive Polycystic Kidney Disease</td>
</tr>
<tr>
<td>BPH</td>
<td>Benign Prostatic Hypertrophy</td>
</tr>
<tr>
<td>CCD</td>
<td>Cortical Collecting Duct</td>
</tr>
<tr>
<td>CHF</td>
<td>Congestive Heart Failure</td>
</tr>
<tr>
<td>CIN</td>
<td>Chronic Interstitial Nephritis</td>
</tr>
<tr>
<td>CLL</td>
<td>Chronic Lymphocytic Leukemia</td>
</tr>
<tr>
<td>CNS</td>
<td>Central Nervous System</td>
</tr>
<tr>
<td>COPD</td>
<td>Chronic Obstructive Pulmonary Disease</td>
</tr>
<tr>
<td>CRF</td>
<td>Chronic Renal Failure</td>
</tr>
<tr>
<td>CRH</td>
<td>Corticotrophic Releasing Hormone</td>
</tr>
<tr>
<td>CT</td>
<td>Computed Tomography</td>
</tr>
<tr>
<td>DCIS</td>
<td>Ductal Carcinoma In Situ</td>
</tr>
<tr>
<td>DHEA</td>
<td>Dehydroepiandrosterone</td>
</tr>
<tr>
<td>DHEA-S</td>
<td>Dehydroepiandrosterone Sulfate</td>
</tr>
<tr>
<td>DIC</td>
<td>Disseminated Intravascular Coagulation</td>
</tr>
<tr>
<td>DKA</td>
<td>Diabetic Ketoacidosis</td>
</tr>
<tr>
<td>DRE</td>
<td>Digital Rectal Exam</td>
</tr>
<tr>
<td>DVT</td>
<td>Deep Vein Thrombosis</td>
</tr>
<tr>
<td>EABV</td>
<td>Effective Arterial Blood Volume</td>
</tr>
<tr>
<td>ECF</td>
<td>Extracellular Fluid</td>
</tr>
<tr>
<td>ENaC</td>
<td>Epithelial Sodium Channel</td>
</tr>
<tr>
<td>FEV1</td>
<td>Forced Expiratory Volume in One Second</td>
</tr>
<tr>
<td>FJN</td>
<td>Familial Juvenile Nephronophthisis</td>
</tr>
<tr>
<td>FSGS</td>
<td>Focal Segmental Glomerulosclerosis</td>
</tr>
<tr>
<td>FSH</td>
<td>Follicle Stimulating Hormone</td>
</tr>
<tr>
<td>FVC</td>
<td>Forced Vital Capacity</td>
</tr>
<tr>
<td>GBM</td>
<td>Glomerular Basement Membrane</td>
</tr>
<tr>
<td>GERD</td>
<td>Gastrointestinal Esophageal Reflux Disease</td>
</tr>
<tr>
<td>GFR</td>
<td>Glomerular Filtration Rate</td>
</tr>
<tr>
<td>GHRH</td>
<td>Growth Hormone Releasing Hormone</td>
</tr>
<tr>
<td>GH</td>
<td>Growth Hormone</td>
</tr>
<tr>
<td>GI</td>
<td>Gastrointestinal</td>
</tr>
<tr>
<td>GN</td>
<td>Glomerulonephritis</td>
</tr>
<tr>
<td>GnRH</td>
<td>Gonadotropin Releasing Hormone</td>
</tr>
<tr>
<td>GPA</td>
<td>Granulomatosis with Polyangiitis</td>
</tr>
<tr>
<td>GRA</td>
<td>Glucocorticoid</td>
</tr>
<tr>
<td>GTN</td>
<td>Gestational Trophoblastic Neoplasm</td>
</tr>
<tr>
<td>H+</td>
<td>Hydrogen</td>
</tr>
<tr>
<td>HCG</td>
<td>Human Chorionic Gonadotropin</td>
</tr>
</tbody>
</table>
High Density Lipoprotein
Hemolysis, Elevated Liver Enzymes, Low Platelets
Human Immunodeficiency Virus
Human Peripheral Lung Epithelial Cell Line 1a
Hormone Replacement Therapy
Henoch-Schönlein Purpura
Herpes Simplex Virus
Hemolytic-Uremic Syndrome
Irritable Bowel Disease
Irritable Bowel Syndrome
Increased Intracranial Pressure
Intensive Care Unit
Insulin-like Growth Factor
International Normalized Ratio
Idiopathic Thrombocytopenic Purpura
Intrauterine Growth Restriction
Intravenous
Intravenous Pyelogram
Jugular Venous Pyelogram
Potassium
Kidney, Ureter, Bladder
Lobular Carcinoma In Situ
Low Density Lipoprotein
Large for Gestational Age
Luteinizing Hormone
Lower Limit of Normal
Level of Consciousness
Lipoprotein Lipase
Minimal Change Disease
Mean Corpuscular Hemoglobin
Mean Corpuscular Hemoglobin Concentration
Mean Corpuscular Volume
Multiple Endocrine Neoplasma
Myocardian Infarction
Microscopic Polyangiitis
Membranoproliferative Glomerulonephritis
Multiple Sclerosis
Musculoskeletal
Sodium
Non-Steroidal Anti-Inflammatories
Oral Contraceptive Pill
Osmolality
Pulmonary Embolism
Pelvic Inflammatory Disease
Polymorphic Neutrophils
Plasma Osmolality
Preterm Premature Rupture of Membranes
Premature Rupture of Membranes
Prothrombin Time
Parathyroid Hormone
Partial Thromboplastin Time
Peptic Ulcer Disease
Pelviureteric Junction
Right Afferent Pupillary Defect
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAS</td>
<td>Renal Artery Stenosis</td>
</tr>
<tr>
<td>RBC</td>
<td>Red Blood Cell</td>
</tr>
<tr>
<td>RTA</td>
<td>Renal Tubular Acidosis</td>
</tr>
<tr>
<td>SGA</td>
<td>Small for Gestational Age</td>
</tr>
<tr>
<td>SLE</td>
<td>Systemic Lupus Erythematosus</td>
</tr>
<tr>
<td>TORCH</td>
<td>Toxoplasmosis, Other (Hepatitis B, Syphilis, Varicella-Zoster virus, HIV, Parvovirus B19), Rubella, Cytomegalovirus, Herpes Simplex Virus</td>
</tr>
<tr>
<td>TSH</td>
<td>Thyroid Stimulating Hormone</td>
</tr>
<tr>
<td>TSHR</td>
<td>Thyroid Stimulating Hormone Receptor</td>
</tr>
<tr>
<td>TTKG</td>
<td>Transtubular Potassium Gradient</td>
</tr>
<tr>
<td>TTP</td>
<td>Thrombotic Thrombocytopenic Purpura</td>
</tr>
<tr>
<td>UTI</td>
<td>Urinary Tract Infection</td>
</tr>
<tr>
<td>US</td>
<td>Ultrasound</td>
</tr>
<tr>
<td>VACTERL</td>
<td>Vertebral Anomalies, Anal Atresia, Cardiovascular Anomalies, Tracheoesophageal Fistula, Esophageal Atresia, Renal Anomalies, Limb Anomalies</td>
</tr>
<tr>
<td>VSD</td>
<td>Ventricular Septal Defect</td>
</tr>
<tr>
<td>VUJ</td>
<td>Vesicoureteral Junction</td>
</tr>
</tbody>
</table>
Notes
Superficially resembling flowcharts, schemes are a way to ease the memorization of differential diagnoses by breaking large lists into sets of smaller, conceptually-intuitive information packets. Using the Medical Council of Canada’s Clinical Presentation List, *Blackbook* organizes the most common medical presentations of patients into diagnostic schemes. As a tool for medical students, residents, allied health trainees, and health care educators, medical presentation schemes will ease the learning of the volume of medical diagnoses, and will facilitate recall when needed.

Based on the medical presentation schemes used in the University of Calgary Medical curriculum, *Blackbook* is a joint production of the students and the Cumming School of Medicine at the University of Calgary.

© 2019 Cumming School of Medicine, University of Calgary.