

**déjàreview**



# Internal Medicine

SECOND EDITION

**MAXIMUM  
RETENTION**

**•  
MINIMAL  
TIME**

- Active recall Q&A for exam success
- Mnemonics and clinical vignettes cover core concepts

Sarvenaz S. Saadat Mobasser

**DEJA REVIEW™**  
**Internal Medicine**

## NOTICE

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# DEJA REVIEW™

## Internal Medicine

Second Edition

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*To my beautiful daughters Chaya and Charlotte:  
You are the inspiration for everything I do.  
You put the twinkle in my eyes.  
Always reach for the moon and the stars!  
With all my love,  
Mommy*





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# Preface

The principles learned in *internal medicine* are the fundamental core principles applied in clinical medicine as well as the largest proportion of questions posed on the USMLE Step 2CK exam. In order to do well both on the wards and on the Step 2CK exam, you must have a solid foundation in these principles. This guide has been written as a high-yield resource to endorse the rapid recall of the essential facts in a well-organized and efficient manner.

## ORGANIZATION

All concepts are presented in a question and answer format that covers the key facts on hundreds of commonly tested internal medicine topics that may appear on the USMLE Step 2CK exam. The material is divided into chapters organized by internal medicine subcategories, along with vignettes at the end of each chapter that incorporate the material with their clinical presentation and relevance.

This question and answer format has several advantages:

- It provides a rapid, straightforward way for you to assess your strengths and weaknesses.
- It allows you to efficiently review and commit to memory a large body of information.
- The clinical vignettes incorporated expose you to the prototypical presentation of diseases classically tested on USMLE Step 2CK.
- It serves as a quick, last-minute review of high-yield facts.
- Compact, condensed design of the book is conducive to studying on the go.

## HOW TO USE THIS BOOK

This text is intended to be used not only to study for the USMLE Step 2CK exam but is also an essential tool while on the internal medicine and medicine subspecialty rotations, and during medical school. Remember, this text is not intended to replace comprehensive textbooks, course packets, or lectures. It is simply intended to serve as a supplement to your studies during your internal medicine clinical rotation and throughout your preparation for Step 2CK. We encourage you to begin using this book early in your third year to reinforce topics you encounter while on the wards. Also, it is recommended that you cover up the answers (rather than just reading both the questions and the answers) and quiz yourself or even your classmates. Carry the book in your white coat pocket so that you can easily access study material during down time. However you choose to study, we hope you find this resource helpful throughout your clinical years and during your preparation for USMLE Step 2CK. Best of Luck!

*Sarvenaz S. Saadat Mobasser, MD*



# Introduction

## Important Lab Values

Blood Test	Value
Albumin, serum	3.2-5.5 g/dL
Alkaline phosphatase	26-110 IU/L
Ammonia, plasma	17-60 $\mu\text{mol/L}$
Amylase, serum	25-125 IU/L
Bilirubin	
Direct	0-0.2 mg/dL
Total	0-1.4 mg/dL
Calcium	9-10.6 mg/dL
Chloride	101-111 mEq/L
CO <sub>2</sub>	25-34 mEq/L
Cortisol, AM	6-28 $\mu\text{g/dL}$
Cortisol, PM	3-16 $\mu\text{g/dL}$
CPK	22-269 U/L
Creatinine	0.5-1.3 mg/dL
D-Dimer	<0.5 $\mu\text{g/mL}$
ESR, female	0-20 mm/h
ESR, male	0-15 mm/h
Ferritin, female	10-1107 ng/mL
Ferritin, male	23-233 ng/mL
Folate	3-18.2 ng/mL
Glucose	70-115
Hematocrit, female	34%-44%
Hematocrit, male	39.5%-50%
Hemoglobin, female	11.5-15 g/dL
Hemoglobin, male	13.5-16.9 g/dL
Iron, female	37-170 $\mu\text{g/dL}$
Iron, male	49-181 $\mu\text{g/dL}$
Lactate dehydrogenase (LDH)	91-180 IU/L
Lipase	4-24 IU/L
Magnesium	1.8-2.5 mg/dL
Osmolality, serum	278-305 mOsm/kg
Osmolality, urine	50-1200 mOsm/kg
Phosphorus	2.5-4.6 mg/dL

Platelets	150-450,000
Potassium	3.3-4.8 mEq/L
Prealbumin	18-45 mg/dL
Protein, total	6.7-8.2 g/dL
PSA, age age 0-39	0-1.4 ng/mL
PSA, age age 40+	0-2.8 ng/mL
Reticulocyte count	0.5%-1.5%
SGOT	10-42 U/L
SGPT	<60 U/L
Sodium	135-145 mEq/L
T3 uptake	25%-38%
T4 total	0.7-2.1 ng/dL
Transferrin	212-360 mg/dL
TSH	0.5-5.0 $\mu$ IU/mL
Uric acid	2.6-7.2 mg/dL
WBC	4500-10,500

## Writing Notes

**Daily progress note:** This should be in SOAP format.

**Subjective:** In this area you should report any overnight events, how the patient is feeling today, any complaints or problems the patient may be experiencing, and pertinent positives and negatives.

**Objective:** Any physical findings are reported in this section.

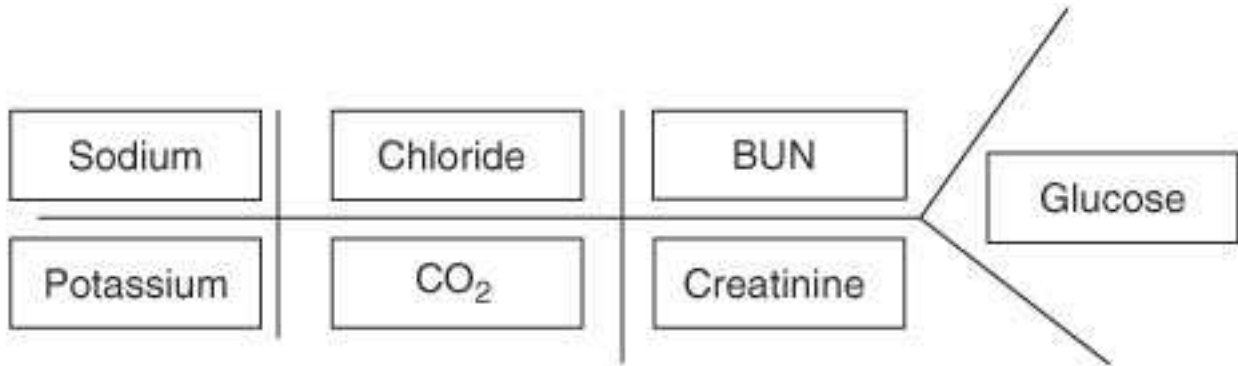
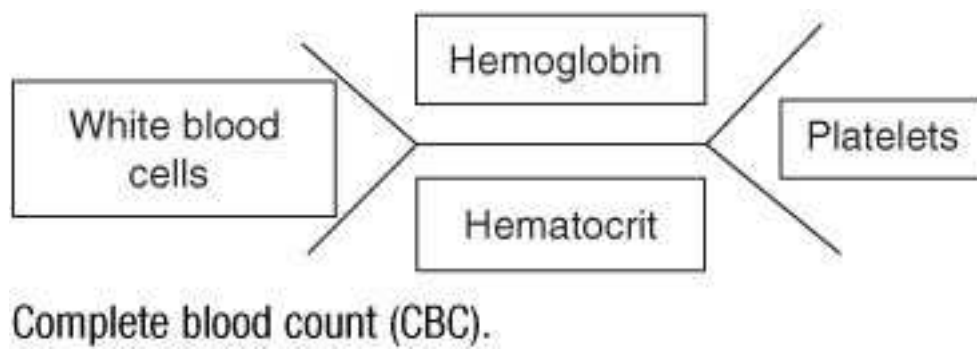
Vitals: temperature, max temperature, blood pressure, pulse, respiratory rate, oxygen saturation

Glucose (if patient is diabetic): Ins and Outs (Ins = IV fluids + po intake + any parenteral intake or blood products over 24 hours and Outs = urine output + stool + other [NG tube, chest tube, drains, emesis])

Physical examination:

- General: Patient's general appearance
- HEENT (head, eyes, ears, nose, throat)
- Cardiovascular
- Pulmonary
- Abdomen
- Extremities
- Neurologic

Labs: Laboratory tests are reported here.



Chemistry 7.

**Meds:** Some people include a list of all the medication the patient is currently using. **Assessment** and **plan:** Write a summary of the patient, their problem(s) and possible differentials. Then write the plan for each problem.

X

*Sign your note*

### Example

S: Patient has no complaints today. She is no longer short of breath and was able to ambulate yesterday.

O: T: 36.8°C, Tmax 37°C, P: 70-85, BP: 128-148/68-80, RR: 20, O<sub>2</sub> sat: 95-100%, I/O: 1500/2000

GEN: NAD (no apparent distress)

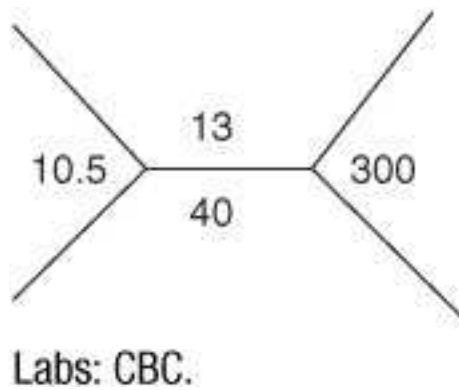
HEENT: PERRLA (pupils are equally round and reactive to light accommodation), EOMI (extraocular muscles are intact), NCAT (normocephalic atraumatic)

CV: RRR no M/R/G (regular rate and rhythm with no murmurs, rubs, or gallops)

Pulm: CTA B (clear to auscultation bilaterally); no R/R/W (no rhonchi, rales, or wheezes)

Abd: S (soft)/NT (nontender)/ND (nondistended)/NABS (normal abdominal bowel sounds)

Ext: no C (clubbing)/C (cyanosis)/E (edema); no calf tenderness



Meds: Aspirin 81 mg daily

Albuterol nebs q4h

A/P: 35 y/o female with asthma exacerbation now improved and at baseline

1. Asthma: Patient improved with steroids and albuterol/atrovent treatments. Patient will be sent home with a medrol pack and albuterol inhaler. Patient will also be sent home with a steroid inhaler.
2. Disposition: Patient will be discharged home today with follow-up in 1 week.

*Greta Student, MS III*

## History and Physical Examination

**Chief complaint (CC):** Main problem that the patient is here for (eg, shortness of breath)

**History of present illness (HPI):** Include a chronologic history of the patient's problems and prior treatments for this problem as well as any other history that is pertinent. Describe symptoms in terms of onset, duration, quality of discomfort, setting, instigating and relieving factors.

**Past medical history (PMH):** Include the patient's medical history and be sure to ask about heart disease, hypertension, diabetes, cancer, and any other pertinent history. The patient's medication list can often serve as a clue since patients will sometimes forget to mention medical problems that they have.

**Surgical history (SH):** Include all operations a patient has as well as when and why. **Medication:** List all the patient's medications as well as doses and frequency with which they are taken. Also ask the patient about any possible over-the-counter medications and alternative meds.

**Allergies:** Name all drugs the patient is allergic to and what happened when they took the drug.

NKDA means "no known drug allergies"

**Family history (FH):** This should include the health, medical problems of the patient's family including parents, grandparents, siblings, and often, aunts, uncles, and cousins. Be sure to ask about heart disease, diabetes, hypertension, hyperlipidemia, and cancer.

**Social history (SH):** This section includes the patient's marital status, occupation, exercise history, sexual history, diet, and tobacco use, drug use, and alcohol use.

**Review of systems (ROS):** Report all the pertinent positive and negative signs and symptoms that the patient

reports (eg, the patient denies any nausea, vomiting, diarrhea, chest pain, cough, travel history ...)

**Physical examination:** Include all pertinent organs and systems:

Vital signs: Tmax, BP, HR, RR, O<sub>2</sub> sat, Ins/Outs

General:

HEENT:

Neck:

Cardiovascular:

Pulmonary:

Abdominal:

Genitourinary:

Back:

Extremities:

Neurologic:

**Labs and studies:** Include all labs and studies that you have results for.

Assesment and plan: Write a summary of the patient's problems and differential diagnoses as well as a plan for each problem.

X

*Sign your name at the bottom*

## **Procedure Note**

Whenever a procedure is done, a procedure note must be written in the chart. Always remember to get consent from the patient before a procedure is done. Below is an example.

### **Procedure Note:**

Procedure: Biopsy of left lower abdominal macule.

Indications: Rule out melanoma.

Consent: The risks, benefits, and possible side effects of the procedure including but not exclusive of pain, bleeding, infection, and scar were explained to the patient who understands and wishes to have the procedure done.

Preparation: The area was prepped and draped in a sterile fashion.

Anesthesia: The area was anesthetized with 10 cc of 2% lidocaine solution using a 30-gauge needle.

Procedure: A wide excision (1 cm on each side) of the macule was done using a number-15 blade. There was minimal bleeding. The site of the excision was closed using 4-0 nylon sutures and the specimen was sent to pathology for examination.

Complications: The patient tolerated the procedure with no complications.

*Greta Student, MS III*

## How to Write a Prescription

Patient name: _____	Medical record number _____	
Address: _____	Phone #: _____	DOB: _____
Rx: <i>Drug name, drug dose</i>		
Dispense # : Write number here		
Sig: Write instructions here		
Refill:		
X <i>Sign your name here</i>		Date: _____

Example

Patient name: Ima N. Payne _____	Medical record number: 12345678	
Address: 1111 Oak Street ; LA, CA	Phone #: 222-2222	DOB: 1/1/69 _____
Rx: Famotidine 20 mg tablets		
Dispense # : Sixty		
Sig: Take two tablets by mouth twice daily		
Refill: 1		
X <i>Dr. Health</i>		Date: 10/20/09

## How to Admit a Patient

Admission Orders

Admit to:

Floor:



Service:

Medical student name:

Resident name:

Attending name:

Diagnosis:

Primary diagnosis:

Other diagnoses:

Condition:

Good, stable, fair, guarded, critical

Vitals:

Per routine (usually q2h in ICU and q4h on the floor)

q shift

q \_\_ h

Activity:

Ad lib

Bed rest

To chair

Ambulate bid

Bathroom privileges

Fall risk

Nursing:

Neuro check q\_\_h

Weigh daily

Pulse oximetry

Wound care

CALL MD for systolic blood pressure (SBP) >165 or <110; diastolic BP >100 or <60;

Pulse >100, T >38.5°C

Etc

Diet:

Regular

Diabetic

Low sodium

Low fat

Clear liquid

Soft

npo (nothing by mouth)

Ins and Outs: strict, per routine

IV fluids: eg, D51/2NS @ 100 cc/h

Drains: Foley, NG tube to suction, chest tube to suction

Medication:

Medication name, dose, route, frequency

Home medication should be written out

Antibiotics

Etc

Special: These are things you will usually need to think about.

DVT prophylaxis

Pain medications

Antiemetics

Antipyretics

Allergies:

NKDA (no known drug allergies)

Penicillin

Sulfa

Etc

Labs/studies:

CBC, electrolytes, BUN, Cr, ECG, radiology studies; other labs

## Example

---

Admit to 2 North, Internal Medicine, Medical Student: Stew Dent;

Resident:

Dr. Smith; Attending: Dr. Bay

Diagnosis: Pneumonia

Condition: Fair

Vitals: Per routine

Activity: Bathroom privileges

Nursing: Pulse oximetry; call MD for systolic blood pressure (SBP) > 165 or < 110; diastolic BP > 100 or < 60; Pulse > 100, Temp > 38.5; Pulse ox < 90%

Diet: Regular

Ins and outs: Strict

IV fluids: D5NS@120 cc/h

Meds: Ceftriaxone 2 g IV q24 hours

Azithromycin 500 mg IV q24 hours

Tylenol 650 mg po q6 hours prn mild pain or Temp > 38.5

Special: Sequential compression stockings

Allergies: NKDA

Labs/studies: PA and lateral CXR; sputum culture/Gram stain; CBC; electrolytes; BUN; Cr

---

## Abbreviations You Should Know

AAA  
abdominal aortic aneurysm

AAS  
acute abdominal series

abd  
abdomen

Abx  
antibiotics

ac

before meals

ACLS

advanced cardiac life support

ACTH

adrenocorticotrophic hormone

ADA

American Diabetes Association

ADH

antidiuretic hormone

ADL

activities of daily living

AFB

acid fast bacillus

AFP

alpha feto protein

AI

aortic insufficiency

AKA

above knee amputation

alk phos

alkaline phosphatase

ALL

acute lymphocytic leukemia

ALS

amyotrophic lateral sclerosis

AMA

against medical advice

AMI

acute myocardial infarction

AML

acute myelogenous leukemia

ANA

antinuclear antibody

ant

anterior

AP  
anteroposterior

APTT  
activated partial thromboplastin time

AR  
aortic regurgitation

ARDS  
acute respiratory distress syndrome

ARF  
acute renal failure

AS  
aortic stenosis

ASA  
aspirin

ASD  
atrial septal defect

ASO  
antistreptolysin O

ATN  
acute tubular necrosis

AV  
arteriovenous

AVN  
atrioventricular node

B  
bilateral

BBB  
bundle branch block

BE  
barium enema

BIB  
brought in by

bid  
two times per day

BKA  
below knee amputation

BM  
bowel movement; bone marrow

BPH  
benign prostatic hypertrophy

BRBPR  
bright red blood per rectum

BRP  
bathroom privileges

BS  
blood sugar; breath sounds

BUN  
blood urea nitrogen

Bx  
biopsy

c  
with

Ca  
calcium

CA  
cancer, carcinoma

CABG  
coronary artery bypass graft

CAD  
coronary artery disease

cath  
catheter

CBC  
complete blood count

CBG  
capillary blood gas

CC  
chief complaint

CEA  
carcinoembryonic antigen

CF  
cystic fibrosis

CHF  
congestive heart failure

CK-MB  
creatinine kinase-myocardial band

CLL  
chronic lymphocytic leukemia

CML  
chronic myelogenous leukemia

CMV  
cytomegalovirus

CN  
cranial nerves

CNS  
central nervous system

CO  
cardiac output

c/o  
complains of

COPD  
chronic obstructive pulmonary disease

CP  
chest pain

CPAP  
continuous positive airway pressure

CPK  
creatinine phosphokinase

CPR  
cardiopulmonary resuscitation

CRF  
chronic renal failure

C and S  
culture and sensitivity

CSF  
cerebrospinal fluid

CT  
computerized tomography

CTAB

clear to auscultation bilaterally

CV

cardiovascular

CVA

cerebrovascular accident

CVAT

costovertebral angle tenderness

CVP

central venous pressure

CXR

chest x-ray

D51/2NS

5% dextrose in half normal saline

D5W

5% dextrose in water

DA

dopamine

D/C

discharge, discontinue

Ddx

differential diagnosis

DI

diabetes insipidus

DIC

disseminated intravascular coagulation

DIP

distal interphalangeal joint

DJD

degenerative joint disease

DKA

diabetic ketoacidosis

DM

diabetes mellitus

DNR

do not resuscitate



DOA

dead on arrival

DOE

dyspnea on exertion

DT

delirium tremens

DTR

deep tendon reflexes

DVT

deep vein thrombosis

Dx

diagnosis

EBL

estimated blood loss

ECT

electroconvulsive therapy

EEG

electroencephalogram

EGD

esophagogastroduodenoscopy

EKG

electrocardiogram

EMG

electromyogram

ENT

ears, nose, and throat

EOMI

extraocular muscles intact

ERCP

endoscopic retrograde cholangiopancreatography

ESR

erythrocyte sedimentation rate

ETOH

alcohol, ethanol

ETT

endotracheal tube

FB  
foreign body

FBS  
fasting blood sugar

f/c  
fever and chills

FEV<sub>1</sub>  
forced expiratory volume in 1 second

FFP  
fresh frozen plasma

FH  
family history

FRC  
functional residual capacity

FTA-ABS  
fluorescent treponemal antibody absorption (syphilis)

FTT  
failure to thrive

f/u  
follow-up

FUO  
fever of unknown origin

FVC  
forced vital capacity

fx  
fracture

GC  
gonococcus, gonorrhea

GERD  
gastroesophageal reflux disease

GI  
gastrointestinal

GU  
genitourinary

HA  
headache

HBsAg  
hepatitis B surface antigen

HBV  
hepatitis B virus

Hct  
hematocrit

HDL  
high-density lipoprotein

HEENT  
head, eyes, ears, nose, throat

Hgb  
hemoglobin

HIV  
human immunodeficiency virus

HLA  
histocompatibility locus antigen

h/o  
history of

HO  
house officer

HOB  
head of bed

HPI  
history of present illness

HSM  
hepatosplenomegaly

HTN  
hypertension

Hx  
history

ICU  
intensive care unit

I&D  
incision and drainage

IDDM  
insulin-dependent diabetes mellitus

Ig  
immunoglobulin

IM  
intramuscular

INH  
isoniazid

I&O  
intake and output

ITP  
idopathic thrombocytopenic purpura

IVF  
intravenous fluids

IVP  
intravenous pyelogram

JVD  
jugular venous distention

KUB  
kidney ureter, bladder x-ray

LAD  
left axis deviation (lymphadenopathy)

LAE  
left atrial enlargement

LAP  
left atrial pressure

LCM  
left costal margin

LDH  
lactate dehydrogenase

LLE  
left lower extremity

LLL  
left lower lobe

LLQ  
left lower quadrant

LMN  
lower motor neuron

LOC  
loss of consciousness

LP  
lumbar puncture

LR  
lactated ringers

LUE  
left upper extremity

LUL  
left upper lobe

LUQ  
left upper quadrant

LVH  
left ventricular hypertrophy

m  
murmur

MAO  
monoamine oxidase inhibitor

MAP  
mean arterial pressure

MCH  
mean cell hemoglobin

MCHC  
mean cell hemoglobin concentration

MCP  
metacarpophalangeal joint

MCV  
mean corpuscular volume

MEN  
multiple endocrine neoplasia

MI  
myocardial infarction

MRSA  
methicillin-resistant *Staphylococcus aureus*

MS  
mitral stenosis, multiple sclerosis

MVA  
motor vehicle accident

MVI  
multivitamin

NAD  
no apparent distress

ND  
nondistended

NG  
nasogastric tube

NIDDM  
non-insulin-dependant diabetes mellitus

NKDA  
no known drug allergies

npo  
nothing by mouth

NS  
normal saline

NSAID  
nonsteroidal anti-inflammatory drug

NSR  
normal sinus rhythm

NT  
nontender

N/V  
nausea and vomiting

OB  
occult blood

OOB  
out of bed

OR  
operating room

PAC  
premature atrial contraction

PAT  
paroxysmal atrial tachycardia

**PCWP**  
pulmonary capillary wedge pressure

**PDA**  
patent ductus arteriosus

**PE**  
pulmonary embolism

**PEEP**  
positive end-expiratory pressure

**PERRLA**  
pupils equally round and reactive to light

**PFT**  
pulmonary function test

**PMD**  
primary medical doctor

**PMH**  
past medical history

**PMI**  
point of maximal impulse

**PMN**  
polymorphonuclear cell

**PM&R**  
physical medicine and rehabilitation

**PND**  
paroxysmal nocturnal dyspnea

**po**  
by mouth

**POD**  
post operative day

**PR**  
per rectum

**PRBC**  
packed red blood cells

**PT**  
physical therapy, prothrombin time

**pt**  
patient

PTCA  
percutaneous transluminal coronary angioplasty

PTH  
parathyroid hormone

PTT  
partial thromboplastin time

PUD  
peptic ulcer disease

PVC  
premature ventricular contraction

PVD  
peripheral vascular disease

qAC  
before each meal

qd  
daily

qid  
four times per day

qod  
every other day

q4h  
every 4 hours

RA  
rheumatoid arthritis

RAD  
right axis deviation

RAE  
right atrial enlargement

RBC  
red blood cells

RDW  
red cell distribution width

RHD  
rheumatic heart disease

RLE  
right lower extremity



RLL  
right lower lobe

RLQ  
right lower quadrant

RML  
right middle lobe

r/o  
rule out

ROM  
range of motion

ROS  
review of systems

RR  
respiratory rate

RRR  
regular rate and rhythm

RT  
respiratory therapy

RTA  
renal tubular acidosis

RTC  
return to clinic

RUE  
right upper extremity

RUL  
right upper lobe

RUQ  
right upper quadrant

RVH  
right ventricular hypertrophy

s  
without

SBE  
subacute bacterial endocarditis

SBO  
small bowel obstruction

SBP

subacute bacterial peritonitis

SEM

systolic ejection murmur

SGOT

serum glutamic-oxaloacetic transaminase

SGPT

serum glutamic-pyruvic transaminase

SIADH

syndrome of inappropriate antidiuretic hormone

SL

sublingual

SLE

systemic lupus erythematosus

SOB

shortness of breath

s/p

status post

stat

immediate

subQ

subcutaneous

Sx

symptoms

T

temperature

tab

tablets

TB

tuberculosis

TIA

transient ischemic attack

TIBC

total iron-binding capacity

tid

three times per day

TKO  
to keep open

TLC  
total lung capacity

TPN  
total parenteral nutrition

TSH  
thyroid-stimulating hormone

TTP  
thrombotic thrombocytopenic purpura

TURP  
transurethral resection of the prostate

TV  
total volume

Tx  
Treatment

UA  
Urinalysis

UGI  
upper gastrointestinal

UMN  
upper motor neuron

URI  
upper respiratory infection

US  
Ultrasound

UTI  
urinary tract infection

VC  
vital capacity

VCUG  
voiding cystourethrogram

VDRL  
venereal disease research laboratory (syphilis test)

V/Q  
ventilation perfusion scan

VSS  
vital signs stable

WBC  
white blood cells

WNL  
within normal limits

y/o  
years old

## Common Formulas

Maintenance fluids per hour: 4:2:1 rule:

4 mL/kg up to 10 kg + 2 mL/kg from 11 to 30 kg + 1 mL/kg >30 kg

**Example:** A person weighing 100 kg should get

$$(4 \times 10) + (2 \times 20) + (1 \times 70) = 40 + 40 + 70 = 150 \text{ cc/h}$$

Maintenance fluids over 24 hours: 100:50:20 rule

100 mL/kg up to 10 kg + 50 mL/kg from 11 to 30 kg + 20 mL/kg >30 kg

Anion gap:  $\text{Na} - (\text{Cl} + \text{HCO}_3)$

Osmolality:  $2\text{Na} + \text{glucose}/18 + \text{BUN}/2.8$

Fractional Na excretion ( $\text{FE}_{\text{Na}}$ ): 
$$\frac{\text{urine Na} \times \text{serum creatinine}}{\text{serum Na} \times \text{urine creatinine}}$$

Creatinine clearance, also known as glomerular filtration rate (GFR):

$$\frac{\text{urine creatinine} \times \text{urine volume in mL}}{\text{serum creatinine} \times \text{time in minutes}}$$

Estimated creatinine clearance: 
$$\frac{(140 - \text{age}) \times (\text{weight in kg}) (\text{for females} \times 0.85)}{\text{serum creatinine} \times 72}$$

Corrected Na:  $\text{Na} + [(\text{glucose} - 100) \times 0.016]$

Corrected total calcium:  $[0.8 \times (\text{normal albumin} - \text{measured albumin})] + \text{Ca}$

Bodywater deficit: 
$$\frac{0.6 \times \text{weight (kg)} \times (\text{patient Na} - \text{normal Na})}{\text{normal Na}}$$

Aa gradient:  $[(713 \times \text{FIO}_2) - (\text{PaCO}_2 / 0.8)] - \text{PaO}_2 = 150 - (\text{PaCO}_2 / 0.8) - \text{PaO}_2$

Anion gap:  $\text{Na} - \text{Cl} + \text{HCO}_3$  (normal value is between 8 and 12 mEq/L)

MAP (mean arterial pressure):  $\text{diastolic BP} + [(\text{systolic BP} - \text{diastolic BP})/3]$

Cerebral perfusion pressure:  $\text{MAP} - \text{ICP}$  (intracranial pressure)

## Statistics

Incidence: Number of **new cases** of a disease in a population in a certain period of time

Prevalence: Number of **existing cases** of a disease in a population at a specific time point

Sensitivity: This determines how well the test is able to detect disease.

$$\frac{\text{Number of patients with disease and positive test}}{\text{Total number with disease}}$$

Specificity: This determines how well the test detects the absence of disease.

$$\frac{\text{Number of patients without disease and negative test}}{\text{Total number without disease}}$$

$$\text{Relative risk: } \frac{\text{Incidence in exposed}}{\text{Incidence in unexposed}}$$

Positive predictive value (PPV): Test precision or the probability that a patient truly has the disease when they test positive. Calculation:  $\text{true positive}/\text{all positive}$ .

Negative predictive value (NPV): Probability that a patient truly does **not** have the disease when they test negative. Increased sensitivity increases NPV, and the lower the prevalence of a disease, the higher the NPV. Calculation:  $\text{true negative}/\text{all negative}$ .

True positive: Patient **with** disease and positive test

False positive: Patient **without** disease and positive test

True negative: Patient **without** disease and negative test

False negative: Patient **with** disease and negative test

	With Disease	Without Disease
Positive Test	True Positive (A)	False Positive (B)
Negative Test	False Negative (C)	True Negative (D)

Sensitivity:  $A/A+C$

Specificity:  $D/(B+D)$

PPV:  $A/(A+B)$

NPV:  $D/(D+C)$

Relative risk:  $[A/(A+B)]/[C/(C+D)]$

Odds ratio:  $AxD/CxB$

Absolute risk: (incidence of disease in exposed) – (incidence of disease in unexposed)

Number needed to treat (NNT): Number of patients that need to be treated in order to prevent one negative outcome. Calculation:  $1/\text{absolute risk}$

Length time bias: Screening tests will tend to be able to detect cases of slowly progressive disease much better than rapidly progressive diseases, just because of the nature of having a longer asymptomatic period

Lead time bias: Screening tests detects disease before symptomatic phase, increasing the time between diagnosis and death.

Likelihood ratio: true positive/false positive

Null hypothesis: The statement that the thing being tested is **not** associated with the outcome

Type I error ( $\alpha$ ): probability of detecting a difference when one does not actually exist (for example concluding that a drug works when it actually does not)

Type II error ( $\beta$ ): Probability of **not** detecting a difference when one does actually exist (for example concluding that a drug does **not** work when it actually does)

Power: Probability of **NOT** detecting a difference when one actually does **not** exist (eg, concluding that a drug does **NOT** work and it actually does NOT work). Power is increase by larger sample size.

Calculation:  $1 - \text{type II error}$

$p$  value: probability that the results of a study could happen by chance alone. Generally  $p < 0.05$  is considered statistically significant.

Precision (reliability): reproducibility of the results of a test

Validity (accuracy): whether the test actually correctly measures what it is trying to measure

## Study Types

Randomized controlled: Subjects are blindly assigned to groups being studied. (Eg, if you are studying a cholesterol drug, patients are randomly assigned to the treatment group and placebo group.)

Cohort study: Exposed subject are identified and followed for a certain time to study disease outcome.

Case-control study: Identify cases and non-cases and studied retrospectively to find possible risk factors.

## **Experimental Errors**

Recall bias: Overestimation or underestimation of risk factors due to the fact that patients may not recall accurately. Relevant to retrospective studies.

Interviewer bias: Interpretation of data being skewed due to the scientist's personal bias. This occurs when the study is not a blinded study.

Unacceptability bias: Patients may not report certain information because they feel ashamed or want to please the scientist.





# CHAPTER 1

## The Basics

### QUICK RADIOLOGY

#### Chest X-ray

##### **What is the first thing that you should check when evaluating a radiographic study?**

Check the name of the patient as well as the date and medical record number.

##### **How can you determine if the chest x-ray (CXR) is adequate?**

1. Penetration: Disk spaces can be seen without distinguishing the details of the spine.
2. Inspiratory effort: Diaphragm anteriorly should be below rib 7.
3. Rotation: Spinous processes of thoracic vertebrae should be midway between clavicles.

##### **What is a posterior-anterior (PA) film?**

Posterior-anterior film: The x-ray is shot from the back of the patient to the plate in front of the patient.

##### **What is an anterior-posterior (AP) film?**

Anterior-posterior film: The x-ray is shot from the front of the patient to the back of the patient.

##### **When is an AP film appropriate?**

When a patient is bed bound

##### **How is the image altered in an AP film?**

The heart appears large.

##### **How should you approach reading a CXR?**

Remember **A, B, C, D plus lungs and soft tissue**

**Airway:** Trachea should be midline.

**Bones:** Check for any bony defects, fractures, osteolytic lesions.

**Cardiac:** The heart should be less than  $\frac{1}{2}$  the width of the chest.

**Diaphragm:** There should be no blunting of the costophrenic angles.

No free air should be seen under the hemidiaphragm.

**Lungs:** Look for any nodules, opacification, bronchial markings.

**Soft tissue:** Look for any lesions, lymphadenopathy, masses.

##### **What structure does each of the following types of infiltrates obscure?**

Right middle lobe

Right lower lobe

Left upper lobe

Left lower lobe

Right atrium

Right diaphragmatic border

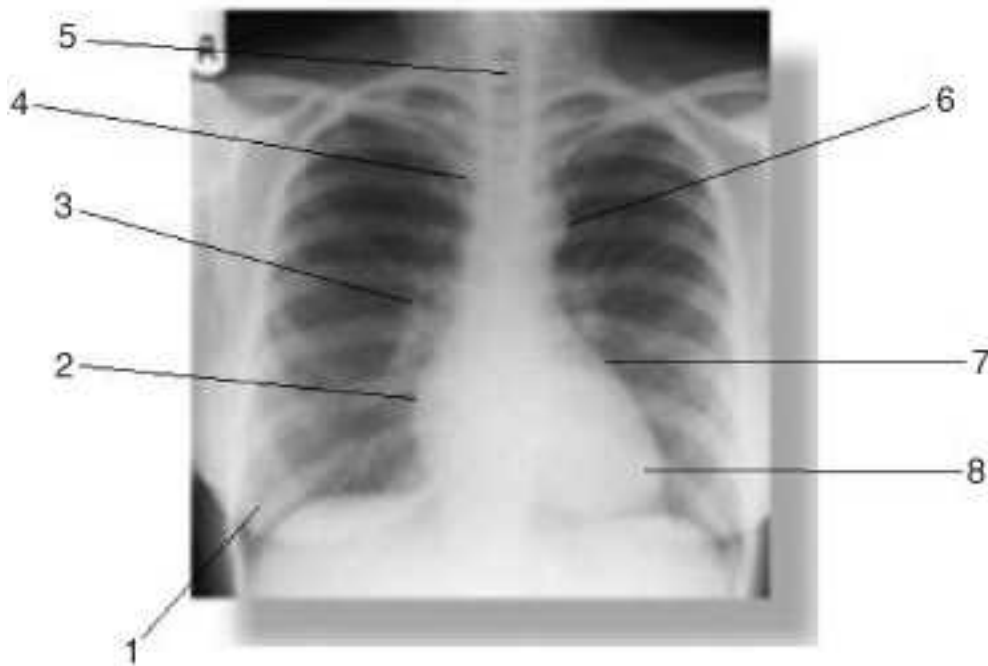
Left heart border

Left diaphragmatic border

**What classic features are seen on a chest x-ray with congestive heart failure?**

Cephalization of vessels; curly B lines

**Name the parts of the CXR shown below?**



*(Reproduced, with permission, from William Herring, MD, FACR; Radiology Residency Program Director at Albert Einstein Medical Center in Philadelphia, PA. Available at: <http://www.learningradiology.com>)*

1. Sharp costophrenic angle
2. Right atrium
3. Hilum and main bronchus
4. Superior vena cava
5. Trachea (midline)
6. Aortic arch
7. Left atrium
8. Left ventricle

### **Other Radiologic Studies**

**What is a kidneys, ureter, and bladder (KUB)?**

X-ray which looks at the kidney, ureter, and bladder

**What structures do computed tomographic (CT) scans visualize best?**

CT scans visualize bone best and can identify acute bleeds.

**What structures does a magnetic resonance imaging (MRI) visualize best?**

Soft tissue

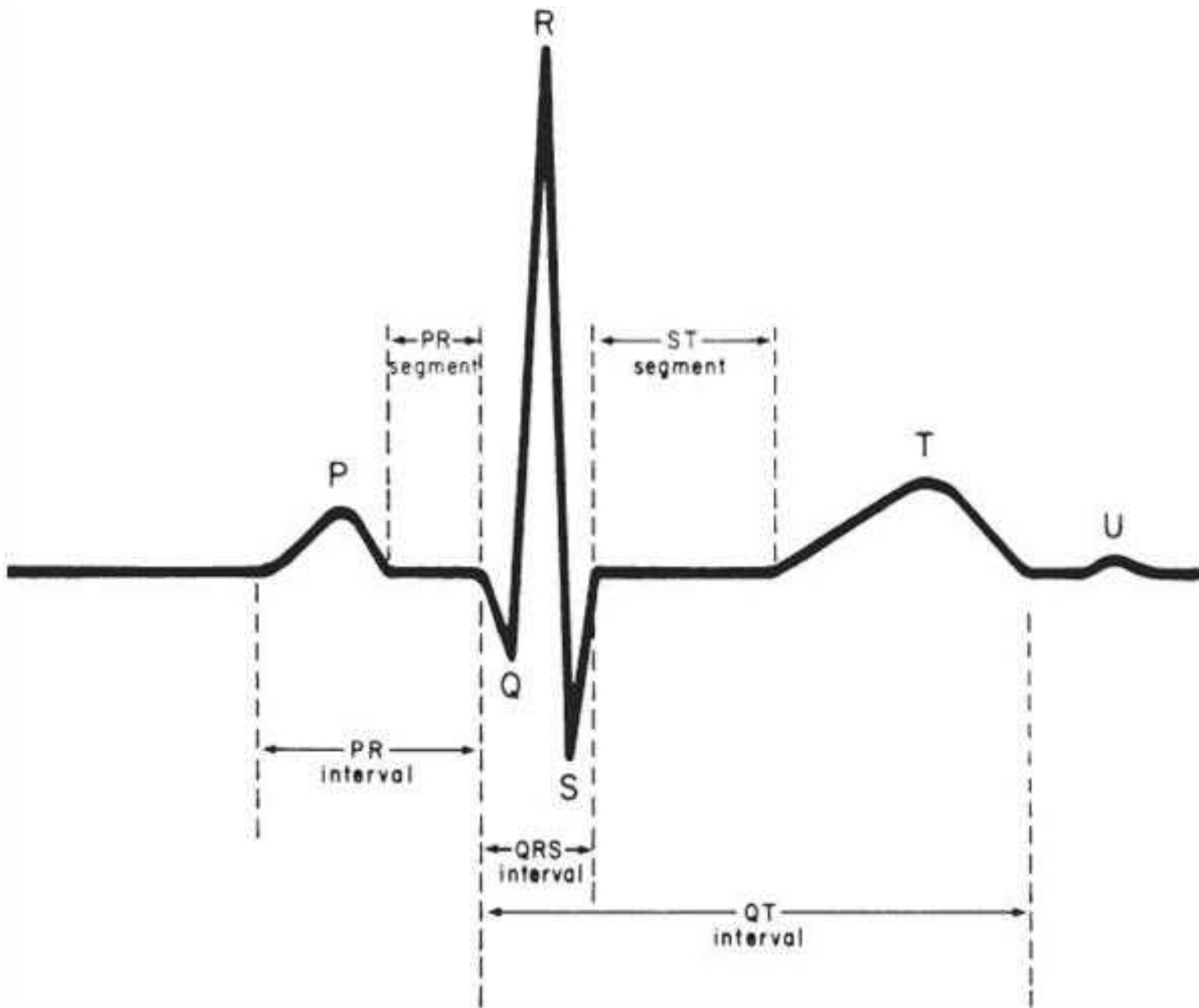
**Name the radiographic study you would use to evaluate each of the following:**

<b>Biliary tract</b>	Right upper quadrant ultrasound
<b>Differentiate between loculated and unloculated pleural effusion</b>	Lateral decubitus film—fluid that is loculated will not layer out
<b>Carotid artery stenosis</b>	Carotid ultrasound
<b>Kidney stones</b>	KUB
<b>Stroke</b>	MRI of the brain; CT to rule out hemorrhage
<b>Anterior cruciate ligament (ACL) tear of the knee</b>	MRI of the knee
<b>Acute cholecystitis</b>	Hepatobiliary iminodiacetic acid (HIDA) scan

**Name what each of the following radiographic findings is most commonly indicative of:**

<b>Flattened diaphragms</b>	Chronic obstructive pulmonary disease (COPD)
<b>Blunted costophrenic angles</b>	Pleural effusion
<b>Air outside pleural lines</b>	Pneumothorax
<b>Consolidation of lung parenchyma</b>	Pneumonia
<b>Dilated loops of small bowel</b>	Small bowel obstruction
<b>Air fluid levels</b>	Small bowel obstruction

**QUICK EKG INTERPRETATION**



**Figure 1-1** Parts of the EKG. (Reproduced, with permission, from Tintinalli JE. Emergency Medicine: A comprehensive study guide. 6th ed. New York: McGraw-Hill, 2004:181.)

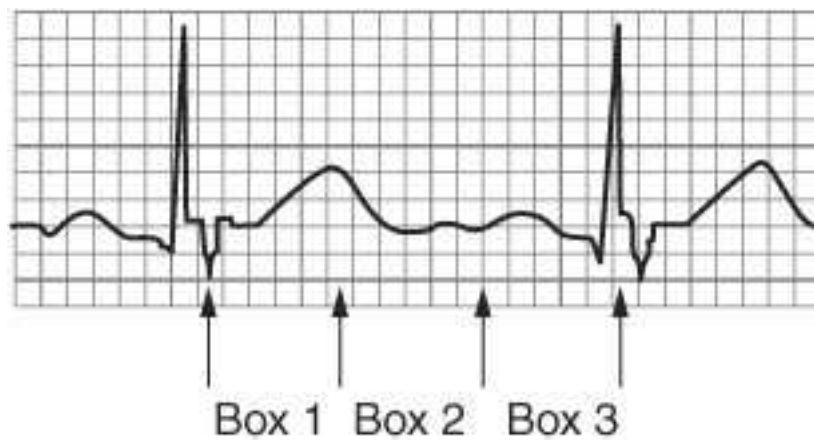
**Step 1:** Calculate the rate ([Fig 1-2](#)).

Rate = beats per minute.

The easy way to calculate the rate is **300/(# big boxes between two QRS complexes)** or **300, 150, 100, 75, 60, 50**.

$300/3 = 100$ .

In this example, the rate is about 100 beats per minute.

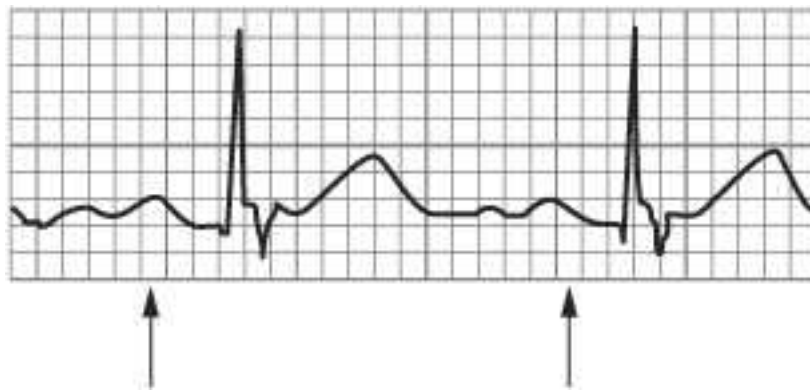


**Figure 1-2** Rate calculation example. In this EKG, the rate is  $300/3 = 100$  beats/min.

**Step 2:** Calculate the rhythm ([Fig 1-3](#)).

Ask the question: Is there a P wave before each QRS? And, are the P waves of the same morphology? If yes, then the rhythm is sinus.

In the example, there is a P wave of the same morphology before each QRS, which indicates that the patient is in sinus rhythm. If there were a lack of P waves or a disorganized rhythm, a differential diagnosis, which you will find in [Chapter 2](#), would come into play.



**Figure 1-3** Sinus rhythm.

**Step 3:** Determine the axis ([Fig 1-4](#)).

Rules of thumb:

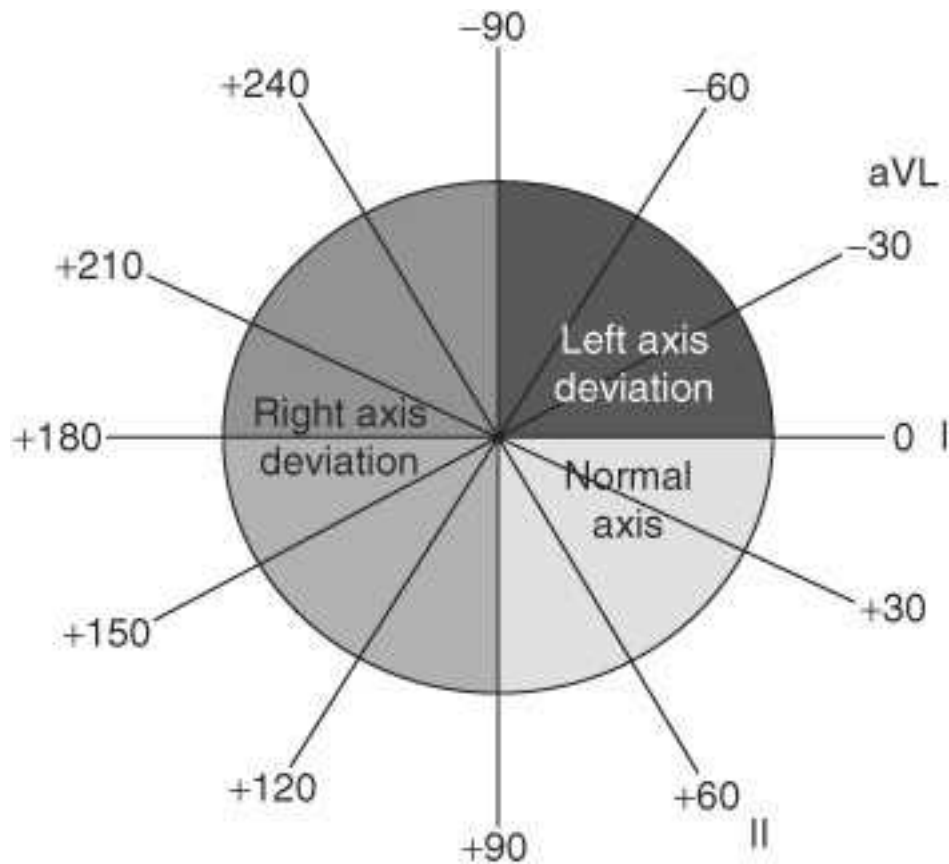
If I and aVF are positive, then axis is normal.

If I is positive and aVF is negative, check lead II.

If lead II is positive, then the axis is normal.

If lead II is negative, then there is left axis deviation.

If I is negative and aVF is positive, then there is right axis deviation.



**Figure 1-4**

**Step 4:** Evaluate the intervals.

One large box = 0.20 seconds.

One small box = 0.04 seconds.

Normal measurements:

P wave <0.12 seconds

PR interval (beginning of P wave to beginning of QRS complex) 0.12-0.2 seconds

QRS interval (beginning of the Q to the end of the S wave) <0.12 seconds

QT interval (beginning of QRS to the end of the T wave) 0.33-0.47 seconds

If PR <0.12, **then** junctional rhythm or bypass tract

If PR >0.2, **then** atrioventricular (AV) block

If QRS >0.12, **then** either a left bundle branch block (LBBB), right bundle branch block (RBBB), or a nonspecific conduction delay

**Step 5:** Check for hypertrophy.

*Atrial hypertrophy*

**Right atrium:** tall P waves in II, III, and aVF or V<sub>1</sub> or V<sub>2</sub>

**Left atrium:** notched P waves in limb leads

*Ventricular hypertrophy*

**Left ventricular hypertrophy:** height of S (mm) in V<sub>1</sub> + height of R (mm) in

V<sub>5</sub> >35 mm

**Right ventricular hypertrophy:** height of R (mm)/height of S (mm) in V<sub>1</sub> >1

**Step 6:** Look for ischemic changes.

ST elevation or depression

T-wave inversion

**Q waves indicating old infarct**

# PREVENTATIVE MEDICINE

## Adult Immunizations

Table 1-1 Adult Immunization Recommendations

---

<b>Tdap (tetanus toxoid, reduced diphtheria toxoid, acellular pertussis)</b>	Give complete series if patient has not received it. Age 19-65 as a booster every 10 years instead of Td. Especially important with outbreak of pertussis.
<b>Influenza</b>	Annually. Can be given to all patients but especially those with immunocompromised states, such as pregnant women, chronic disease states. FluMist nasal spray can only be used in "healthy" people aged 2-49 who are not pregnant.
<b>Pneumococcal</b>	Patients aged >65 Patients aged >50 with chronic diseases or immunocompromised Booster if aged >65 and primary vaccine >5 years ago
<b>Varicella</b>	Patients with no history of disease and/or negative titers. Two doses 1-2 months apart.
<b>MMR (measles, mumps, rubella)</b>	Born after 1957 and never immunized. Two doses at least 1 month apart.
<b>HBV (hepatitis B vaccine)</b>	Not previously immunized and at increased risk of exposure such as occupational and social exposure

---

# PREVENTATIVE SCREENING

Table 1-2 Preventative Screening Recommendations

Condition	Recommendation
Abdominal aortic aneurysm	Men aged 65-75 who have smoking history; <b>one time</b> screening by ultrasound
Blood pressure	Men and women aged >18; every 2 years
Breast cancer	Women aged $\geq 40$ ; <b>every 1 to 2 years</b> . If there is a family history of a first-degree relative, then screen 10 years before the age at which the cancer was detected. Typically by mammography.
Cervical cancer	Women starting at age 21 using a Pap smear cytologic test. Women aged 21-29 screen with Pap smear cytologic test every 2 years unless there is an abnormality detected, then follow the specific guidelines. Women aged $\geq 30$ -65 screen with Pap smear cytologic test + HPV screening every 3 years if they have had 3 consecutive normal Pap tests. Stop screening at 65-70 years of age if 3 or more consecutive normal Pap test and no abnormal in the last 10 years.
<i>Chlamydia</i> infection	Sexually active women aged $\leq 25$ and other women at increased risk
Cholesterol screening	Patients at high risk for CAD, initial screening: men aged 20-35 and women aged $\geq 20$ Otherwise: all men aged $\geq 35$ and all women aged $\geq 45$ every 5 years Using fasting lipid profile or non-fasting total cholesterol and HDL



<b>Colorectal cancer</b>	Men and women aged >50 to 75. Annual fecal occult blood test and sigmoidoscopy every 5 years <i>or</i> colonoscopy every 10 years. Screening to be started earlier if patient at high risk.
<b>Diabetes, type II</b>	Asymptomatic men and women with blood pressure >135/80
<b>Gonorrhea infection</b>	Sexually active women aged ≤25 and other women at increased risk
<b>HIV</b>	All adults and adolescents at increased risk for infection. <i>All</i> pregnant women.
<b>Osteoporosis</b>	Postmenopausal women aged ≥65 and women aged ≥60 who are at high risk for osteoporotic fractures. DEXA scan is used.
<b>Ovarian cancer</b>	Routine screening is <i>not recommended</i> .
<b>Prostate cancer</b>	USPSTF has found insufficient evidence for or against screening using digital rectal examination or serum PSA, but most physicians consider screening men between the age of 40 and 75.
<b>Syphilis infection</b>	Men and women at increased risk and <i>all</i> pregnant women.

---

DEXA, dual energy x-ray absorptiometry; HDL, high-density lipoprotein; PSA, prostate-specific antigen.

## FLUIDS AND ELECTROLYTES

### Fluids

**What percentage of body mass is water?**

50% to 70%

**In what two compartments is body water stored and what is the portion in each?**

Intracellular ( $\frac{2}{3}$ )

Extracellular ( $\frac{1}{3}$ )

**How is extracellular fluid separated?**

Intravascular ( $\frac{1}{4}$ ); extravascular or interstitial ( $\frac{3}{4}$ )

**What percentage of body mass does intracellular water account for?**

40%

**What percentage of body mass does extracellular water account for?**

20%

**What percentage of body mass does blood account for?**

About 7%

**What physical examination signs can be used to assess volume status?**

Skin turgor, mucous membranes, pulse, urine output, acute weight change

**What are signs of hypovolemia?**

Tachycardia, tachypnea, dry mucous membranes, decreased urine output, decreased blood pressure, decreased skin turgor

**What is normal urine output in an adult?**

Above 30 cc/h; on average 0.5-1 cc/kg/h

**How do you calculate maintenance fluids per hour?**

4/2/1 rule:

4 mL/kg (up to 10 kg); 2 mL/kg (from 11 to 30 kg); 1 mL/kg (>30 kg)

**How do you calculate maintenance fluids per day?**

100/50/20 rule:

100 mL/kg (up to 10 kg); 50 mL/kg (from 11 to 30 kg); 20 mL/kg (>30 kg)

**What are each of the following IV fluids comprised of?**

<b>D5W</b>	5% dextrose in water
<b>D10W</b>	10% dextrose in water
<b>Normal saline (NS)</b>	154 mEq Na, 154 mEq Cl
<b><math>\frac{1}{2}</math> NS</b>	77 mEq Na, 77 mEq Cl
<b><math>\frac{1}{4}</math> NS</b>	39 mEq Na, 39 mEq Cl
<b>Lactated Ringer</b>	130 mEq Na, 110 mEq Cl, 4 mEq K, 3 mEq Ca, 28 mEq lactate

**What are the two most commonly used maintenance fluids?**

D5  $\frac{1}{2}$  NS or D5  $\frac{1}{2}$  NS with 20 mEq K

**What type of IV fluids should be given for fluid resuscitation?**

NS or lactated Ringer because they are isotonic

**Electrolytes**

## Hyperkalemia

### What is the normal range for potassium?

3.5-5.0 mEq/L

### What are the causes of hyperkalemia?

Increased load vs decreased excretion:

**Increased load:** exogenous  $K^+$  ingestion, blood transfusion, tissue injury (rhabdomyolysis, burns), acidosis, hypoaldosteronism

**Decreased excretion:** renal failure,  $K^+$ -sparing diuretics

### What is pseudohyperkalemia?

Elevated  $K^+$  in a blood sample due to hemolysis

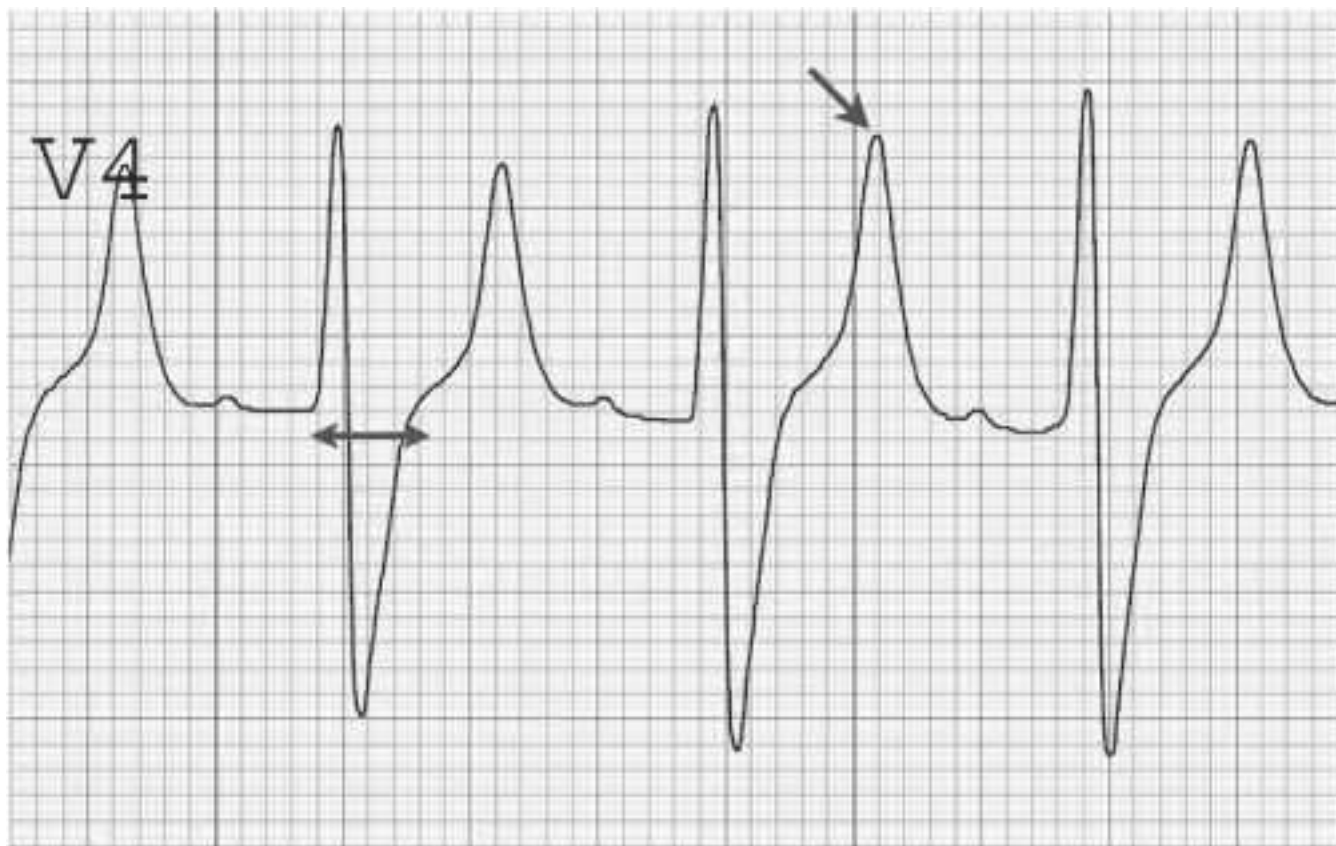
### What are the signs and symptoms?

Muscle weakness, paresthesias, areflexia, bradycardia, respiratory failure, EKG changes

### What are the characteristic EKG findings?

**Peaked T waves**

Prolonged PR interval, widening of QRS, P-wave loss, ([Fig 1-5](#))



**Figure 1-5** Peaked T waves (arrow), widened QRS (double arrow), and subtle flattening of the P waves are seen in this patient with a serum K of 7.1. (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB, et al. Atlas of Emergency Medicine. 3rd ed. New York: McGraw-Hill; 2010:778.)

### Above what level are symptoms usually seen?

$K^+ >6.5$ .

## How is hyperkalemia treated?

1. Protect cells by increasing membrane threshold: calcium gluconate (cardioprotective)
2. Drive  $K^+$  into cells: sodium bicarbonate, insulin with glucose
3. Excrete  $K^+$ : kayexalate (binds  $K^+$ ), furosemide, dialysis

## What is the mnemonic for treatment of hyperkalemia?

### C BIG K Drop:

Calcium gluconate

Bicarbonate

Insulin

Glucose

Kayexalate

Dialysis

r

o

p

## What acid-base disturbance can lead to hyperkalemia?

Acidosis

## Hypokalemia

## What are some causes of hypokalemia?

Vomiting, diarrhea, nasogastric (NG) tube suction, diuretic use (thiazides are a common culprit), insulin, amphotericin, hypomagnesemia

## What are the signs and symptoms of hypokalemia?

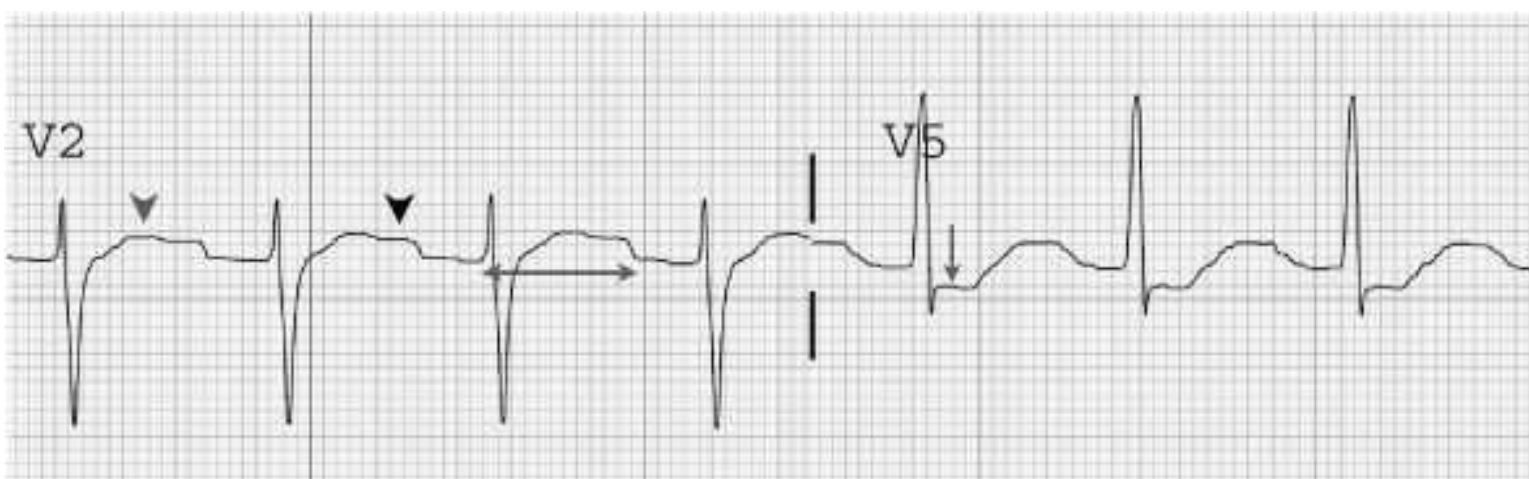
Nausea, vomiting, weakness, paresthesias, hyporeflexia, ileus, digoxin sensitivity, v-tach, and EKG changes

## What acid-base disturbance can cause hypokalemia?

Alkalosis

## What are the characteristic EKG findings of hypokalemia?

T-wave depression, U waves, prolonged QT (QU) intervals ([Fig 1-6](#))



**Figure 1-6** This EKG demonstrates multiple findings consistent with hypokalemia: flattened T waves (gray arrowhead), U waves (black arrowhead), prolonged QT (QU) intervals (double arrow), and ST-segment depression (arrow). This patient's potassium level was 1.9. (Reproduced, with permission, from Knoop KJ,

**How is severe hypokalemia acutely treated?**

IV KCl

**What is the major side effect of IV potassium?**

Burning sensation at IV site through which it is being administered

**How can the burning be avoided when administering IV potassium?**

Slow infusion usually not more than 10 mEq/h

**How can mild or chronic hypokalemia be treated?**

Oral KCl supplementation or potassium-rich foods

**What electrolyte level should be checked in a patient with hypokalemia?**

Magnesium; hypomagnesemia can precipitate hypokalemia.

**What medication can be used to treat hypokalemia?**

Potassium-sparing diuretic (eg, spironolactone)

*Hypercalcemia*

**What is the normal range for calcium?**

9.0-10.6 (serum calcium)

**What are the causes for hypercalcemia?**

Mnemonics **CHIMPANZEES**:

Calcium supplementation

Hyperparathyroidism

Iatrogenic

Milk alkali syndrome

Paget disease

Addison disease

Neoplasm

Zollinger-Ellison syndrome (MEN I)

Excess vitamin A

Excess vitamin D

Sarcoidosis

**What is a common iatrogenic cause of hypercalcemia?**

Thiazide diuretics

**What are the symptoms of hypercalcemia?**

**Stones** (kidney stones), **bones** (bone pain), **abdominal groans** (abdominal pain, nausea, constipation), and **psychiatric overtones** (confusion, concentration, fatigue)

**What does the EKG look like?**

Prolonged PR interval, short QT interval

**What is the treatment?**

IV hydration, loop diuretic (furosemide)

**How is it treated in refractory cases?**

Calcitonin, pamidronate, etidronate, glucocorticoids, plicamycin, dialysis

## *Hypocalcemia*

### **What are the causes of hypocalcemia?**

Renal failure, vitamin D deficiency, pancreatitis, diuretics, hypomagnesemia, parathyroidectomy

### **What can cause a pseudohypocalcemia?**

Hypoalbuminemia

### **How can the true calcium level be calculated in hypoalbuminemia?**

$0.8 \times (4 - \text{plasma albumin level}) + \text{calcium level} = \text{true calcium level}$

### **What are the two classic signs of hypocalcemia?**

**Trousseau** and **Chvostek** signs

### **What is Trousseau sign?**

Carpal spasm with arterial occlusion using a blood pressure cuff

### **What is Chvostek sign?**

Facial spasm with tapping of the facial nerve

### **What are some other signs and symptoms of hypocalcemia?**

Tetany, seizures, perioral paresthesias, altered mental status, fatigue, weakness, EKG changes, abdominal cramping, convulsions

### **What is the classic EKG finding with hypocalcemia?**

**Prolonged QT interval**

### **What is the treatment for acute hypocalcemia?**

IV calcium gluconate

### **What is the treatment for chronic hypocalcemia?**

Vitamin D with oral calcium tablets

## *Hypernatremia*

### **What is the normal range for sodium?**

135-145 mEq/L

### **What are the causes of hypernatremia?**

**Hypovolemia:** decreased oral intake of water secondary to illness or altered mental status; increased water loss such as diuresis, vomiting, diarrhea, hyperaldosteronism

**Hypervolemia:** hypertonic fluid administration, excess ingestion of salt, Cushing syndrome, Conn syndrome

**Isovolemia:** diabetes insipidus, skin loss

### **How do you calculate water deficit in hypernatremia?**

$0.6 \times \text{weight (kg)} \times (\text{measured Na}/\text{normal Na}) - 1$

### **What are the signs and symptoms of hypernatremia?**

Seizure, coma, ataxia, lethargy, irritability, spasticity, edema

**What is the treatment for hypernatremia?**

Treatment is dependent on each of the following underlying cause of hypernatremia:

**Hypovolemia:** Replace fluid with isotonic saline. Replace 1/2 of water deficit in first 24 hours and 1/2 over the next 48-72 hours.

**Hypervolemia:** Loop diuretics to increase sodium excretion and fluid replacement with 1/2 NS

**Isovolemia:** Fluid replacement with 1/2 NS (1/2 water deficit in first 24 hours and 1/2 over next 48-72 hours). If patient has central diabetes insipidus, give vasopressin.

**What is the risk of rapid correction of hypernatremia?**

Cerebral edema

**What is the maximum rate at which plasma osmolality can be corrected?**

2 mOsm/kg/h

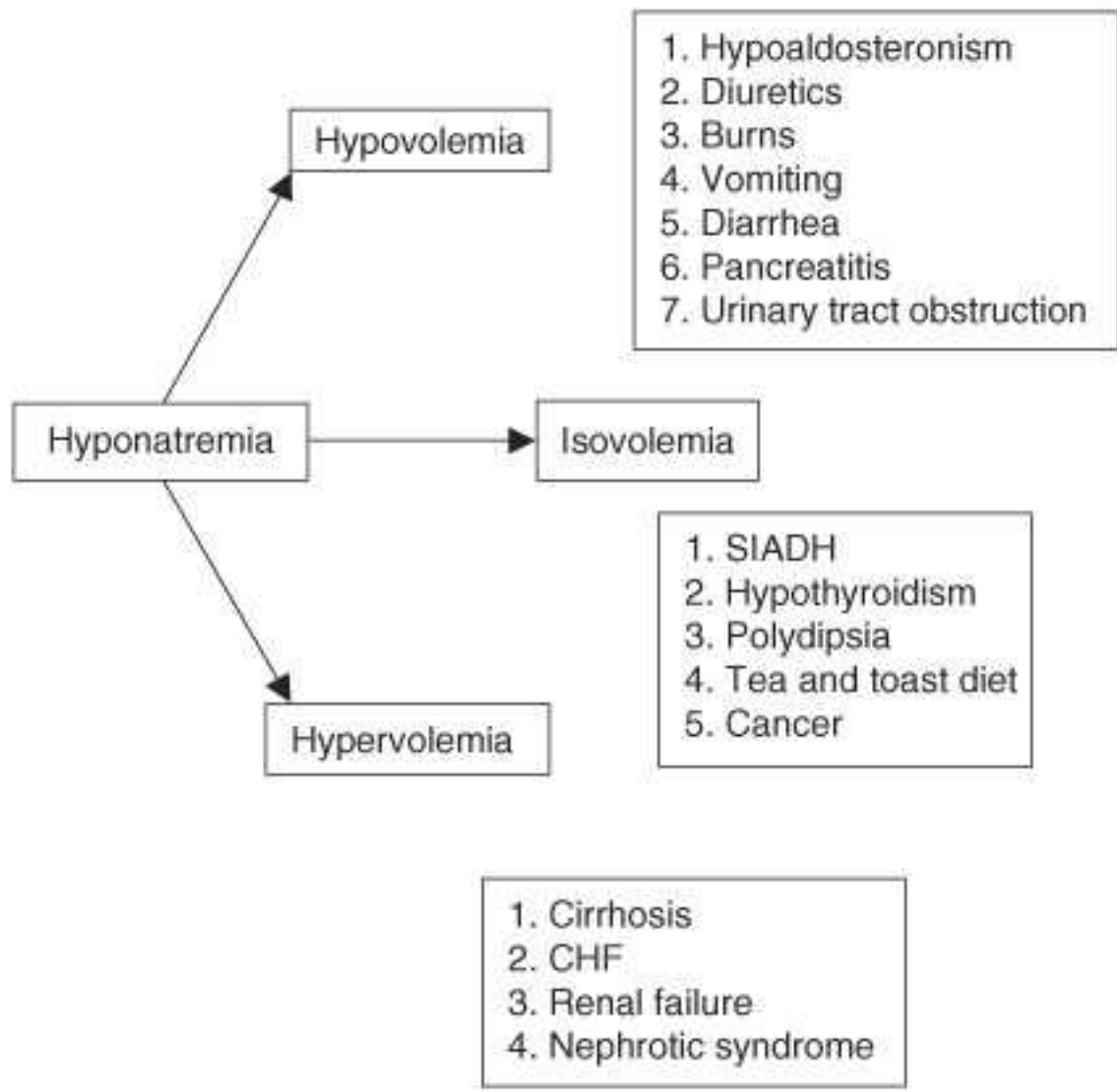
**What is the maximum rate at which sodium concentration can be corrected safely?**

1 mEq/L/h

*Hyponatremia*

**What is the differential diagnosis of hyponatremia?**

See [Fig 1-7](#).



**Figure 1-7**



### What is pseudohyponatremia?

There is no true sodium deficit, but appears to be because the serum is occupied by lipids or protein.

### What is factitious hyponatremia?

Normal total body sodium but decreased serum sodium because of an osmotic flow of water into serum secondary to excess glucose or mannitol in the serum

### How is serum osmolality calculated?

$$2 \times \text{Na} + \text{blood urea nitrogen (BUN)}/2.8 + \text{glucose}/18$$

### How is hyponatremia evaluated?

See [Fig 1-8](#).

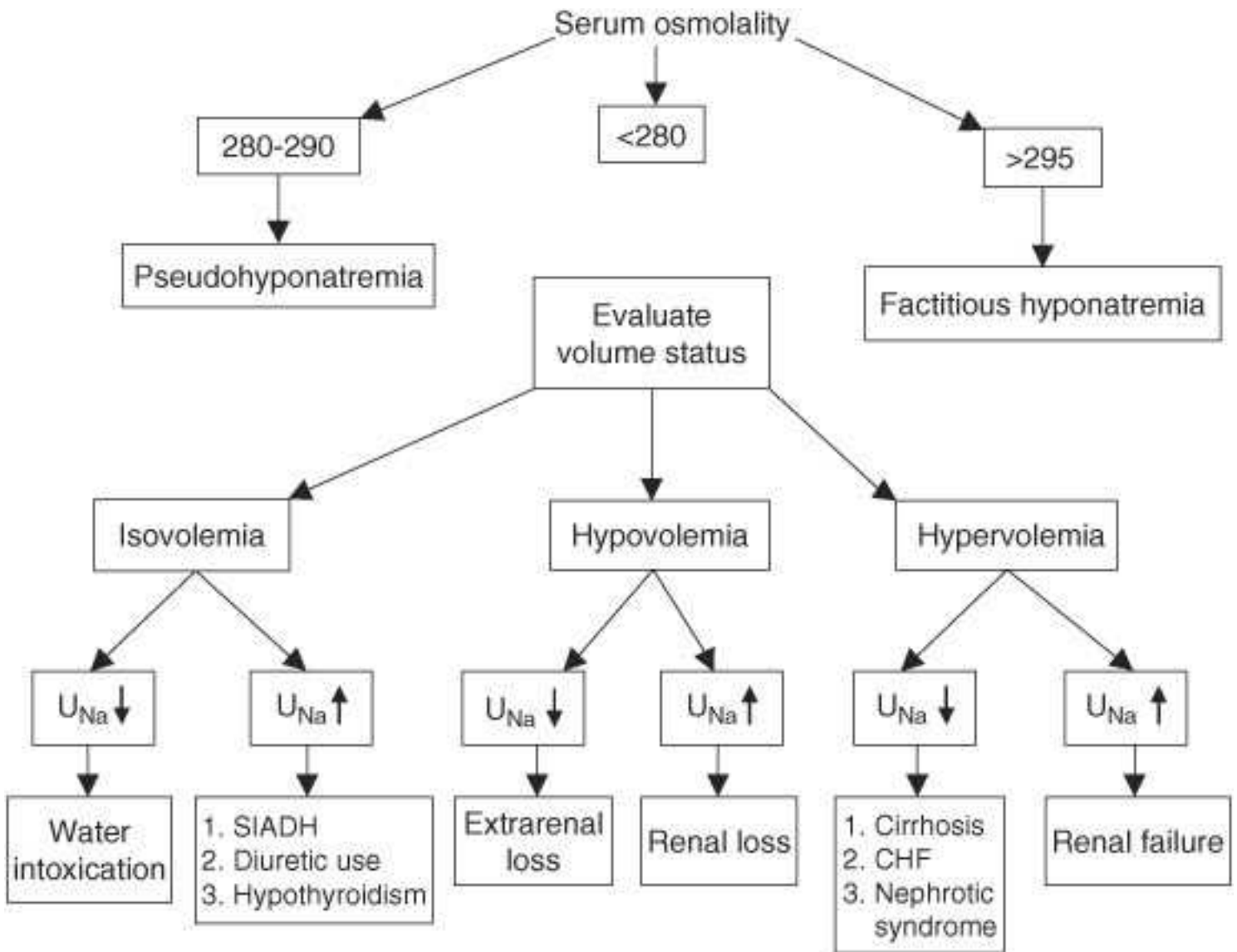


Figure 1-8

### What are the signs and symptoms of hyponatremia?

Seizure, coma, lethargy, weakness, nausea, vomiting, ileus, altered mental status

### What is the treatment for hypotonic hypovolemic hyponatremia?

Correct the underlying disorder and fluid resuscitation with IV normal saline (NS).

### What is the treatment for hypotonic hypervolemic hyponatremia?



Fluid restriction. Diuretics like furosemide are helpful.

**What is the treatment for hypotonic isovolemic hyponatremia?**

Treat the underlying cause. Fluid restriction.

**What is the maximum speed at which hyponatremia can be safely corrected?**

1 mEq/h

**What can happen if sodium is corrected too quickly?**

Central pontine myelinolysis

*Hyperphosphatemia*

**What is the normal range of phosphate?**

2.5-4.5 mg/dL

**What are the most common causes of hyperphosphatemia?**

Iatrogenic

**What are other causes of hyperphosphatemia?**

Hypoparathyroidism, hypocalcemia, renal failure, rhabdomyolysis, tumor lysis

**What are the signs and symptoms of hyperphosphatemia?**

Heart block, ectopic soft tissue calcification

**What is the treatment for hyperphosphatemia?**

Aluminum hydroxide; sevelamer hydrochloride (Renagel); calcium acetate (Phoslo); lanthanum carbonate (Fosrenol); insulin and glucose; in severe cases—dialysis

*Hypophosphatemia*

**What are the causes of hypophosphatemia?**

Hyperparathyroidism, diuresis, decreased po (oral) intake, renal tubular acidosis, hypokalemia, hypomagnesemia, acetazolamide, glucose, and insulin

**What are the signs and symptoms of hypophosphatemia?**

Proximal muscle weakness, ataxia, rhabdomyolysis, paresthesias, hemolytic anemia, seizure

**What is the treatment for hypophosphatemia?**

Potassium phosphate or sodium phosphate supplementation

*Hypermagnesemia*

**What is the normal range of magnesium?**

1.5-2.5 mEq/L

**What are the causes of hypermagnesemia?**

Iatrogenic, renal failure, tumor lysis

**What are the signs and symptoms of hypermagnesemia?**

Weakness, fatigue, ↓ deep tendon reflexes, hypotension, paresthesias, coma, decreased respirations

**What is the treatment for hypermagnesemia?**

Calcium gluconate and dialysis in refractory cases

## Hypomagnesemia

### What are the causes of hypomagnesemia?

Malabsorption, diarrhea, vomiting, NG tube suction, alcoholic patient, diuresis, hypokalemia or hypocalcemia induce hypomagnesemia, insulin and glucose administration, short bowel syndrome, total parenteral nutrition, hypercalcemia

### What are the signs and symptoms of hypomagnesemia?

Weakness, hyperreflexia, seizure, altered mental status, torsades de pointes, atrial fibrillation, hypokalemia, and hypocalcemia refractory to replacement

### What EKG changes would you expect to see in a patient with hypomagnesemia?

Prolonged QT and PR intervals, flattened T waves; may see torsades de pointes

### What is the treatment for hypomagnesemia?

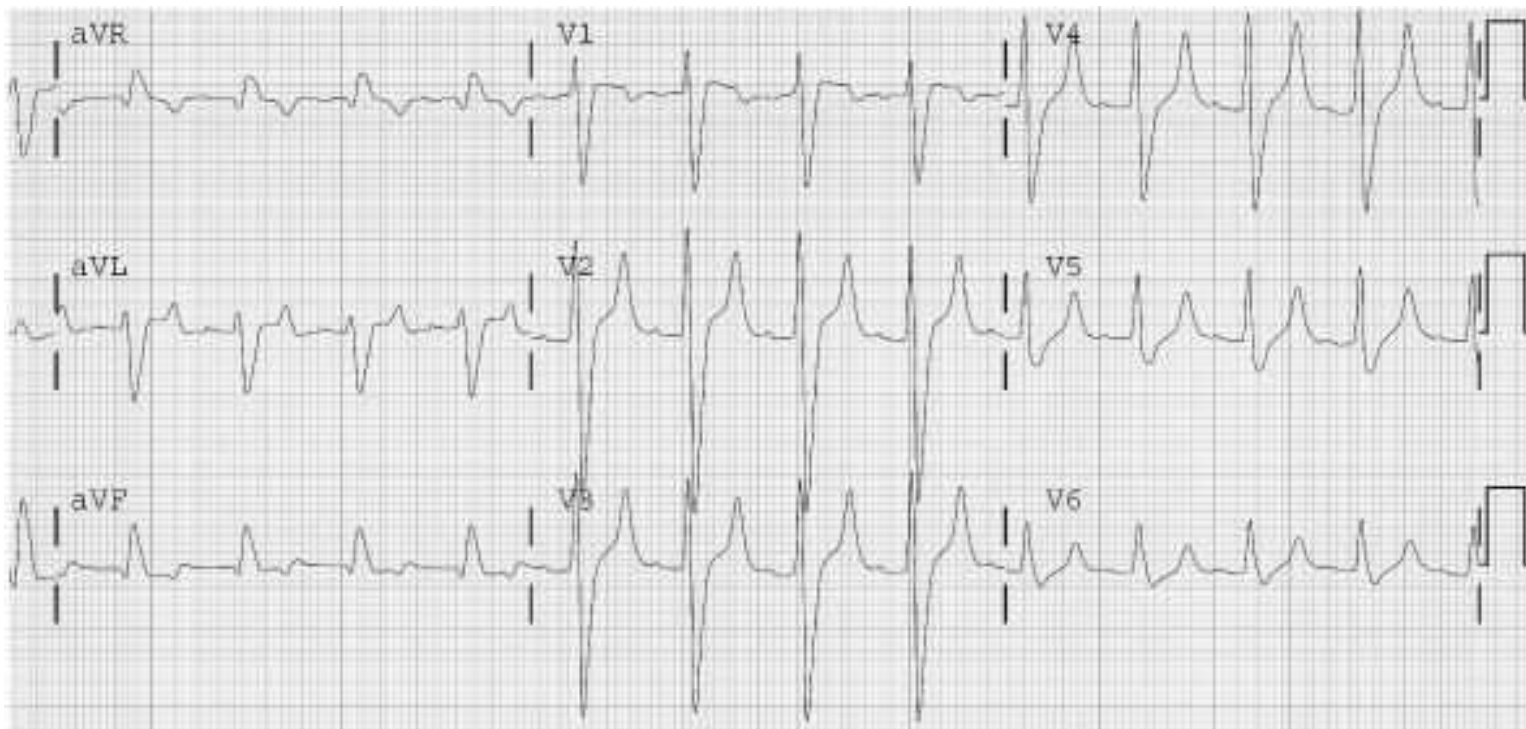
Magnesium sulfate IV

### What other electrolyte abnormalities are related to hypomagnesemia?

Hypokalemia and hypocalcemia—if magnesium is low, these electrolyte abnormalities become refractory to treatment.

### Name the electrolyte abnormality associated with the following EKG ([Fig. 1-9](#)).

Hyperkalemia with peaked T waves



**Figure 1-9** Peaked T waves. (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB, et al. Atlas of Emergency Medicine. 3rd ed. New York: McGraw-Hill, 2010: 778. Photo contributor: R. Jason Thurman, MD.)

## NUTRITION

**Name the type of diet you would order for each of the following types of patients:**

**Patients who have no dietary restrictions**

Regular diet

**Patients with diabetes type I or II**

Diabetic diet or American Diabetes Association (ADA) diet; be sure to specify the number of calories per day

**Patients with renal failure or liver disorders**

Protein-restricted diet; specify the amount of protein per day

**Patients who do not have teeth or have difficulty with chewing and/or swallowing**

Mechanical soft or pureed food

**Patients with pancreatitis**

Npo (nothing by mouth)

**Patients who are at risk for aspiration**

Npo

**Patients with coronary artery disease**

Low-fat diet; cardiac diet

**Patients who are being transitioned from npo to an oral diet**

Clear liquids (includes clear broth, gelatin), then full liquids

**Patients with syndrome of inappropriate secretion of antidiuretic hormone (SIADH)**

Fluid-restricted diet; specify the amount of fluid per day

**Normally, what is the daily protein requirement for an adult?**

1 g/kg per 24 hours

**Normally, what is the daily carbohydrate requirement for an adult?**

35 kcal/kg per 24 hours

**How many kilocalories (kcal) in 1 g of fat?**

9 kcal

**How many kcal in 1 g of carbohydrate?**

4 kcal

**How many kcal in 1 g of protein?**

4 kcal

**What lab test is used to determine chronic nutritional status?**

Albumin, since the half-life is about 20 days

**What lab test is used to determine acute nutritional change?**

Prealbumin, since the half-life is about 3 days

**Name the fat-soluble vitamins.**

D, E, A, K (DEAK)

**Where are the fat-soluble vitamins absorbed?**

In the terminal ileum

**Where is vitamin B<sub>12</sub> absorbed?**

In the terminal ileum

**What must bind B<sub>12</sub> in order for it to be absorbed?**

Intrinsic factor

**Where is iron absorbed?**

Jejunum

**Where is intrinsic factor produced?**

It is produced by the gastric parietal cells.

**Name the effect on the body with each of the following deficiencies:**

**Vitamin B<sub>1</sub> deficiency**

Beriberi, Wernike-Korsakoff syndrome

**Vitamin B<sub>2</sub> deficiency**

Cheilosis

**Vitamin B<sub>3</sub> deficiency**

Pellagra

**Vitamin B<sub>6</sub> deficiency**

Associated with isoniazid (INH) use

**Vitamin B<sub>12</sub> deficiency**

Megaloblastic anemia, neurologic symptoms

**Zinc deficiency**

Poor wound healing, dermatitis, alopecia

**Folic acid deficiency**

Megaloblastic anemia

**Vitamin C deficiency**

Bleeding gums, scurvy

**Vitamin A deficiency**

Poor wound healing

**Vitamin K deficiency**

Bleeding, elevated PT and PTT

**What are the vitamin K-dependent clotting factors?**

Factors 2, 7, 9, 10

**What is TPN?**

Total parenteral nutrition

**What are the indications for TPN use?**

Npo for >7 days

Pancreatitis

Anorexia

Enterocutaneous fistula

Ileus that is not resolving

Burn patients  
Patients unable to take food by mouth

**What are the three main components of TPN?**

1. Amino acids
2. Dextrose
3. Fat

**What percentage of TPN is fat?**

10% (20% in the form of intralipid)

**What percentage of TPN calories comes from dextrose?**

50% to 70%

**What percentage of total calories comes from fat?**

30% to 50%

**What percentage of total calories comes from amino acids (or protein)?**

10% to 20%

**How is basal energy expenditure (BEE) calculated in a male?**

$66 + (13.7 \times \text{weight [kg]}) + (5 \times \text{height [cm]}) - (6.8 \times \text{age})$

**How is BEE calculated in a female?**

$65 + (9.6 \times \text{weight [kg]}) + (1.8 \times \text{height [cm]}) - (4.7 \times \text{age})$

**What are the complications of TPN?**

Fatty liver, acalculous cholecystitis, hyperosmolality, line infection, refeeding syndrome, cholestasis

**What is refeeding syndrome?**

Low potassium, phosphate, and magnesium after refeeding of a patient who was previously starving

**What is PPN?**

Partial parenteral nutrition

**When would PPN be used?**

In patients who can tolerate some nutrition orally and only need some supplementation

**A patient who becomes jaundiced while on TPN or PPN most likely has what condition?**

Cholestasis

**BLOOD PRODUCTS AND TRANSFUSIONS**

**What blood products are measured when checking a complete blood count (CBC)?**

White blood cells, hemoglobin, hematocrit, platelets, red blood cells

**Name the blood products described below:**

<b>Contains no platelets or clotting factors</b>	Packed red blood cells (PRBC)
<b>Contains red blood cell (RBC), white blood cells (WBC), plasma, and platelets and can be used for an acute, heavy bleed</b>	Whole blood
<b>Used to replace clotting factors</b>	Fresh frozen plasma (FFP)
<b>Contains von Willebrand factor, factors VIII and XIII, and fibrinogen. Used in hemophilia A, fibrinogen deficiency, and von Willebrand disease.</b>	Cryoprecipitate
<b>Used to replace low platelets</b>	Platelets

**Name the blood tests described below:**

<b>Tests the intrinsic coagulation pathway</b>	Partial thromboplastin time (PTT)
<b>Tests the extrinsic coagulation pathway</b>	Prothrombin time (PT)
<b>Measures PT</b>	International normalized ratio (INR)

**What is the problem with using FFP in patients on Coumadin?**

It will reverse the anticoagulation quickly; however, it is more difficult to get the patient back to a therapeutic level.

**What else can be used to reverse anticoagulation in a patient on Coumadin?**

Vitamin K, but much slower than FFP

**Which foods have vitamin K?**

Leafy green vegetables

**What is involved in normal coagulation?**

Damage to the endothelium leads to platelet binding and aggregation; coagulation factors then help lay down fibrin to form and stabilize a clot.

**What is a therapeutic INR level for a patient on Coumadin for each of the following underlying conditions:**

<b>Atrial fibrillation</b>	INR 2-3
<b>Mechanical prosthetic heart valve</b>	INR 2.5-3.5
<b>Deep venous thrombosis (DVT)</b>	INR 2-3
<b>Recurrent thromboembolic events with therapeutic INR</b>	INR 2.5-3.5

**When should you consider a blood transfusion in a normal, healthy patient?**

When hemoglobin drops below **8**

**When should you consider a blood transfusion in a patient with coronary artery disease?**

When hemoglobin drops below **10**

**How does 1 U of PRBC affect the hemoglobin and hematocrit?**

1 U should increase the hemoglobin by 1 g/dL and hematocrit by 3%.

**What is the formula for converting hematocrit to hemoglobin?**

Hematocrit  $\div$  3 = hemoglobin.

**What study should be ordered if you are considering transfusing a patient?**

Type and cross

**What is a type and cross?**

The patient's RBCs are cross-matched to available donor blood for transfusion. In this process, the patient's serum is checked for preformed antibodies to the RBCs of the donor.

**What is a type and screen?**

The patient's blood type and Rh antigen are determined and the donor's blood is screened for common antibodies.

**What blood type is considered the universal donor?**

O

**What blood type is considered the universal recipient?**

AB

**What are the two main complications of a blood transfusion that a patient should know about before consenting for a transfusion?**

Possibility of acquiring an infectious disease and possibility of rejection

**What is the most common cause of rejection during a blood transfusion?**

Clerical error leading to ABO incompatibility

**What are the most common signs and symptoms seen of an acute rejection?**

Fever, chills, tachycardia, shock, acute renal failure

**What is the treatment of a rejection to a blood transfusion?**

*Stop the transfusion!* IV fluid resuscitation and make sure the patient has good urine output. If urine output is not sufficient, furosemide (Lasix) can be administered.

**After a transfusion, what would you expect to happen to the ionized calcium in the blood?**

It decreases because of the preservative citrate used to store blood.

**What is the most common transfusion-related infection?**

Hepatitis

**What is the risk of infection with hepatitis B from a blood transfusion?**

1 in 200,000 U of blood

**What is the risk of infection with hepatitis C from a blood transfusion?**

1 in 2 million U of blood

**What is the risk of getting infected with human immunodeficiency virus (HIV) from a blood transfusion?**

1 in 2 million U of blood

**How long can PRBCs be stored?**

6 weeks

**What is the life span of a RBC?**

120 days

**What is thrombocytopenia?**

Platelet count <200,000

**At what platelet count is there a risk for spontaneous intracranial bleeding?**

Platelet count <20,000

**In an actively bleeding patient or a patient who is preoperative, what should the platelet count be?**

A minimum of 50,000

**In what cases of thrombocytopenia are platelets not transfused?**

Do not transfuse platelets in patients with thrombotic thrombocytopenic purpura (TTP), idiopathic thrombocytopenic purpura (ITP), and disseminated intravascular coagulation (DIC), because platelet transfusion will only perpetuate the problem. Platelets are only transfused if the patient is actively bleeding.





# CHAPTER 2

## Cardiology

### HYPERTENSION

#### How is hypertension defined?

Prehypertension: 120-139/80-89

Stage 1: 140-159/90-99

Stage 2: >160/>100

#### What is the most common cause of hypertension?

90% is essential or idiopathic.

#### What are some secondary causes of hypertension?

1. Cardiovascular: coarctation of aorta, aortic regurgitation
2. Renal: renal artery stenosis, polycystic kidney disease, glomerular disease
3. Endocrine: eclampsia, pheochromocytoma, primary hyperaldosteronism (Cushing and Conn)

#### When would you suspect a possible secondary cause?

Resistant hypertension despite multiple medications, diagnosis of hypertension at age <25 or >55

#### Define hypertensive urgency.

Systolic >180, diastolic >120 **with *no* end-organ failure**

#### Define hypertensive emergency.

Also known as malignant hypertension; systolic >180, diastolic >120; **with end-organ failure**

#### What are the signs and symptoms of malignant hypertension?

1. Change in mental status
2. Papilledema
3. Anuria (sign of renal failure)
4. Heart failure
5. New-onset neurologic change

#### What is the treatment for malignant hypertension?

Nitroprusside or nitroglycerine

#### In malignant hypertension, by how much should the blood pressure be reduced in 1 hour?

**Do not** decrease by more than  $\frac{1}{4}$  within 2-6 hours, otherwise the patient will be at risk for a stroke.

#### How do you calculate mean arterial pressure (MAP)?

$(2 \times \text{diastolic} + \text{systolic})/3$

#### What hypertensive treatment is favorable for a patient with each of the following comorbidities?

<b>No comorbidities</b>	If they fail lifestyle modification for 6 months, add a thiazide diuretic.
<b>Postmyocardial infarction (MI)</b>	Beta-blocker and angiotensin-converting enzyme (ACE) inhibitor
<b>Benign prostatic hyperplasia (BPH)</b>	Alpha-blocker
<b>Congestive heart failure (CHF)</b>	ACE inhibitor
<b>Osteoporosis</b>	Thiazide diuretics (do not excrete calcium)
<b>Diabetes</b>	ACE inhibitor
<b>African American</b>	Calcium channel blocker, diuretic

**What are the relative contraindications for each of the following treatments?**

<b>ACE inhibitors</b>	Teratogenic in pregnancy, in renal artery stenosis, renal failure
<b>Beta-blocker</b>	Chronic obstructive pulmonary disease (COPD), asthma, diabetes, hyperkalemia
<b>Short-acting calcium channel blockers</b>	Prior MI, CHF
<b>Potassium (K)-sparing diuretics</b>	Renal failure (can lead to hyperkalemia)
<b>Thiazide diuretics</b>	Diabetes (can cause hyperglycemia)

**What are the most common side effects for each of the following treatments?**

<b>ACE inhibitors</b>	Cough, angioedema, hyperkalemia
<b>Beta-blockers</b>	Bronchospasm, bradycardia, fatigue
<b>Alpha-blockers</b>	Orthostatic hypotension
<b>Diuretics</b>	Hypokalemia, hyperlipidemia, hyperglycemia, hyperuricemia
<b>ARBs</b>	Angioedema, rash, hyperkalemia
<b>Hydralazine</b>	Lupus-like syndrome

**Which three drugs are proven to reduce morbidity and mortality?**

1. Beta-blockers
2. Thiazide diuretics
3. ACE inhibitors

## **HYPERLIPIDEMIA**

**When should a patient with no family history be screened for hyperlipidemia?**

Men aged 35; women aged 45

**How often should a patient with previously normal lipids be rechecked for hyperlipidemia?**

Every 5 years

**What should the low-density lipoprotein (LDL) level be in a patient with no or one risk factor(s) for coronary artery disease (CAD)?**

<160

**What is the goal LDL for a patient with known CAD or CAD equivalents?**

<70

**What is the goal LDL for patient with no known CAD but with two or more risk factors?**

<130

**What are some examples of CAD equivalents?**

Diabetes, peripheral artery disease, abdominal aortic aneurysm, more than a 20% 10-year risk of developing coronary artery disease

**What is a protective factor in terms of hyperlipidemia?**

High-density lipoprotein (HDL) >60

**What is the mechanism for each of the following lipid-lowering agents?**

<b>Statins</b>	3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase inhibitors; ↓ LDL ↑ HDL
<b>Nicotinic acid</b>	Decreases lipolysis and prevents cholesterol synthesis by the liver; ↓ LDL ↑ HDL
<b>Fibrates</b>	Reduces triglycerides in very low-density lipoprotein (VLDL) and chylomicrons; ↑ HDL ↓ triglycerides
<b>Bile acid sequestrants</b>	Bind bile acids in the gut; ↓ LDL

**What should you be concerned about in a patient on a statin complaining of muscle pain?**

Rhabdomyolysis

**How can you test for this?**

Check creatine kinase (CK)

**What side effect of statins should you screen for?**

Elevation in alanine aminotransferase (ALT)

## **CORONARY ARTERY DISEASE**

**What is CAD?**

Atherosclerosis leading to angina or MI

**What are the risk factors for CAD?**

**Major**

Family (hx) (MI before age 55 in a male or 65 in a female)

Diabetes

Smoking

Hyperlipidemia

Hypertension

Age: male >45, female >55

**Minor**

Obesity

Male sex

Postmenopausal female

Elevated plasma homocysteine

**What lifelong treatment has been shown to decrease mortality in a patient with CAD?**

Aspirin, beta-blocker, statin, ACE inhibitor

**What is stable angina?**

Substernal chest pain (may radiate as well to arms, jaw, and so forth) due to ischemia that occurs both predictably and reproducibly at a certain level of exertion and relieved with rest/nitrates

**What are some classic electrocardio-graphic (EKG) findings in a patient with angina?**

ST depression or T-wave inversion

**What is the treatment for acute angina?**

Sublingual nitroglycerin up to three doses

**What is the long-term treatment for angina?**

Nitrates, aspirin, beta-blocker, statin, smoking cessation

**What is unstable angina?**

Angina occurring more frequently, unrelieved by nitroglycerin, or occurs at rest

**How do you evaluate a patient with unstable angina?**

EKG, cardiac enzymes, and, once stable, a cardiac stress test to risk stratify; angiography may be necessary

**How should a patient with unstable angina be treated?**

Hospitalization and treatment with nitroglycerin, aspirin, beta-blocker, ACE inhibitor, statin, heparin drip or Lovenox while on a cardiac monitor

**When is a coronary artery bypass graft (CABG) indicated?**

Failure of medical treatment with severe three-vessel disease; multiple vessel disease in a diabetic patient; or >50% stenosis of the left main artery; proximal significant left anterior descending (LAD) coronary artery stenosis with left ventricular (LV) dysfunction

### **What is Prinzmetal angina?**

Angina due to coronary vasospasm that is usually nonexertional but can be exertional. Angiography is normal in these patients.

### **What is an MI?**

Myocardial necrosis caused by ischemia

### **What are the classic symptoms of an MI?**

Crushing, substernal chest pain described as chest tightness or pressure. It can radiate to the left arm, neck, or jaw and can be associated with concomitant diaphoresis, shortness of breath, nausea, and vomiting.

### **What patients can present with nonclassic symptoms?**

Diabetics and the elderly

### **What are the classic EKG changes associated with an MI?**

ST elevation ([Fig 2-1A](#)) or depression, new left bundle branch block (LBBB), T-wave changes ([Fig 2-1B](#))



**Figure 2-1A**



**Figure 2-1B**

### **What are defining factors for an MI?**

Two of the following three being true:

1. New left bundle branch block
2. Chest pain >20 minutes
3. Elevated cardiac markers

### **What are the three different cardiac enzymes tested in a patient with chest pain?**

Troponin, creatine kinase (CPK), and CK-MB (creatin kinase-MB)

## How do the three cardiac enzymes differ in terms of elapsed time since an MI?

See [Table 2-1](#).

**Table 2-1** Cardiac Enzyme Elevation in an Acute Myocardial Infarction

Cardiac Enzyme	Troponin	CPK	CK-MB
Rises	2-6 hours after injury	4-6 hours	Within 3-4 hours
Peaks	12-16 hours	24 hours	Varies
Stays elevated for	5-10 days	2-3 days	1-2 days

## How often should the cardiac enzymes be done?

Repeat every 6-8 hours for a 24-hour period.

## What is the mnemonic for emergent treatment of an MI?

**Be MONA:**

Beta-blocker

Morphine

Oxygen

Nitroglycerin

Aspirin

## When is thrombolysis indicated?

In an ST-elevation MI, within 12 hours of onset of chest pain

## What are contraindications to thrombolytics?

Previous cerebral hemorrhage, known cerebral aneurysm or arteriovenous malformation (AVM), known intracranial neoplasm, ischemic stroke in the last 3 months, aortic dissection, active bleeding, significant closed head or facial trauma

## What is a contraindication to the use of streptokinase specifically?

Cannot be used more than once in a 6-month period because of its immunogenicity

## What are some possible post-MI complications?

New arrhythmias; Dressler syndrome; papillary muscle rupture; thromboembolism; CHF, ventricular septal defect (VSD), myocardial rupture

## What is Dressler syndrome?

An autoimmune process with the features of fever; pericarditis; elevated erythrocyte sedimentation rate (ESR) that occurs 2-4 weeks after an MI

## What is the treatment of Dressler syndrome?

Nonsteroidal anti-inflammatory drugs (NSAIDs) and aspirin

## What physical examination finding is indicative of a papillary muscle rupture?

New mitral regurgitation

## ARRHYTHMIAS

**Define each of the following types of heart block:**

See [Fig 2-2A-D](#).

**First-degree**

**PR interval is >0.2 seconds** but all atrial impulses are conducted.

**Second-degree Mobitz type I**

Also known as Wenckebach; **PR intervals progressively increase until a beat is dropped**

**Second-degree Mobitz type II**

**PR intervals are fixed with intermittently dropped QRS complexes.**

**Third-degree**

Also known as complete heart block; dissociation between atrial and ventricular activity; no relationship between P waves and QRS intervals

**What is the treatment for each of the following types of heart block?**

**1. First-degree**

1. No treatment required

**2. Second-degree Mobitz type I**

2. If caused by a drug, stop offending drug; may need a pacemaker if bradycardic

**3. Second-degree Mobitz type II**

3. Pacemaker, because it can progress to third-degree block

**4. Third-degree**

4. Pacemaker

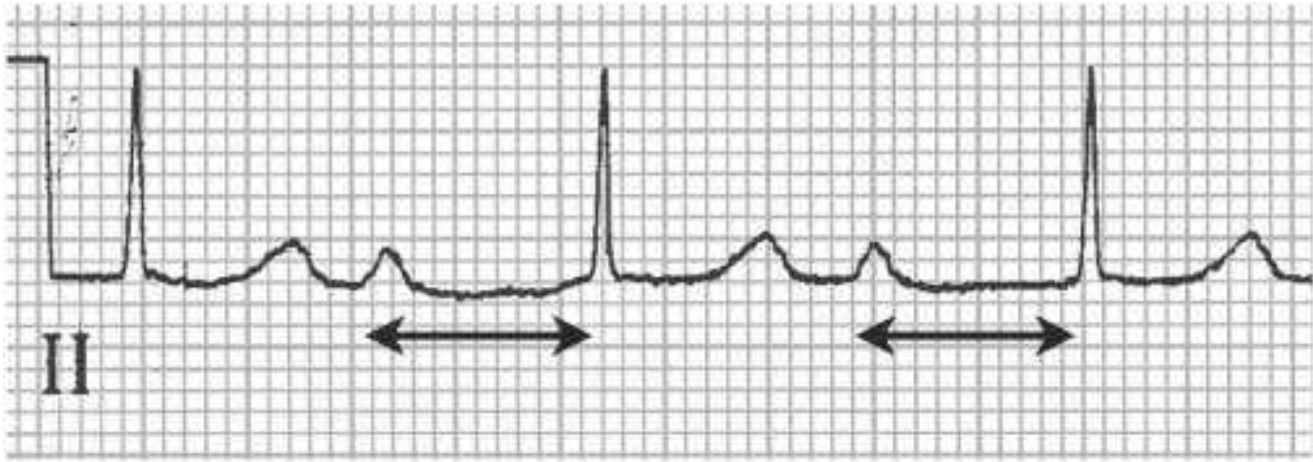
**Name some medications that can lead to second-degree heart block?**

Digoxin, beta-blockers, calcium channel blockers

**What is the most common chronic arrhythmia?**

Atrial fibrillation





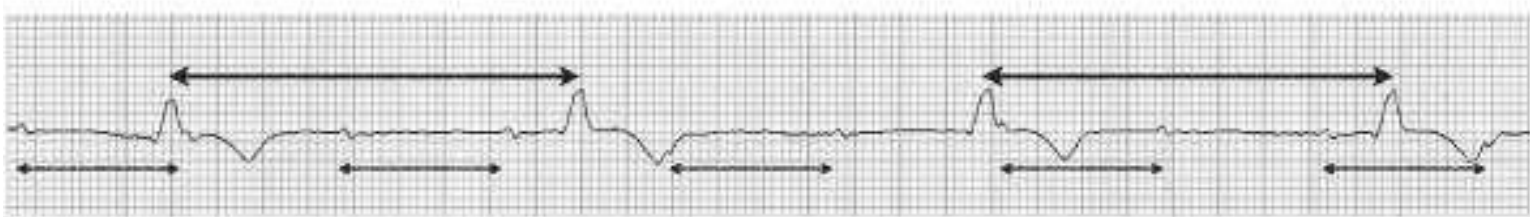
A



B



C



D

**Figure 2-2A-D** (A) The PR interval is fixed (double arrows) and is  $>0.2$  seconds, or five small blocks. (B) The PR interval gradually increases (double arrows) until a P wave is not followed by a QRS and a beat is “dropped” (brackets). The process then recurs. P waves occur at regular intervals, though they may be hidden by T waves. (C) The PR interval is constant (double arrows) until the dropped beat (brackets). (D) The P-P interval is uniform (lower double arrows) and the R-R interval is uniform (upper double arrows), but the P waves and QRS complexes are dissociated. (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB, et al. Atlas of Emergency Medicine. 3rd ed. New York: McGraw-Hill; 2010:747-750.)

### What is atrial fibrillation?

Irregularly irregular rhythm caused by disorganized electric activity of the atrium ([Fig 2-3](#))



**Figure 2-3**

**What is the mnemonic for some etiologies of atrial fibrillation?**

**PIRATES:**

- Pulmonary disease
- Ischemia
- Rheumatic heart disease
- Anemia/Atrial myxoma
- Thyroid
- Ethanol
- Surgery, Sepsis

**What is the most common underlying cause of atrial fibrillation?**

Chronic hypertension

**What are some symptoms that patients with atrial fibrillation complain of?**

Fatigue, light-headedness, palpitations

**What is the major complication of atrial fibrillation if left untreated?**

Embolization which often can lead to stroke

**What are the treatments of atrial fibrillation?**

- Rate control** with beta-blocker, calcium channel blocker (diltiazem), digoxin
- Antiarrhythmic agents** (if failure to rate control or symptomatic despite rate control)
- Anticoagulation** with Coumadin
- In an unstable patient, synchronized cardioversion

**What is atrial flutter?**

Macroreentrant arrhythmia; atrial rates are typically between approximately 240 and 400 beats/min

**What is the classic EKG pattern described in atrial flutter?**

“Saw tooth” ([Fig 2-4](#))



**Figure 2-4**

**What is multifocal atrial tachycardia (MAT)?**

Irregularly irregular rhythm caused by at least three sites of competing atrial activity

**What is the classic EKG finding in MAT?**

At least three different P-wave morphologies in the same lead ([Fig. 2-5](#))



**Figure 2-5**

**What medical condition is associated with MAT?**

COPD

**What is the treatment for MAT?**

Treat the underlying cause.

**What is a premature ventricular contraction (PVC)?**

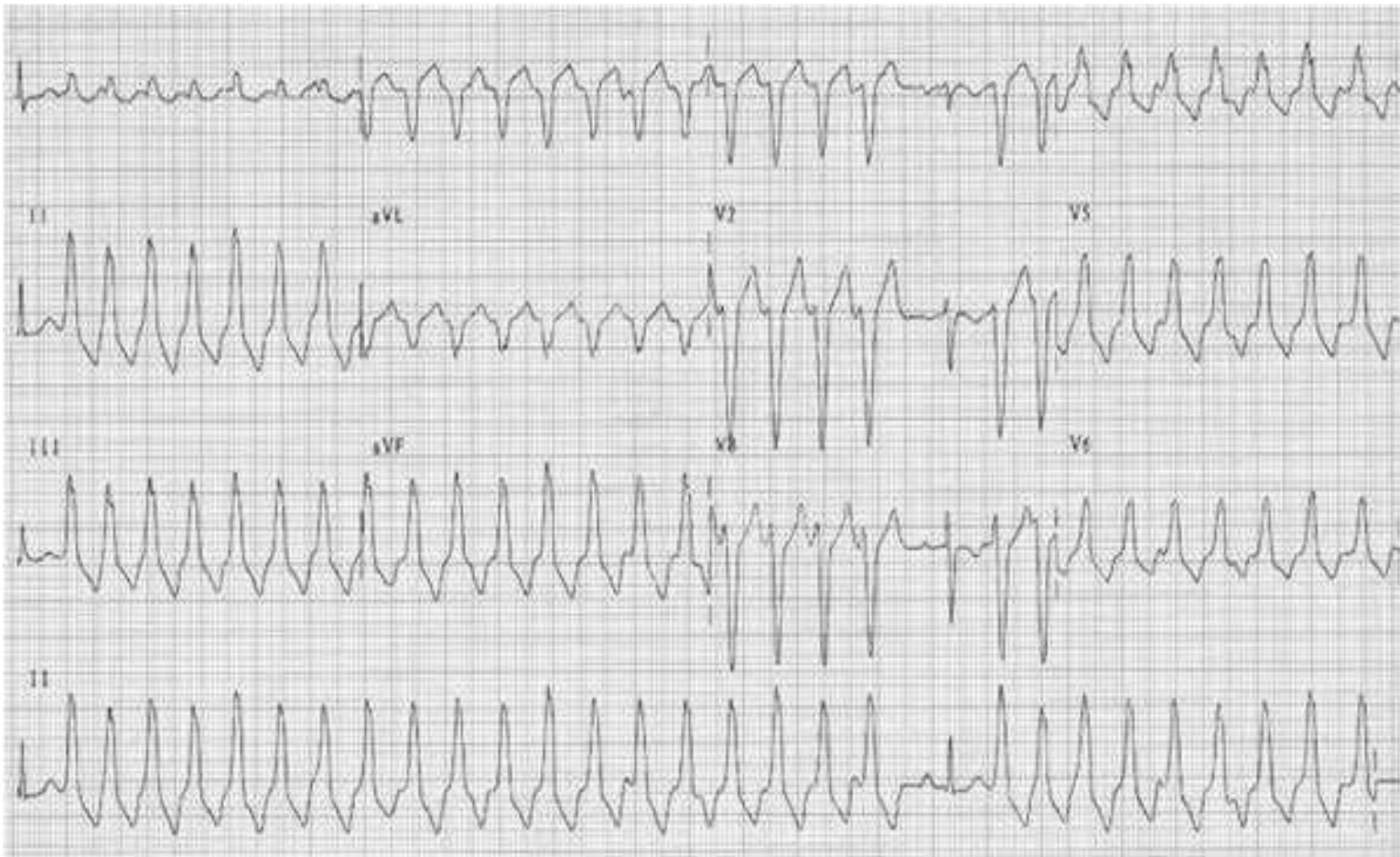
Ectopic beats of ventricular origin

**What is the typical EKG finding in PVCs?**

Wide QRS with no P wave

**What is ventricular tachycardia (VT)?**

More than three consecutive PVCs; sustained VT must last >30 seconds ([Fig 2-6](#))



**Figure 2-6** Ventricular tachycardia with capture beat. (Reproduced, with permission, from Knoop KJ, Stack



**What is the possible complication of VT?**

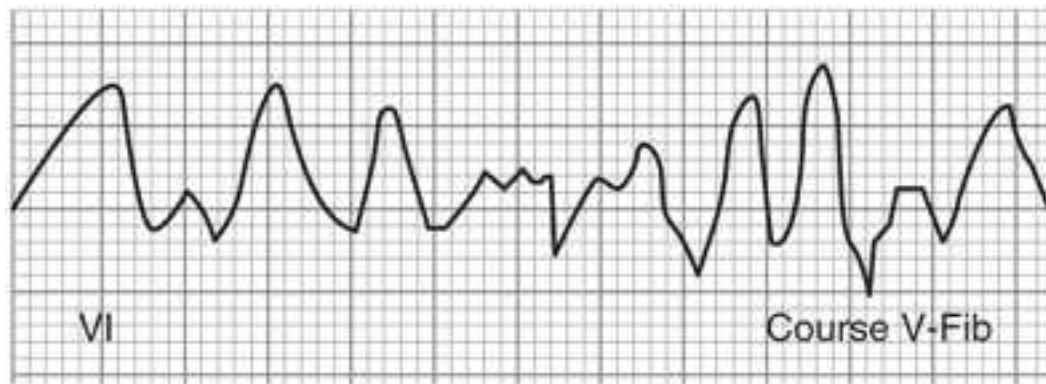
Ventricular fibrillation or cardiac arrest/hemodynamic collapse

**What is the treatment for VT?**

If the patient is asymptomatic and not hypotensive, treat with lidocaine or amiodarone; if the patient is hypotensive or pulseless, treatment is defibrillation.

**What is ventricular fibrillation?**

Disorganized electric activity of the ventricle ([Fig 2-7](#))



**Figure 2-7**

**What is the treatment for ventricular fibrillation?**

Emergent cardioversion

**What is torsades de pointes?**

Prolonged VT with rotation around the axis in a patient with a prolonged QT interval at baseline

**What are the underlying causes of torsades de pointes?**

Quinine, procainamide, intracranial bleed, tricyclics, phenothiazines, electrolyte abnormalities such as hypomagnesemia, hypokalemia, hypocalcemia

**What are the classic EKG findings in Wolff-Parkinson-White (WPW) syndrome?**

“Delta” waves and short PR interval ([Fig 2-8](#))



**Figure 2-8** The PR interval is shortened (double arrow) and a delta wave (upsloping initial QRS segment) is seen (arrow, shaded area). (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB, et al. Atlas of Emergency Medicine. 3rd ed. New York: McGraw-Hill; 2010:775.)

**What medications are contraindicated in WPW?**

**ABCD:**

Adenosine

Beta-blocker

Calcium channel blocker

Digoxin

**What is the primary medical treatment for WPW?**

Procainamide

**What would be the first-line treatment in a WPW patient with hypotension, tachycardia, and evidence of hypoperfusion?**

Synchronized cardioversion because this patient is unstable

**How does digoxin toxicity present?**

Supraventricular tachycardia (SVT) with atrioventricular (AV) block and yellow vision

## **CONGESTIVE HEART FAILURE**

**What is the definition of CHF?**

Inability of the heart to pump enough blood to meet systemic demands. Left-sided heart failure (LHF) leads to pulmonary vascular congestion while right-sided heart failure (RHF) causes systemic venous congestion.

**What are the underlying causes of CHF?**

Myocardial ischemia, anemia, pulmonary embolism, endocarditis, cardiomyopathy, hypertension, pericarditis, cardiac dysrhythmias, thyrotoxicosis, diabetes, rheumatic heart disease, CAD

**What is the most common cause of RHF?**

Left heart failure

**What are the symptoms of RHF?**

Hepatomegaly, jugular venous distension (JVD), ascites

**What are the symptoms of LHF?**

Orthopnea, S<sub>3</sub> gallop, paroxysmal nocturnal dyspnea, cough, diaphoresis, rales

**What is classically seen on a chest x-ray (CXR) in a patient with CHF?**

Pulmonary vascular congestion, enlarged heart, curly B lines

**What are the treatments for CHF?**

ACE inhibitor, diuretics, digoxin, calcium channel blocker, sodium-restricted diet, beta-blockers (but not in acute CHF)

**What is second-line treatment for CHF?**

Isosorbide and hydralazine if the patient can't tolerate an ACE inhibitor ACE inhibitors, nitroprusside

**What medications decrease afterload?**

Diuretics, morphine, nitroglycerine

**What medications decrease preload?**

**Which medications have been shown to decrease mortality in CHF?**

ACE inhibitor, beta-blocker, spironolactone (in class 3 and 4 heart failure)

**What is initially used to treat acute pulmonary edema?**

Remember the mnemonic **MORFiN**

**M**orphine

**O**xygen

**r**

**F**urosemide

**i**

**N**itrates

**Name the drug(s) used in CHF that:**

**Reduces afterload**

ACE inhibitor

**Is used for acute fluid retention**

Loop diuretics

**Are positive inotropes**

Dobutamine, Dopamine, Digitalis

## **VALVULAR HEART DISEASES**

**What does the S<sub>1</sub> sound represent in a heart beat?**

Closure of mitral and tricuspid valves

**What does the S<sub>2</sub> sound represent in a heart beat?**

Closure of the aortic and pulmonic valves

**What is the most common valvular heart disease found in young women?**

Mitral valve prolapse

**What is the underlying etiology of mitral valve prolapse?**

Idiopathic; genetic transfer via autosomal dominant gene; ischemic heart disease; Marfan; myxomatous degeneration of the mitral valve

**What is the pathognomonic murmur heard in a mitral valve prolapsed?**

Late systolic murmur and a mid-systolic click

**Where is the murmur most audible?**

Apex

**What is the treatment for mitral valve prolapse?**

No treatment is necessary.

**What are the underlying etiologies of mitral stenosis?**

Most commonly due to **rheumatic heart disease**

**In what sex does mitral stenosis predominate?**

Females

**What are the signs and symptoms of mitral stenosis?**

Dyspnea, orthopnea, cough, rales, hoarse voice, atrial fibrillation, hemoptysis

**What is the underlying cause leading to the symptoms found in mitral stenosis?**

Flow is decreased behind the mitral valve leading to left atrial enlargement and eventually heart failure.

**Name the valvular heart diseases that cause a systolic ejection murmur.**

Pulmonary stenosis, aortic stenosis

**Name the valvular heart diseases that cause a pansystolic murmur.**

Mitral regurgitation, tricuspid regurgitation

**Name the valvular heart diseases that cause a diastolic murmur.**

Aortic regurgitation

**Name the valvular heart disease associated with each of the following:**

Systolic crescendo-decrescendo murmur at the second right intercostal space, which radiates to carotids	Aortic stenosis
Mid-diastolic murmur with an opening snap and rumble best heard at the left sternal border	Mitral stenosis
Holosystolic murmur that radiates to the axilla	Mitral regurgitation
High-pitched decrescendo diastolic murmur, louder if leaning forward	Aortic regurgitation
Diastolic murmur louder with inspiration	Tricuspid stenosis
Holosystolic murmur at the left lower sternal border	Tricuspid regurgitation
Late-systolic murmur with mid-systolic click	Mitral valve prolapse

**What is a mnemonic to remember diastolic murmurs?**

AR/MS piTS (Aortic Regurgitation/Mitral Stenosis, Tricuspid Regurgitation)

**What is a mnemonic to remember holosystolic murmurs?**

MoR/TaR (Mitral Regurgitation/Tricuspid Regurgitation)

## **CARDIOMYOPATHY**

**What are the three categories of cardiomyopathy?**

Remember the mnemonic **HaRD**

**H**ypertrophic

**a**

**R**estrictive

**D**ilated

**What is the mnemonic for some etiologies of a dilated cardiomyopathy?**

**ABCD I**

**A**lcohol abuse

**B**eriberi

**C**ocaine, Chagas disease, Coxsackie B

**D**oxorubicin

**I**diopathic, **I**schemic, **I**nfectious

**Name the type of cardiomyopathy associated with each of the following descriptions:**



<b>Symptoms of CHF, S<sub>3</sub> heart sound, enlarged balloon-like heart, atrial fibrillation, mitral regurgitation, systolic dysfunction</b>	Dilated
<b>50% of cases are genetically inherited via an autosomal dominant trait</b>	Hypertrophic
<b>Diastolic dysfunction as a result of ventricular enlargement and thickened septum, and systolic dysfunction as a result of LV outflow obstruction</b>	Hypertrophic
<b>Caused by radiation-induced fibrosis, endomyocardial fibrosis, amyloidosis, sarcoidosis, glycogen storage diseases</b>	Restrictive
<b>Syncope with exertion</b>	Hypertrophic
<b>Most common cause of sudden death in young adults</b>	Hypertrophic
<b>Mitral regurgitation, S<sub>4</sub> heart sound, systolic ejection murmur, large boot-shaped heart</b>	Hypertrophic
<b>Systolic dysfunction and left ventricular dilation are necessary to make the diagnosis</b>	Dilated
<b>Similar to constrictive pericarditis</b>	Restrictive
<b>Treatment includes cessation of all alcohol use</b>	Dilated
<b>Symptoms relieved with beta-blockers or calcium channel blockers</b>	Hypertrophic
<b>Treated with ACE inhibitor, beta-blocker, CHF-directed therapies, diuretics</b>	Dilated

## **ENDOCARDITIS**

## What is endocarditis?

Heart valve inflammation usually due to an infective cause

## Name the most common causes of the following types of endocarditis:

### Acute

Most commonly, *Staphylococcus aureus* (IVDA [intravenous drug abuse]); others: *Streptococcus pneumoniae*, *Neisseria gonorrhoeae*

### Subacute

Most commonly, *Streptococcus viridans* (dental work); others: *Enterococcus*, *Staphylococcus*

### Culture negative

#### HACEK:

*Haemophilus influenzae*

*Actinobacillus*

*Cardiobacterium*

*Eikenella*

*Kingella*

### Marantic

Previous rheumatic fever or cancer metastasis

## What type of endocarditis is seen in systemic lupus erythematosus (SLE)?

Libman-Sacks endocarditis (LSE) caused by autoantibodies damaging heart valves

## How can this be distinguished on echocardiogram?

Sterile fibrofibrinous vegetations that favor the left-sided heart valves. They tend to form on the ventricular surface of the mitral valve.

## What are the signs and symptoms of endocarditis?

Fever, chills, **Janeway lesion**, **Roth spots**, **Osler nodes**, **splinter hemorrhages**, new murmur, conjunctival hemorrhages

## What are Janeway lesions?

Dark hemorrhagic peripheral macules or painless nodules usually on palms and soles ([Fig 2-9](#))



**Figure 2-9** Janeway lesions. (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB, et al. Atlas of Emergency Medicine. 3rd ed. New York: McGraw-Hill; 2010:374. Photo contributor: Department of Dermatology, Wilford Hall USAF Medical Center and Brooke Army Medical Center, San Antonio, Texas.)

**What are Roth spots?**

Retinal hemorrhages

**What are Osler nodes?**

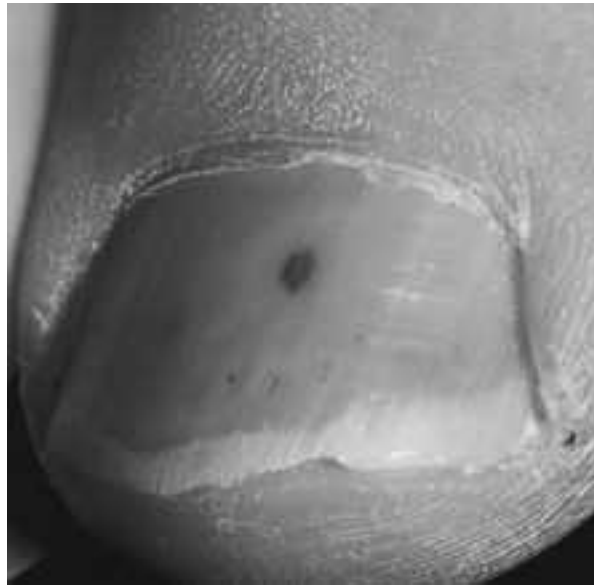
Ouch! Painful nodules on fingers and toes ([Fig 2-10](#))



**Figure 2-10** Osler nodes. (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB, et al. Atlas

### **What are splinter hemorrhages?**

Petechiae on fingernails ([Fig 2-11](#))



**Figure 2-11** Splinter hemorrhage. (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB, et al. Atlas of Emergency Medicine. 3rd ed. New York: McGraw-Hill; 2010:375. Photo contributor: Armed Forces Institute of Pathology, Bethesda, Maryland.)

### **What is the most likely cause of right-sided endocarditis?**

IVDA

### **What tests would you order to help diagnose endocarditis?**

Three sets of blood cultures and an echocardiogram to look for vegetations

### **What valve is most commonly affected in endocarditis?**

Mitral valve

### **What valve is most commonly affected in an IV drug user with infective endocarditis?**

Tricuspid valve

### **What criteria are used to make the diagnosis of endocarditis?**

Duke criteria

### **What are the major criteria?**

1. Two positive blood cultures demonstrating the same organism
2. Positive echocardiogram

### **What are the minor criteria?**

1. Predisposing condition such as a valvular heart abnormality, hypertrophic cardiomyopathy, congenital heart disease
2. Documented temperature  $>38^{\circ}\text{C}$
3. Signs of embolic disease such as Janeway lesions, pulmonary emboli, cerebral emboli, hepatic or splenic emboli
4. Immunologic signs such as Roth spot

5. One positive blood culture

**Before an organism is isolated and antibiotics can be tailored, what antibiotics should be initiated in a patient suspected to have endocarditis?**

Aminoglycoside and a beta-lactam

**How long should a patient with endocarditis be treated with antibiotics?**

4-6 weeks

**Who should be treated with prophylactic antibiotics for endocarditis before dental procedures or gastrointestinal or genitourinary procedures?**

Patients with any of the following:

History of endocarditis, prosthetic heart valves, unrepaired cyanotic heart disease, congenital cyanotic disease repaired within the last 6 months, or cardiac transplantation with subsequent valvulopathy

**What antibiotic is standard for prophylaxis prior to dental procedures?**

Amoxicillin

## **RHEUMATIC FEVER**

**What infection causes rheumatic fever?**

Group A streptococcal pharyngitis

**Why does this infection cause rheumatic heart disease?**

The antistreptococcal antibodies react with cardiac antigen.

**What valve is most commonly affected in rheumatic heart disease?**

Mitral valve

**What serologic test could be used to confirm a prior streptococcal infection?**

A positive antistreptolysin (ASO) antibody titer

**What is the mnemonic for the five major criteria for rheumatic heart disease?**

**Jones** criteria:

**J**oints (migratory polyarthritis)

**C**arditis (endocarditis, pericarditis, myocarditis)

**N**odules (subcutaneous)

**E**rythema marginatum (serpiginous rash)

**S**ydenham chorea

**What are the minor criteria for rheumatic heart disease?**

PR-interval prolongation

Fever

Elevated ESR

Arthralgias

**How should streptococcal pharyngitis be treated to prevent rheumatic heart disease?**

Penicillin

## **PERICARDITIS**

## **What is pericarditis?**

Inflammation of the pericardium

## **What are some causes of pericarditis?**

Infectious: viral, bacterial, fungal

Autoimmune: rheumatoid arthritis, SLE, scleroderma

Drugs HIP: hydralazine, isoniazid, procainamide (these are the same drugs that can lead to SLE-like reaction); radiation therapy

Trauma

Post-MI

Metastatic cancer

Uremia

## **What is pericarditis that occurs 2-4 weeks post-MI called?**

Dressler syndrome

## **What are the classic symptoms of pericarditis?**

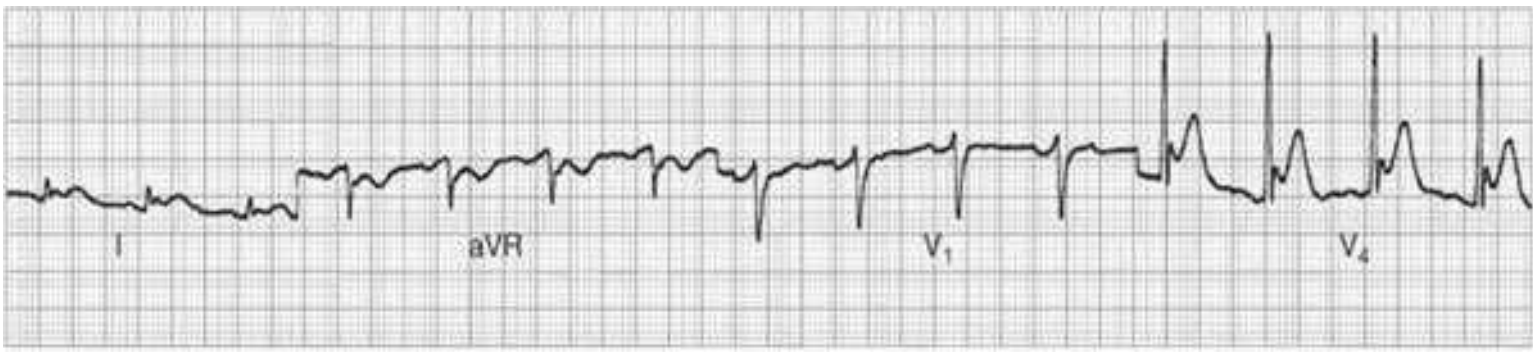
Pleuritic chest pain that is relieved with sitting up and leaning forward

## **What are the pathognomonic physical exam findings of pericarditis?**

Pericardial **friction rub** on auscultation of the heart during expiration; **pulsus paradoxus**

## **What are the classic EKG findings associated with pericarditis?**

Diffuse ST elevations and PR depressions (usually in all or almost all leads) ([Fig 2-12](#))



**Figure 2-12** Classic EKG finding associated with pericarditis. (Reproduced, with permission, from Stead LG, Stead SM, Kaufman MS, et al: First Aid for the Medicine Clerkship. 2nd ed. New York: McGraw-Hill; 2006:33.)

### How can the diagnosis of pericarditis be confirmed?

Pericarditis is a clinical diagnosis, but an echocardiogram may show a pericardial effusion.

### How is pericarditis treated?

The underlying cause should be addressed. NSAIDs to decrease inflammation; antibiotics for bacterial causes; steroids for autoimmune etiology; pericardiocentesis would be necessary for a large pericardial effusion

## MYOCARDITIS

### What is myocarditis?

Inflammation of the heart muscle

### What is the most common viral cause of myocarditis?

Enterovirus infection (eg, Coxsackie B)

**What are the causes of myocarditis?**

Viral: Coxsackie A and B, HIV, EBV (Epstein-Barr), HBV (hepatitis B), cytomegalovirus (CMV)

Bacterial: rheumatic fever, Lyme disease, meningococcus, mycoplasma

Parasitic: Chagas disease, toxoplasmosis, trichinella

Autoimmune: SLE, Kawasaki disease

Drugs

**What are the signs and symptoms of myocarditis?**

Precordial chest pain with signs of CHF

**What does the EKG look like in a patient with myocarditis?**

Nonspecific ST changes, dysrhythmias

**How can a definitive diagnosis of myocarditis be made?**

Myocardial biopsy

**What is the treatment for myocarditis?**

Treat CHF symptoms, dysrhythmias, and the underlying etiology. Steroids are contraindicated. In some cases, intravenous immunoglobulin (IVIG) is beneficial.

## **CARDIAC TAMPONADE**

**What is cardiac tamponade?**

Pericardial fluid accumulation that causes impaired cardiac filling and thus leads to decreased cardiac output

**What is Beck's triad?**

Symptoms seen in cardiac tamponade:

1. **Hypotension**
2. **Distant heart sounds**
3. **JVD**

**What are some other classic symptoms of cardiac tamponade?**

Dyspnea, tachycardia, pulsus paradoxus

**What is pulsus paradoxus?**

>10 mm Hg fall in blood pressure during inspiration

**What is seen on EKG in a patient with pulsus paradoxus?**

**Electrical alternans**—a beat-to-beat change in the height of the QRS complex

**What study can help confirm the diagnosis of cardiac tamponade?**

Echocardiogram will show a pericardial effusion.

**What is the treatment for pericardial tamponade?**

Pericardiocentesis vs pericardial window. IV fluids should also be given for volume expansion.

## **ABDOMINAL AORTIC ANEURYSM**



**Who should be screened for an abdominal aortic aneurysm (AAA)?**

Men older than 65 with a smoking history

**What is the screening tool used?**

Ultrasound

**How should AAA be managed?**

AAA <5 cm: blood pressure control, smoking cessation, and annual imaging AAA >5 cm: elective surgical repair

**What are the typical symptoms of a ruptured aneurysm?**

Severe chest pain with radiation to the back between the scapula. Often described as a tearing pain.

**What is the treatment of a ruptured aneurysm?**

Emergent surgery

**What are the risk factors to the development of an AAA?**

1. Smoking (#1 risk factor)
2. Hyperlipidemia
3. Chronic hypertension

**What is the classic description of a patient with an AAA on chest x-ray?**

Widened mediastinum

**CLINICAL VIGNETTES**

**A 54-year-old male with type II diabetes comes in for a routine physical. The vitals show a BP of 138/69. The patient currently takes aspirin, Zocor, and metformin. What type of drug would you add to this regimen?**

ACE inhibitor

**A 65-year-old male with a history of long-standing hypertension, presents with sensation of lightheadedness, shortness of breath, and palpitations. An EKG shows an irregularly, irregular rhythm. The heart rate is 110. The patient is started on a beta-blocker and the rate is controlled. You decide to start Coumadin. What is the goal INR?**

INR between 2 and 3

**A patient with a history of coronary artery disease presents to the emergency room complaining of chest pain. His medication list includes the following drugs: Prozac, lisinopril, atenolol, Zyrtec, nitroglycerin, aspirin, daily multivitamin. What class of medication would you suggest him to add to this regimen?**

Statin

**An obese 48-year-old male presents complaining of palpitations and light-headedness. An EKG demonstrates an irregularly irregular rhythm at 120 beats/min. What is the most likely underlying cause of this patient's problem?**

The patient has atrial fibrillation and most likely caused by hypertension.

**A 36-year-old male with no past medical history complains of several days of chest pain. The chest pain is exacerbated with inspiration and relieved with sitting up. He recently had a viral illness with fever. His**

**physical examination is unremarkable. His EKG shows diffuse ST-segment elevations. What is the most likely diagnosis for this patient's symptoms and what is the first-line treatment?**

Pericarditis and NSAIDs



# CHAPTER 3

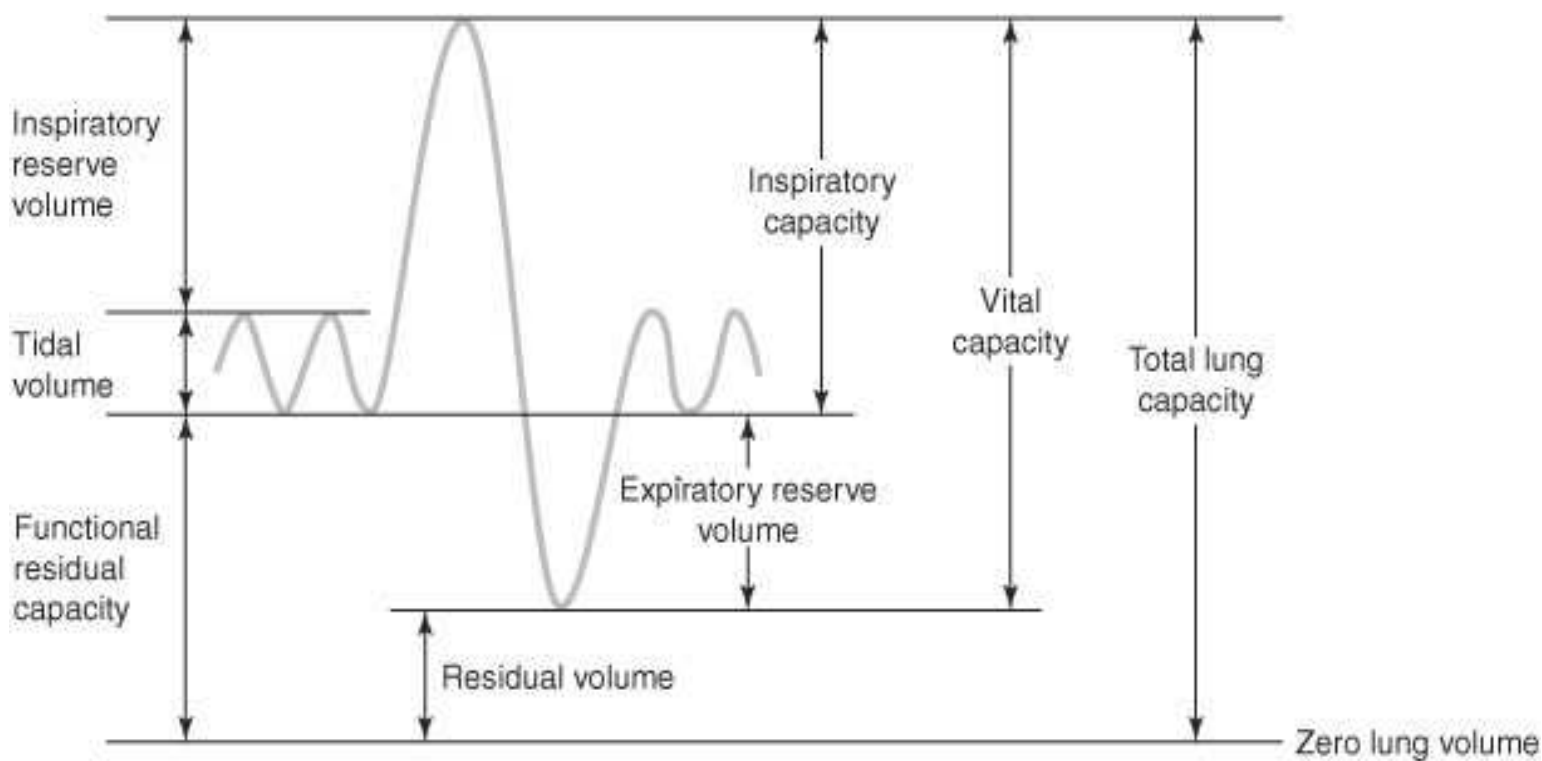
## Pulmonology

### LUNG VOLUMES

What is the definition of each of the following? ([Fig 3-1](#))

See [Figure 3-1](#)

<b>Tidal volume (TV)</b>	The air that is inhaled and exhaled during a normal respiration
<b>Residual volume (RV)</b>	Air that remains in the lungs after a maximal respiration
<b>Inspiratory reserve volume (IRV)</b>	Air in excess of TV that enters the lungs at maximal inspiration
<b>Expiratory reserve volume (ERV)</b>	Air that can be expired from the lungs after a normal expiration
<b>Functional residual capacity (FRC)</b>	$RV + ERV$
<b>Inspiratory capacity (IC)</b>	$TV + IRV$
<b>Total lung capacity (TLC)</b>	$TV + IRV + RV + ERV$
<b>Vital capacity</b>	$TLC - RV$



**Figure 3-1** Lung volumes as represented by spirogram tracing. (This figure was published in Lumb AB. *Nunn's Applied Respiratory Physiology, 5th ed. Butterworth-Heinemann. Copyright Elsevier 2000.*)

## HYPOXIA

**What is the mnemonic for the mechanisms of hypoxia?**

**CIRCULAR:**

Circulatory

Increased oxygen requirement

Respiratory

Carbon monoxide poisoning

Underutilization

Low fraction of inspired oxygen ( $FI_{O_2}$ )

Anemia

Right-to-left shunt

**What are the important respiratory causes of hypoxia?**

Hypoventilation due to a decreased respiratory rate, decreased vital capacity, or ventilation/perfusion ratio (V/Q) mismatch

**How can respiratory hypoxia be improved?**

Supplemental oxygen and by treating the underlying cause

**What is a common underlying cause of decreased respiratory rate?**

Drugs: opiates

**What are common underlying causes of increased respiratory rate?**

Infection

Trauma

**What are some reasons for decreased vital capacity?**

Underlying lung disease, deformities of the chest wall such as in severe scoliosis, muscle weakness

**When is low FIO<sub>2</sub> mostly a problem?**

High altitudes or closed spaces with no fresh air or fire

**How does diffusion impairment cause hypoxia?**

With circulatory impairment such as in heart failure or anemia, there is poor perfusion and, therefore, decreased blood transit time in the lungs causing decreased diffusion. Other reasons for diffusion impairment would be due to underlying lung pathology causing an increased diffusion pathway.

**Give an example of hypoxia caused by underutilization.**

When there is impairment of cytochrome due to toxins/poisons, such as with cyanide

**What are the examples of increased requirement for oxygen?**

Exercise, hyperthyroidism, infection

**What are some examples of causes of V/Q mismatch?**

Pulmonary embolism, underlying lung disease such as in lung cancer or chronic obstructive pulmonary disease (COPD), bronchospasm, pneumonia, pulmonary edema

**Why is carbon monoxide poisoning a cause of tissue hypoxemia?**

Carbon monoxide binds to hemoglobin and makes it unavailable for oxygen transport.

**What is the clinical sign of carbon monoxide poisoning?**

Cherry red lips and nails

**What is an A-a gradient?**

The difference in concentration between alveolar and arterial oxygen. It is a measure of gas exchange efficiency in the lung. The less the gradient the greater the oxygenation.

**How do you expect the PCO<sub>2</sub>, and A-a gradient to be affected in each of the following causes of hypoxia?**

See [Table 3-1](#).

- 1. Hypoventilation
- 2. Right-to-left shunt
- 3. Low FIO<sub>2</sub>
- 4. V/Q mismatch

**Table 3-1** Hypoxia Etiology and Effects on PCO<sub>2</sub> and A-a Gradient

	Hypoventilation	R to L Shunt	Low FIO <sub>2</sub>	V/Q Mismatch
PCO <sub>2</sub>	↑	↑	normal	normal
A-a gradient	normal	↑	normal	↑

**What are the signs and symptoms of hypoxia?**

Dyspnea, tachypnea, tachycardia (increased perfusion), clubbing of nails, and cyanosis of extremities

### **What is the treatment for most types of hypoxia?**

Increased FIO<sub>2</sub> via oxygen administration while identifying and treating the underlying cause

### **What type of hypoxemia does not improve with increased FIO<sub>2</sub>?**

A **right-to-left shunt** because there is no ventilation of the abnormal alveoli and, therefore, blood does not come in contact with oxygen

### **How is hypoxemia secondary to high altitude treated?**

Oxygen administration can help but the body adjusts and self-corrects within several weeks.

## **OBSTRUCTIVE PULMONARY DISEASES**

### **What defines chronic obstructive pulmonary disease (COPD)?**

As the name implies, it is defined by chronic obstruction to expiratory airflow such that the forced expiratory volume in 1 second/forced vital capacity (FEV<sub>1</sub>/FVC) is decreased.

### **What are the two main forms of COPD?**

Emphysema and chronic bronchitis

### **What is the male-to-female ratio of emphysema?**

Male:female = 10:1.

### **What defines emphysema?**

Chronic obstructive expiratory airflow with **dilation of air spaces** caused by destruction of alveolar walls

### **What is the most common cause of emphysema?**

Smoking

### **What type of emphysema does smoking cause?**

**Centrilobular**, meaning that it affects the bronchioles (Hint: The “S” sound is in both smoking and centrilobular)

### **What causes panacinar emphysema?**

**Alpha-1-antitrypsin deficiency**

### **What is the function of alpha-1-antitrypsin in the lung?**

It protects the elastin in the lungs from proteolytic enzymes.

### **What are the pathognomonic symptoms associated with emphysema?**

**Pursed lip breathing** (with prolonged expiratory phase), **barrel chest**, **hyperventilation**; classically described as a “**pink puffer**,” weight loss

### **What is seen on a chest x-ray (CXR) in a patient with emphysema?**

Hyperinflation and hyperlucency of the lungs with flattening of the diaphragms; parenchymal bullae and subpleural blebs may be present; alveolar wall destruction

### **What do you expect to see in arterial blood gases (ABGs) in a person with early-stage emphysema?**

Low PCO<sub>2</sub> and normal/low PO<sub>2</sub>

### **What is the long-term treatment for emphysema?**

**Smoking cessation!** Home oxygen, bronchodilators, steroids; pneumococcal and flu vaccines should be offered

**What defines chronic bronchitis?**

Productive cough on most days during 3 or more consecutive months for 2 or more consecutive years

**What is the difference in symptomatology in chronic bronchitis vs emphysema?**

Chronic bronchitis includes a persistent productive cough as well as more hypoxia than seen in emphysema, and patients are usually overweight.

**What is the pathognomonic description of a person with chronic bronchitis?**

“Blue bloater” because of CO<sub>2</sub> retention and hypoxia

**What do you expect to see in an ABG in a person with chronic bronchitis?**

**High Pco<sub>2</sub>** and low PO<sub>2</sub>, compensated respiratory acidosis

**What are the potential complications associated with chronic bronchitis?**

Right heart failure (cor pulmonale), polycythemia, pneumonia, hepatomegaly

**What is the treatment for chronic bronchitis?**

Treatments are the same as that for emphysema and include smoking cessation, oxygen therapy, bronchodilators, and steroids, and, also, some treatment with antibiotics in exacerbations.

**What are the only treatments proven to extend life in COPD?**

Oxygen therapy and smoking cessation

**How is bronchiectasis defined?**

Pathologic dilatation of bronchioles caused by chronic inflammation and wall structure destruction

**What are some common etiologies of bronchiectasis?**

Cystic fibrosis, tuberculosis (TB), lung abscess, toxin inhalation

**What is the underlying pathologic problem that results because of chronic dilatation of bronchioles?**

The dilated bronchioles impede mucociliary clearance, favoring mucus pooling and colonization with bacteria and, therefore, further lung damage.

**What are the most common pathogens that colonize the lung in an individual with bronchiectasis?**

**SHiPS:**

*Staphylococcus aureus*

*Haemophilus influenzae*

**i**

*Pseudomonas*

*Streptococcus pneumoniae*

**How do you treat the organisms that most commonly infect the lung in bronchiectasis?**

Third-generation cephalosporin

**What are the signs and symptoms of bronchiectasis?**

Halitosis, hemoptysis, chronic cough with sputum production

**How can bronchiectasis be diagnosed?**

High-resolution computed tomographic (CT) scan of the lungs will demonstrate bronchial dilatation as well as destruction



**What is the pathognomonic sign seen on CT in a person with bronchiectasis?**

Tram track lung markings

**What is the treatment for bronchiectasis?**

Antibiotics for infections, bronchodilators, oxygen, mucolytics, chest PT and, sometimes, lung transplant

**How is asthma defined?**

Reversible obstruction of airways secondary to airway inflammation, hypersecretion and, most importantly, bronchoconstriction that leads to a decreased peak flow and FEV<sub>1</sub>

**What is intrinsic asthma associated with?**

Exercise-induced or upper respiratory infection (URI)-induced asthma

**What is extrinsic asthma associated with?**

Asthma caused by **eosinophilia** or increased immunoglobulin E (IgE) levels in response to Environmental antigens

**When does asthma usually start and what is its usual course?**

Asthma generally begins during childhood and usually resolves on its own by the early teenage years.

**What is often the first symptom of asthma that a patient will often describe?**

Nighttime cough (for some people this is the only symptom)

**What are some of the major signs and symptoms of an acute asthma exacerbation?**

Expiratory wheeze, shortness of breath, chest tightness, subcostal retractions, accessory muscle use, prolonged expiratory phase

**What would spirometry show in an asthmatic?**

Decreased FEV<sub>1</sub>

**How can it be confirmed that the wheezing is caused by asthma and not some other cause?**

The wheezing resolves with bronchodilator therapy and the FEV<sub>1</sub> will increase by 10% or more.

**What would an ABG show in an asthma attack?**

Hypoxia and respiratory alkalosis

**What is a sign of impending respiratory failure in a case of asthma?**

ABG that shows normalizing Pco<sub>2</sub>

**What classic diagnosis should you think of if the complete blood count (CBC) of an asthmatic demonstrates eosinophilia?**

Churg-Strauss syndrome

**What are the different categories of asthma, what are their symptoms (Sx), and what is the treatment for each?**

See [Table 3-2](#).

**What is the first-line treatment for an acute asthma exacerbation?**

Oxygen, bronchodilators (includes beta-agonist and ipratropium [Atrovent]), and steroids

**What is the second-line treatment for an acute asthma attack?**

Subcutaneous epinephrine and MgSO<sub>4</sub>

### How can mild asthma refractory to aggressive beta-agonist therapy be treated?

Add an inhaled steroid.

### When is systemic corticosteroid therapy indicated in asthma?

Daily or continuous asthma that is refractory to beta-agonist and inhaled steroids

### What are some alternative therapies in asthma?

Leukotriene inhibitors, methylxanthines, immunomodulators, leukotriene receptor modifiers, and cromolyn sulfate. Also allergic desensitization in extrinsic asthma.

**Table 3-2** Asthma Classification and Medical Management

Asthma Type	Symptoms	Treatment
Mild intermittent	<2 × per week and nighttime Sx <2 × per month	Short-acting beta-agonist (albuterol)
Mild persistent	>2 × per week and nighttime >2 × per month	Short-acting beta-agonist and low-dose steroid inhaler
Moderate persistent	Daily asthma with nighttime >1 × per week	Long-acting bronchodilator and medium-dose steroid as well as short-acting rescue as needed
Severe persistent	Continuous symptoms	Systemic steroids and long-acting bronchodilators

## RESTRICTIVE LUNG DISEASE

### What is the definition of a restrictive lung disease?

Unlike obstructive lung disease, the **FEV<sub>1</sub>/FVC is normal to high**; it is the **total lung capacity (TLC)** that **decreases**

### What are some examples of restrictive lung diseases?

Interstitial lung diseases, spaceoccupying lesions such as tumors; pleural effusions; neuromuscular diseases such as severe scoliosis, spinal cord trauma, and multiple sclerosis

### What are some examples of interstitial lung diseases?

Anything that causes chronic lung injury such as asbestosis, acute respiratory distress syndrome (ARDS), coal mine dust, silicosis, berylliosis, chronic lung injury because of chronic infections, radiation

**What is the pathognomonic description of an interstitial lung disease?**

“Honeycomb lung”

**What is the most common cause of atelectasis?**

A postoperative patient who is nonambulatory for a long period of time

**What types of chemotherapy can cause a restrictive lung disease?**

Busulfan and bleomycin

## **PLEURAL EFFUSION**

**What is a pleural effusion?**

Increased fluid in the pleural space

**What are the two main types of pleural effusions?**

1. Exudate
2. Transudate

**What are some common causes of exudative pleural effusions?**

Infection such as pneumonia, malignancy, collagen vascular disease

**What are some common causes of transudative pleural effusions?**

Congestive heart failure (CHF), cirrhosis, nephritic syndrome

**What is the underlying cause of fluid buildup in an exudate?**

Increased capillary permeability

**What is the underlying cause of fluid buildup in a transudate?**

1. Decreased oncotic pressure
2. Increased hydrostatic pressure

**How can a pleural effusion be evaluated?**

Thoracentesis with analysis of cell counts, cultures, chemistries, and cytology

**How can a pleural effusion be treated?**

Treating the underlying cause and thoracentesis can be both diagnostic and therapeutic.

**What lab tests should be sent in order to evaluate the pleural fluid?**

Fluid and serum protein, glucose, lactate dehydrogenase (LDH); fluid culture and Gram stain; fluid cytology and cell count with differential and, additionally, you can send fluid amylase, AFB, ANA, RF, pH

**What defines an exudative effusion?**

If any of the following is true, the fluid effusion is considered exudative. Pleural protein/serum protein  $>0.5$   
Pleural LDH/serum LDH  $>0.6$  Pleural LDH  $<200$

**What does it signify if the pleural fluid has  $>10,000$  WBCs with polymorphonuclear neutrophils (PMNs)?**

Most likely a parapneumonic effusion

**What is gross blood in the pleural fluid associated with?**

Tumor or trauma

**What can low glucose (glucose <60) in the pleural fluid be associated with?**

Tumor, empyema, rheumatologic etiology, parapneumonic exudate

**What are high amylase levels in pleural fluid associated with?**

Pancreatitis but can also be malignancy, or esophageal rupture

**What percentage of pleural effusions caused by malignancy will have a fluid cytology that has malignant cells?**

Only 40%

**How can exudative and transudative pleural effusions be differentiated?**

See [Table 3-3](#).

**Table 3-3** Exudative vs. Transudative Pleural Effusion

Test	Exudate	Transudate
Pleural LDH/serum LDH	>0.6	<0.6
Pleural LDH	>200	<200
Pleural protein/serum protein	>0.5	<0.5
Gram stain	Bacteria present most likely secondary to pneumonia (PNA)	No bacteria
WBC	>1000	<1000
Glucose	<60	>60
Differential	Parapneumonic, malignancy, rheumatologic disease	CHF, pulmonary embolism (PE), cirrhosis, nephritic syndrome

## COUGH

**What is the definition of an acute cough?**

Cough that has lasted <3 weeks

**What is the most common cause of an acute cough?**

Postnasal drip (also very common are asthma and GERD)

**What are the most common causes of postnasal drip?**

Sinusitis, allergic rhinitis, seasonal or environmental allergies, flu or cold

**What is the preferred method of treatment of postnasal drip caused by allergies?**

Antihistamine treatment and/or nasal corticosteroid

**What is the preferred method of treatment of postnasal drip caused by the cold?**

Antihistamine as well as a decongestant

**What is sinusitis?**

A bacterial or viral infection of the sinuses

**Which sinus is most commonly affected?**

The maxillary sinus

**What are the signs and symptoms of sinusitis?**

Fever, tenderness to percussion over the sinuses, increased pain with bending forward, purulent nasal discharge, halitosis, headache

**Define acute, subacute, and chronic sinusitis?**

Acute sinusitis lasts <3 weeks, subacute lasts between 21 and 60 days, and chronic sinusitis lasts >60 days.

**What most commonly causes acute sinusitis?**

Viruses

**What are the most common pathogens involved in acute bacterial sinusitis?**

*Streptococcus pneumoniae*, *H influenzae*, and *Moraxella catarrhalis*

**What is the treatment for acute sinusitis?**

Viral rhinosinusitis does not require antimicrobial treatment. Nasal corticosteroids and decongestants are helpful. Studies have shown that steroids lead to faster symptom resolution. Bacterial causes should be treated with amoxicillin, augmentin, or bactrim for 1-2 weeks.

**What are the potential complications secondary to chronic sinusitis?**

Meningitis, osteomyelitis, orbital cellulitis, cavernous sinus thrombosis, abscess

**What is the classic organism causing sinusitis in a diabetic?**

*Aspergillus* causing mucormycosis

**What is the definition of a chronic cough?**

A cough lasting >3 weeks

**What are the three most common causes of chronic cough?**

1. Postnasal drip
2. Asthma
3. Gastroesophageal reflux disease (GERD)

**What medication class can cause a chronic cough?**

Angiotensin-converting enzyme (ACE) inhibitors

**ACUTE RESPIRATORY DISTRESS SYNDROME**

**What are the components of acute respiratory distress syndrome (ARDS)?**

Refractory hypoxemia, decreased lung compliance, noncardiogenic pulmonary edema

**What is the etiology of ARDS?**

Endothelial injury secondary to aspiration, multiple transfusions, shock, sepsis, trauma

**What are the criteria needed to diagnose ARDS?**

1. Acute onset of respiratory distress
2. PAO<sub>2</sub>: FIO<sub>2</sub> ratio <200 mm Hg
3. Bilateral pulmonary infiltrates on CXR
4. Normal capillary wedge pressure

**What is the treatment for ARDS?**

Treat the underlying disease and give adequate oxygen via mechanical ventilation

**What is the overall mortality in ARDS?**

About 50%

**PULMONARY EMBOLISM****What is the most common etiology of a pulmonary embolism (PE)?**

Dislodged deep vein thrombosis (DVT)

**What are the risk factors for a DVT?**

**Virchow triad:** stasis (usually due to immobilization), hypercoagulable state, endothelial injury

**What are the risk factors for a PE?**

Same risk factors as getting a DVT, as well as having a DVT, stroke, myocardial infarction (MI); recent surgery leading to immobilization

**What are some examples of hypercoagulable states?**

Malignancy; protein C or protein S deficiency; antithrombin III deficiency; factor V Leiden deficiency; hyperestrogen states such as pregnancy, oral contraceptive use, smoking

**What is an important question to ask in the patient's history?**

Ask if they have had any recent travel or other immobilization. Long trips cause people to be immobile for long periods of time and therefore have a greater risk for developing DVTs and therefore PEs.

**What is the most common sign in a patient with a PE?**

Sinus tachycardia

**What are some of the common symptoms of PE?**

Dyspnea, tachypnea, pleuritic chest pain, fever, unilaterally swollen and painful posterior lower extremity, cough, hemoptysis

**What are the classic CXR findings in a PE?**

**Hampton hump**—wedge-shaped infarct

**Westmark sign**—hyperlucency in the lung region supplied by the affected artery

**What is the most common EKG finding in a PE patient?**

Sinus tachycardia

**What is the classic EKG finding in a PE patient?**

S1Q3T3—S wave in lead I, Q wave in lead III, and inverted T wave in lead III ([Fig 3-2](#))



**Figure 3-2** Pulmonary embolism S1Q3T3 pattern. (Reproduced with permission from Kaufman MS et al. First Aid for the Medicine Clerkship. New York: McGraw Hill; 2002:75; [Figure 3-1](#))

**What is the gold standard for diagnosis of PE?**

Pulmonary angiography

**What are some of the diagnostic techniques used to diagnose a PE?**

Spiral CT, V/Q scan, pulmonary angiography or MR angiography

**What blood test can be done to rule out PE if it is not positive?**

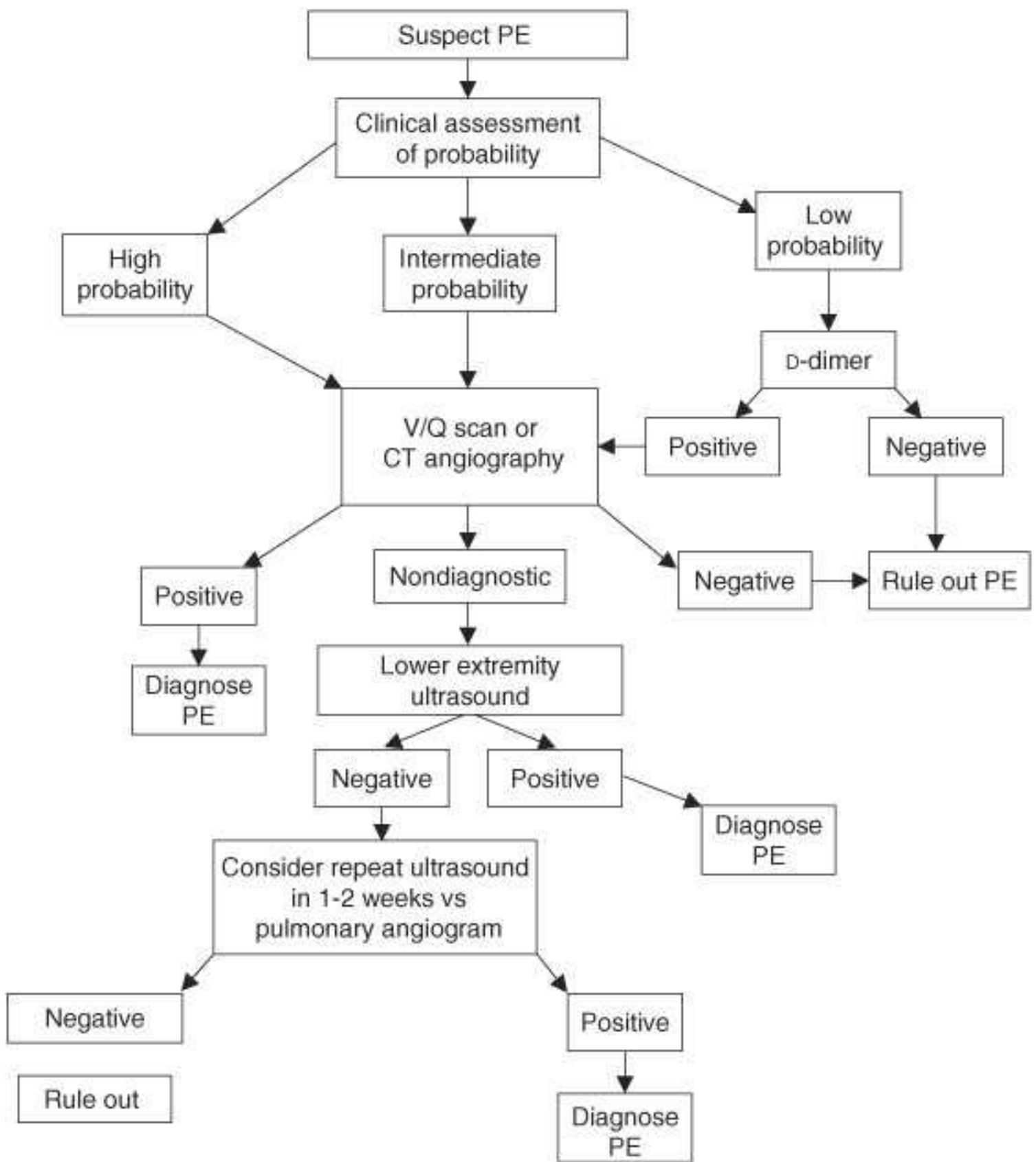
D-dimer

**What diagnostic test can be done to rule out a DVT?**

Duplex ultrasound

**What is the algorithm used to diagnose a PE, when one is suspected?**

See [Fig 3-3](#).



**Figure 3-3**

**What are the treatments for a PE?**

Heparin or Lovenox (low-molecular-weight heparin) acutely, long-term treatment with Coumadin or inferior vena cava (IVC) filter, or tissue-type plasminogen activator (tPA) thrombolysis in massive PE

**What needs to be done if Coumadin is being started?**

Heparin must be continued until Coumadin becomes therapeutic since Coumadin can cause a



hypercoagulable state.

**What is the therapeutic international normalized ratio (INR)?**

INR of 2-3

## **PNEUMOTHORAX**

**A person with what body habitus is most likely to have a primary spontaneous pneumothorax?**

Tall and thin male

**What is the most likely etiology of a primary spontaneous pneumothorax?**

Rupture of subpleural blebs

**What are some risk factors for having a secondary spontaneous pneumothorax?**

COPD, lung cancer, pneumonia, TB, HIV, cystic fibrosis, trauma

**What are the signs and symptoms of a pneumothorax?**

Sudden unilateral chest pain, dyspnea, and tachypnea

**What is found on physical examination in a person with a pneumothorax?**

Absent breath sounds on the side of the pneumothorax and hyperresonance to percussion

**What is seen on CXR in a pneumothorax?**

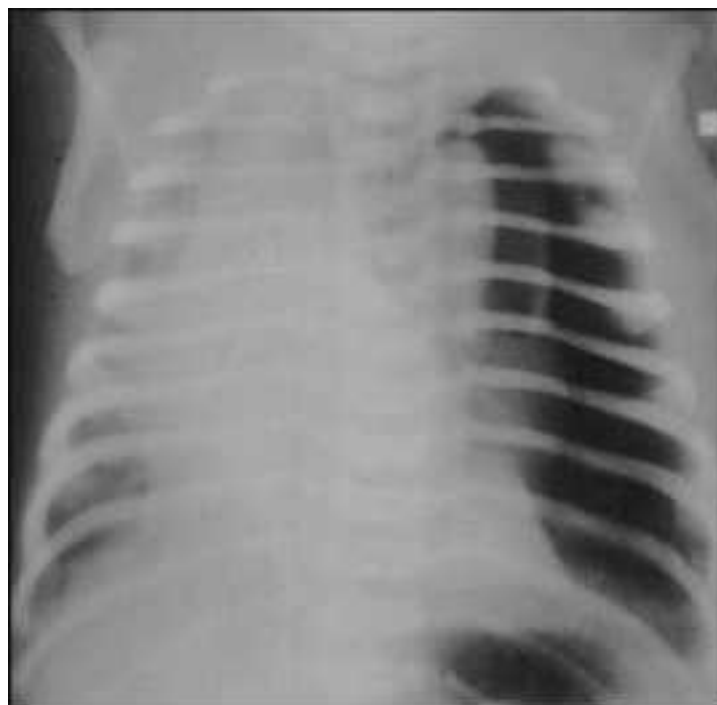
Absent lung markings on the side of the pneumothorax

**What is the treatment of a spontaneous pneumothorax?**

Oxygen is the mainstay of therapy, but if the pneumothorax is symptomatic, a tube thoracostomy may be indicated. Pleurodesis can be used to make the visceral and parietal pleura adhere to each other.

**What is a tension pneumothorax?**

A chest wall defect causes air to be trapped in the pleural space during expiration like a one-way valve ([Fig 3-4](#)).



**Figure 3-4** Tension pneumothorax. (Reproduced, with permission, from William Herring, MD, FACR; Radiology Residency Program Director at Albert Einstein Medical Center in Philadelphia, PA; <http://www.learningradiology.com>)

**How is a tension pneumothorax treated?**

This is a medical emergency. Treatment includes immediate needle decompression and chest tube placement thereafter.

**HEMOPTYSIS**

**What are the two most common causes of hemoptysis in the United States?**

1. Bronchitis
2. Bronchogenic carcinoma

**What are the two most common causes of hemoptysis worldwide?**

1. Tuberculosis
2. Bronchiectasis

**What are some other causes of hemoptysis?**

Pneumonia, Wegener granulomatosis, Goodpasture syndrome, mycetoma, pneumonitis, arteriovenous (AV) malformation, pulmonary embolism, airway trauma, foreign body, metastatic lung tumor, bronchial carcinoid

**What are the treatments for hemoptysis?**

Have the patient lie down with the bleeding side down to protect the airway, oxygen as needed and in severe cases, bronchial artery embolization or intubation of the good lung

**LUNG CANCER**

**What is the most common cause of cancer death in the United States?**

Lung cancer

**What is the most likely causative factor of lung cancer?**

Smoking

**What are some other causes of lung cancer?**

Second-hand smoke, exposure to asbestos, nickel, arsenic, radon gas

**What are the two main categories of lung cancer?**

Small cell and nonsmall cell

**What are the different types of lung tumors that are nonsmall cell lung cancers?**

Large cell, adenocarcinoma, squamous cell, bronchoalveolar cell

**Name the type of lung cancer associated with the following:**

<b>Central location</b>	Small cell, squamous cell
<b>Poor response to chemotherapy</b>	Nonsmall cell
<b>Treated with surgery</b>	Nonsmall cell
<b>Poorer prognosis</b>	Small cell
<b>Sensitive to chemotherapy</b>	Small cell
<b>Peripheral location</b>	Nonsmall cell
<b>Linked to smoking</b>	Small cell and squamous cell
<b>Not linked to smoking</b>	Bronchoalveolar cancer, a type of adenocarcinoma
<b>Secretes parathyroid hormone-related peptide</b>	Squamous cell
<b>Associated with hypercalcemia</b>	Squamous cell
<b>Metastatic at diagnosis</b>	Small cell
<b>Secretes serotonin</b>	Carcinoid tumor
<b>Eaton-Lambert syndrome</b>	Small cell
<b>SIADH (syndrome of inappropriate antidiuretic hormone)</b>	Small cell
<b>Cushing syndrome</b>	Small cell associated with adrenocorticotrophic hormone (ACTH) secretion
<b>Asbestos exposure</b>	Mesothelioma

**What are some signs and symptoms of lung cancer?**

Chronic cough, hemoptysis, weight loss, night sweats, pneumonia (postobstructive), hoarseness, paraneoplastic syndrome

**How is lung cancer diagnosed?**

Usually a nodule or mass is seen on CXR or CT of the chest and is diagnosed with a biopsy usually done via bronchoscopy or CT-guided fine-needle aspiration

**What are some of the signs and symptoms of a carcinoid tumor?**

Symptoms of carcinoid syndrome due to serotonin secretion, which include flushing, asthmatic wheeze, diarrhea

**What is the diagnostic test for a carcinoid tumor?**

Test for elevated urine 5-hydroxyindoleacetic acid (5-HIAA), a serotonin metabolite

**How is carcinoid syndrome treated?**

Serotonin antagonist

**What is a Pancoast tumor?**

Superior sulcus tumor

**What paraneoplastic syndromes are associated with a Pancoast tumor?**

Horner syndrome, superior vena cava syndrome

**What is Pancoast syndrome?**

Shoulder and arm pain secondary to the tumor compressing the thoracic inlet with compression of the brachial plexus and cervical sympathetic nerves

**Name the paraneoplastic syndrome associated with signs and symptoms described below:**

**Ptosis, myosis, anhidrosis**

Horner syndrome

**Facial and upper extremity swelling**

Superior vena cava syndrome

**Hyponatremia secondary to ectopic release of antidiuretic hormone (ADH)**

SIADH

**Low acetylcholine release leading to myasthenia gravis type symptoms**

Eaton-Lambert syndrome

**PNEUMONIA**

**What are some common signs and symptoms of pneumonia (PNA)?**

Cough with purulent sputum, fever, chills, pleuritic chest pain

**What are some common physical examination findings in a patient with pneumonia?**

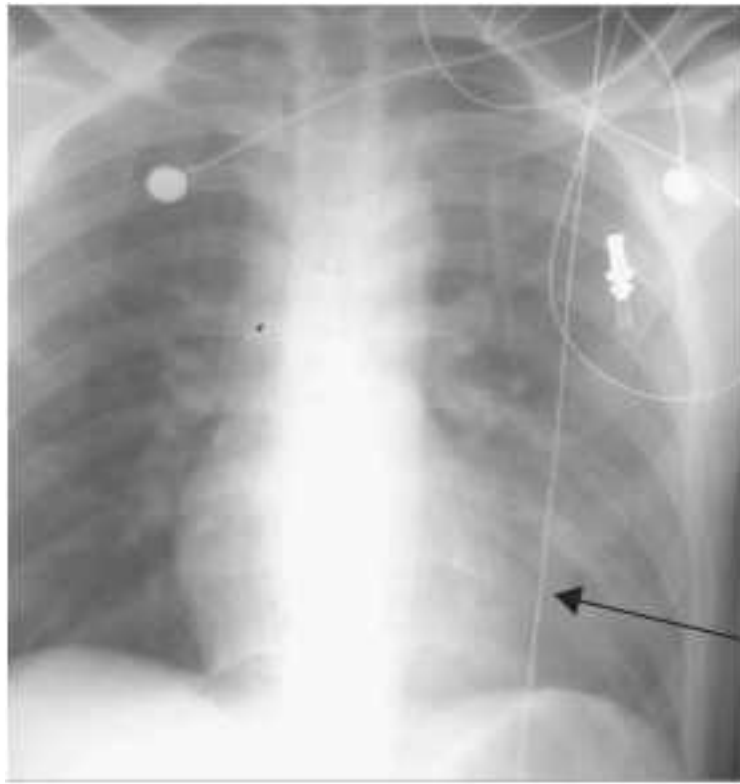
Decreased breathing sounds, crackles, egophony, dullness to percussion, tactile fremitus on the side of the pneumonia, fever

**What studies should be ordered if a PNA is suspected?**

CXR, CBC, sputum culture and Gram stain, blood culture (in hospitalized patient)

**What do you see on a CXR in a patient with pneumonia?**

Lobar consolidation ([Fig 3-5](#))



**Figure 3-5** Pneumonia. (Reproduced, with permission, from William Herring, MD, FACR; Radiology Residency Program Director at Albert Einstein Medical Center in Philadelphia, PA; <http://www.learningradiology.com>)

**What would the CBC show?**

Leukocytosis with a left shift

**Name the most common organism causing pneumonia in each of the following cases:**

<b>Community-acquired pneumonia</b>	<i>S pneumonia</i>
<b>Typical community-acquired pneumonia</b>	<i>S pneumoniae</i> and <i>H influenza</i>
<b>Atypical community-acquired pneumonia</b>	<i>Chlamydia, Legionella, Mycoplasma</i>
<b>Hospital-acquired pneumonia</b>	<i>Pseudomonas, S aureus</i> , enteric gram-negative rods
<b>Pneumonia in a patient with cystic fibrosis that easily develops resistance</b>	<i>Pseudomonas</i>
<b>Pneumonia after the flu</b>	<i>S aureus</i>
<b>Atypical pneumonia in the young patient, "walking pneumonia"</b>	<i>Mycoplasma</i>
<b>Right upper lobe pneumonia in an alcoholic</b>	<i>Klebsiella</i> , usually secondary to aspiration
<b>Positive cold agglutinin test</b>	<i>Mycoplasma</i>
<b>Pneumonia in a butcher who sells rabbit meat</b>	<i>Francisella tularensis</i>
<b>Pneumonia in a person who likes to explore caves in the Ohio Valley</b>	<i>Histoplasma</i>
<b>Pneumonia in a person from southwestern United States</b>	<i>Coccidioides immitis</i>

<b>Pneumonia in a bird keeper</b>	<i>Chlamydia psittaci</i>
<b>Pneumonia that mimics TB, and is gram positive</b>	<i>Nocardia</i>
<b>Pneumonia in a person with a lot of air-conditioning exposure or aerosolized water</b>	<i>Legionella</i>
<b>Aspiration pneumonia in an alcoholic, a patient with dementia, or a person who became unconscious</b>	Anaerobes
<b>Pneumonia contracted from farm animals and called "Q fever"</b>	<i>Coxiella burnetii</i>
<b>Pneumonia with hyponatremia, LDH &gt;700, diarrhea, mental status change</b>	<i>Legionella</i>
<b>Fungus ball</b>	<i>Aspergillus</i>
<b>Rust-colored sputum</b>	<i>S pneumonia</i>
<b>Currant jelly sputum</b>	<i>Klebsiella</i>
<b>Three pneumonias in AIDS patients with CD4 count &lt;200</b>	<i>Pneumocystis carinii</i> , <i>Histoplasma</i> , <i>Cryptococcus</i>
<b>Pneumonia in AIDS patients with CD4 count &lt; 50</b>	<i>Mycobacterium avium</i> , cytomegalovirus (CMV)
<b>Bilateral infiltrates on CXR</b>	<i>Mycoplasma</i> , <i>P carinii</i> pneumonia (also known as <i>Pneumocystis jiroveci</i> )

**What is the treatment for each of the following cases of pneumonia?**

<b>Typical</b>	Third-generation cephalosporin plus macrolide or fluoroquinolone
<b>Atypical</b>	Doxycycline, macrolide, quinolone
<b>Anaerobic</b>	Clindamycin, metronidazole
<i>P carinii</i>	Bactrim

**What are the most common pathogens and treatments in each of the following cases?**

**Outpatient community-acquired pneumonia in a patient aged <60**

Organisms: *S pneumoniae*, *Mycoplasma*, *Chlamydia pneumoniae*, *H flu* (*H influenzae*)

Treatment: erythromycin, tetracycline, or azithromycin to also cover *H flu*

**Outpatient with age >60 and with comorbidities such as CHF, COPD, diabetes, alcoholic, cirrhosis**

Organisms: *S pneumoniae*, *H flu*, aerobic gram-negative rods such as *Klebsiella*, *Escherichia coli*, *Enterobacter*, *S aureus*, *Legionella*

Treatment: second-generation cephalosporin, amoxicillin, fluoroquinolone, erythromycin, or doxycycline for atypical pneumonia

**Community-acquired pneumonia requiring hospitalization**

Organisms: *S pneumoniae*, *H flu*, anaerobes, aerobic gram-negative rods, *Legionella*, *Chlamydia*

Treatment: third-generation cephalosporin and azithromycin or doxycycline for atypical pneumonia

**Community-acquired pneumonia requiring intensive care unit (ICU) admission**

Organisms: *S pneumoniae*, *H flu*, *S aureus*, gram-negative bacilli, *Legionella*, *Pseudomonas*

Treatment: third-generation cephalosporin and azithromycin or doxycycline for atypical pneumonia

**Nosocomial pneumonia**

Organisms: *Pseudomonas*, *S aureus*, *Legionella*, gram-negative rods

Treatment: third-generation cephalosporin, aminoglycoside, or piperacillin tazobactam and vancomycin if methicillin-resistant *S aureus* (MRSA) suspected

## **TUBERCULOSIS**

**How does TB spread?**

Air droplet transmission



**Who is at high risk for becoming infected with TB?**

Immunocompromised, foreign-born, homeless, prisoner, low-income communities, intravenous (IV) drug users

**What are the common signs and symptoms of TB?**

**Productive cough, night sweats, weight loss, hemoptysis**, fever, chills, chest pain

**How is latent TB detected?**

Positive purified protein derivative (PPD) (tuberculin) skin test

**What is considered a positive PPD?**

>15 mm in any person

>10 mm in immunocompromised, IV drug user, foreign-born, prisoner, nursing home resident, people who work in the medical field (that means you), underserved community

>5 mm: HIV, abnormal CXR, close contact with someone who had TB

**How is a positive PPD treated?**

Isoniazid (INH) for 9 months with vitamin B<sub>6</sub>

**What laboratory tests should be done when starting a patient on INH?**

Liver function tests (LFTs) because of possibility of hepatotoxicity

**What part of the lung does primary TB usually affect?**

Lower lobes

**What is the radiographic finding of healed primary TB called?**

“Ghon complex,” which is a calcified nodule with calcified lymph nodes ([Fig 3-6](#))



**Figure 3-6** Tuberculosis. (Reproduced, with permission, from William Herring, MD, FACR; Radiology Residency Program Director at Albert Einstein Medical Center in Philadelphia, PA; <http://www.learningradiology.com>)

**What is secondary TB?**

Reactivation TB

**Where is secondary TB usually found?**

Lung apices

**What is extrapulmonary TB?**

TB that had disseminated to other organs

**What is the most common extrapulmonary location for TB to spread?**

Kidneys

**What are other locations where extrapulmonary TB can be found?**

Liver, central nervous system (CNS), vertebral bodies, psoas muscle, cervical lymph nodes, pericardium

**What is TB of the vertebral bodies called?**

Pott disease

**What is cervical lymphadenopathy secondary to TB infection called?**

Scrofula

**How is active TB diagnosed?**

Clinical symptoms, CXR, and sputum acid-fast stain and culture

**What is seen on CXR in active TB?**

Upper lobe infiltrates with scarring, cavitary lesions

**What is the standard treatment for active TB?**

Four-drug therapy initially for 2 months followed by 2-drug therapy (of INH and rifampin) for 4 months (remember the mnemonic **RIPE**):

Rifampin

INH

Pyrozinamide

Ethambutol

**CLINICAL VIGNETTES**

**A 63-year-old female with a history of ovarian cancer presents with severe shortness of breath and chest pain with inspiration. She has a low-grade fever, heart rate of 125, blood pressure of 138/60, respiratory rate of 25, and oxygen saturation of 88%. What test will confirm the diagnosis?**

CT pulmonary angiogram or V/Q scan to check for a pulmonary embolism

**A 30-year-old male with no significant past medical history presents to your office with fever, cough, and shortness of breath. On examination there are decreased breath sounds in the right lower lobe. His oxygen saturation is 92%. He has an elevated white count on CBC. What organism do you suspect?**

*Mycoplasma*

**A healthy American born 28-year-old male has started a new job at the bank that requires him to get a PPD. He denies exposure to tuberculosis and in a recent HIV test he had was negative. His PPD comes back at 16 mm. What is your next step?**

Treat with INH and vitamin B<sub>6</sub>

**A 60-year-old male with a 40 pack-year history of smoking presents with a cough. He states that the cough has been present for many months. It is a dry cough. He denies any chest pain or fever but does state that he often feels short of breath. A CBC comes back within normal limits. On examination he is a barrel-chested male with decreased breath sounds throughout and distant heart sounds. CXR only demonstrates flattened diaphragms. What is the most likely reason for this patient's cough?**

Emphysema

**A tall 20-year-old male complains of sudden left-sided chest pain with shortness of breath and tachypnea. The chest x-ray shows absent lung markings of the left side. What is the initial treatment for his condition?**

Tension pneumothorax requires immediate needle decompression followed by chest tube placement



# CHAPTER 4

## Neurology

### CEREBROVASCULAR ACCIDENTS

#### **What is a cerebrovascular accident (CVA)?**

Sudden onset of neurologic deficit that is a result of cerebrovascular disease

#### **What does TIA stand for?**

Transient ischemic attack

#### **What is a TIA?**

A neurologic deficit that lasts **<24 hours and resolves completely**

#### **What is a stroke?**

Focal neurologic deficit that results from infarcted cerebral tissue

#### **What does RIND stand for?**

Reversible ischemic neurologic deficit

#### **What is RIND?**

Neurologic deficits that last >24 hours and <3 weeks

#### **What are the two greatest risk factors for a stroke?**

1. Hypertension
2. Smoking

#### **What are the two etiologies of a CVA?**

Ischemic or hemorrhagic stroke

#### **What are the two most common etiologies for ischemia?**

1. Thrombotic etiology which is secondary to atherosclerosis
2. Embolic etiology which is usually either cardiac in origin or from carotid arteries

#### **What is the most common etiology of a CVA?**

Ischemia

#### **Name the term associated with each of the following:**

Difficulty with expression of both written and spoken language as well as difficulty with comprehension

Aphasia

Difficulty with performing motor tasks

Apraxia (a patient with **apraxia can't practice**)

Difficulty with articulation

Dysarthria

CVA sequelae in which the patient speaks with fluency, however, without making sense, and comprehension is impaired and patient is unaware of the deficit

Wernicke aphasia (Wernicke is **wordy**)

CVA sequelae in which the patient has difficulty verbalizing what they want to express, comprehension is intact, and patient is aware of the deficit

Broca aphasia (Broca had **broken** language)

Infarct in the deep gray matter associated with hypertension and atherosclerosis

Lacunar infarct

Infarction that occurs in an area supplied by two major arteries and is usually a result of hypotension

Watershed infarct

Most common source of emboli that leads to a stroke

Carotid atheroma

Thalamus, internal capsule, and cerebral white matter deficit causing *flexion* of the upper extremities

Decorticate posturing

Upper brain stem deficit causing *extension* of the upper extremities

Decerebrate rigidity

Describe the deficits caused by occlusion of the following arteries:

<b>Middle cerebral artery (MCA) supplying the dominant hemisphere</b>	Contralateral hemiparesis and hemisensory deficit, aphasia, homonymous hemianopsia
<b>MCA supplying the nondominant hemisphere</b>	Contralateral hemiparesis and hemisensory deficit, homonymous hemianopsia, confusion, apraxia, body neglect on contralateral side
<b>Anterior cerebral artery (ACA)</b>	Broca aphasia, contralateral weakness of lower extremity, incontinence
<b>Posterior cerebral artery (PCA)</b>	Homonymous hemianopsia with macular sparing, oculomotor nerve palsy, aphasia, and alexia if dominant hemisphere is affected
<b>Posterior inferior cerebellar artery (PICA)</b>	Vertigo, ataxia, contralateral pain and temperature disturbance, dysphagia, dysarthria, ipsilateral Horner syndrome (ptosis, miosis, anhidrosis)
<b>Anterior inferior cerebellar artery</b>	Deafness, tinnitus, ipsilateral facial weakness, gaze palsy
<b>Ophthalmic artery</b>	Amaurosis fugax (transient monocular blindness)

**What is the first study to order if you suspect a stroke in a patient?**

Computed tomography (CT) of head **without** contrast to rule out a bleed

**What other studies can be done to further assess the patient?**

Magnetic resonance imaging (MRI) to evaluate for subacute infarction; carotid Doppler ultrasound to rule out carotid artery stenosis; echocardiogram to rule out embolic sources

**What is the treatment for a TIA?**

Patient should be started on aspirin.

**What medication should the patient be started on if they fail aspirin?**

Plavix (clopidogrel)

**What other antiplatelet therapies are available other than aspirin?**

Plavix (clopidogrel), ticlopidine, Aggrenox

**When would you consider a carotid endarterectomy?**

If the patient had carotid artery stenosis >70%

**What is the treatment for a patient who had a cardioembolic stroke?**

Anticoagulation with heparin or Coumadin

**What treatment improves outcome in a patient who present with an embolic stroke with symptoms beginning <3 hours ago?**

Tissue plasminogen activator (tPA)

**What is the major contraindication to tPA use?**

Intracranial bleeding

**How should hypertension be treated in a patient who acutely had a stroke?**

Hypertension should not acutely be controlled tightly in order to allow for good cerebral perfusion. A 25% reduction in mean arterial pressure in the first 24 hours is acceptable.

**Other than starting medications, what other long-term interventions should be taken in a patient with a history of stroke to prevent future infarctions?**

Good diabetes control (improved HgA1c); control hypertension; smoking cessation; treat hyperlipidemia

## **SEIZURE DISORDERS**

**What is a seizure?**

Excessive firing of cortical neurons leading to neurologic symptoms

**What is the single most useful test to evaluate seizures?**

Electroencephalogram (EEG)

**What tests should be done on a patient suspected to have had a seizure?**

Complete neurologic examination. Check for signs of incontinence, tongue lacerations, other injuries to the body to distinguish from syncope. Also check the following laboratory tests: complete blood count (CBC), electrolytes, calcium, glucose, oxygen level, liver function tests, blood urea nitrogen (BUN), creatinine (CR), rapid plasma reagin (RPR), erythrocyte sedimentation rate (ESR), urine toxicology screen. MRI and CT can also be done to rule out a mass.

**What factors can increase the risk of having a seizure?**

History of having a seizure in the past, central nervous system (CNS) tumor, CNS infection, trauma, stroke, high fever in children, drugs

**What is Todd paralysis?**

Postictal state in which there are focal neurologic deficits that last 24-48 hours; usually associated with focal seizures

**Name the two types of generalized seizures.**

1. Tonic-clonic seizures
2. Absence seizures

**Name the seizure disorder described below:**



<b>Seizure that may involve motor, autonomic, or sensory functions with no loss of consciousness</b>	Simple partial seizure
<b>Elevated prolactin level in postictal state</b>	Tonic-clonic seizure
<b>Seizure that arises from one distinct region of the brain</b>	Focal seizure
<b>Most commonly involves the temporal lobe</b>	Complex partial seizure
<b>Also known as petit mal seizures</b>	Absence seizures
<b>Seizure involving both hemispheres with a loss of consciousness and postictal confusion</b>	Generalized seizure
<b>Loss of consciousness followed by muscle contractions and then symmetric jerking of extremities</b>	Tonic-clonic seizures
<b>Seizures lasting &gt;30 seconds or repetitive seizures lasting &gt;5 minutes with continuous altered level of consciousness</b>	Status epilepticus

<b>Often mimics “daydreaming” in children</b>	Absence seizure
<b>Associated with cyanosis and urinary incontinence</b>	Tonic-clonic seizure
<b>Seizure in which patient has an altered level of consciousness with auditory or visual hallucinations as well as repetitive motor actions and postictal confusion</b>	Complex partial seizures
<b>Also known as grand mal seizure</b>	Tonic-clonic seizure
<b>Can be caused by electrolyte imbalances, withdrawal from drugs or alcohol, infection (often in CNS), trauma</b>	Status epilepticus
<b>Impaired consciousness lasting only a few seconds</b>	Absence seizures
<b>EEG with three per second spike and wave</b>	Absence seizure

**Indicate the treatment for each of the following types of seizures:**

<b>Focal</b>	Phenytoin, carbamazepine, valproic acid
<b>Tonic-clonic</b>	Phenytoin, carbamazepine, phenobarbital
<b>Absence</b>	Ethosuximide and valproic acid
<b>Status epilepticus</b>	This is a medical emergency. Start with the ABCs (airway, breathing, circulation). Benzodiazepine as well as loading dose of phenytoin administration are the next step in treatment, followed by intravenous (IV) sedatives (such as phenobarbital) if patient continues to seize.

**What is the most significant side effect(s) of each of the following antiseizure medications?**

**Phenytoin**

Agranulocytosis, gingival hyperplasia, hirsutism

**Valproic acid**

Hepatotoxic; thrombocytopenia; neutropenia

**Carbamazepine**

Aplastic anemia

**When can antiseizure medication be discontinued in a patient with a history of seizures?**

No seizures for 2 years

## **MENINGITIS**

**What is the most common bacterial pathogen causing meningitis in adults?**

*Streptococcus pneumoniae* causes up to 60% of meningitis cases.

**What two bacterial pathogens cause most cases of meningitis in young adults?**

*S pneumoniae* and *Neisseria meningitides*

**In what population does Group B *Streptococcus* cause meningitis?**

Neonates (most common cause of meningitis in neonates)

**What three bacterial pathogens most commonly cause meningitis in neonates?**

1. *Listeria*
2. Group B *Streptococcus* (GBS)
3. *Escherichia coli*

**In what adult population does *Listeria* cause meningitis?**

Immunocompromised patients

**What bacterial pathogen known to cause meningitis is now vaccinated against?**

*Haemophilus influenzae*

**What is the treatment for each of the bacterial pathogens in meningitis?**

See [Table 4-1](#).

**Table 4-1** Meningitis Organisms and Treatments

Organism	Treatment
<i>S pneumonia</i>	Cefotaxime + vancomycin <b>or</b> ceftriaxone
<i>N meningitidis</i>	Penicillin G <b>or</b> ceftriaxone
<i>Listeria</i>	Ampicillin (consider adding gentamicin)
Group B <i>Streptococcus</i>	Ampicillin
<i>H influenzae</i>	Cefotaxime

**What are the classic symptoms of meningitis?**

Fever, headache with neck stiffness, photophobia, meningismus, Kernig sign, Brudzinski sign

**What is meningismus?**

Patient has difficulty touching their chin to their chest.

**What is Kernig sign?**

Patient has pain when extending the knee with the thigh at 90°.

**What is Brudzinski sign?**

Neck flexion causes involuntary flexion at the hip and knees.

**What test is used to diagnose meningitis?**

Lumbar puncture with cerebrospinal fluid (CSF) analysis including Gram stain, cultures

**What would the CSF findings be in *bacterial meningitis* (see [Table 4-2](#))?**

Increased protein, decreased glucose, very elevated WBCs, elevated opening pressure, and elevated number of neutrophils

**What would the CSF findings be in *viral meningitis*?**

Normal protein and glucose, elevated WBC, normal or elevated opening pressure, increased lymphocytes

**What would the CSF findings be in *fungal meningitis*?**

Elevated protein, decreased glucose, elevated WBC, elevated opening pressure, increased lymphocytes ([Table 4-2](#))

**Table 4-2** CSF Findings in Meningitis

Etiology	Protein	Glucose	WBC	Pressure	Differential
Bacterial	↑	↓	↑	↑	↑ Neutrophils
Viral	Normal	Normal	↑	Normal/↑	↑ Lymphocytes
TB/fungal	↑	↓	↑	↑	↑ Lymphocytes

## What is the appropriate empiric treatment for meningitis in each of the following populations?

(see [Table 4-3](#))

Neonates

1-3 months

Young adults

Adults

Elderly, immunocompromised

**Table 4-3** Meningitis Treatment by Population

Population	Most Common Organisms	Treatment
Neonates (<1 month)	<i>Group B Streptococcus</i> ; <i>Listeria</i> ; <i>E coli</i>	Cefotaxime + ampicillin
1-3 months	<i>S pneumoniae</i> ; <i>H influenzae</i> ; <i>N meningitidis</i>	Cefotaxime
Children; young adults; crowded living environments	<i>S pneumoniae</i> ; <i>N meningitidis</i>	Ceftriaxone + vancomycin
Adults	<i>S pneumoniae</i>	Cefotaxime + vancomycin
Elderly; immunocompromised	<i>S pneumoniae</i> ; <i>Listeria</i>	Ceftriaxone + ampicillin + vancomycin

## BRAIN TUMORS

### What is the most common type of brain tumor?

Metastatic tumor

### From what primary tumors do most metastatic brain tumors originate?

Lung cancer, breast cancer, melanoma, gastrointestinal (GI) tumors

### Anatomically, where do most *adult* brain tumors tend to present?

Supratentorially

### Anatomically, where do most *childhood* brain tumors tend to present?

Infratentorially

### What are some common symptoms of brain tumors?

Headache (especially upon waking), vomiting, seizures, focal neurologic symptoms

**How is a brain tumor diagnosed?**

CT with contrast/MRI with gadolinium localizes the lesion and a biopsy is used to get the histologic class of the tumor.

**What is the most common type of primary brain neoplasm?**

Astrocytoma

**What is the most common type of astrocytoma?**

Glioblastoma multiforme

**What is the prognosis of glioblastoma multiforme?**

Poor prognosis. 5-year survival is <5%.

**Where do ependymomas usually arise?**

In the fourth ventricle

**In what population are ependymomas most common?**

Children

**What is the prognosis?**

80% 5-year survival

**What is the most common cranial nerve tumor?**

Schwannoma

**What cranial nerve does a schwannoma affect?**

Cranial nerve VIII—vestibular division

**What is the most common mesodermal tumor?**

Meningioma

**How are most brain tumors treated?**

Surgical excision and radiation. Medulloblastomas also require chemotherapy and schwannomas are treated with surgery alone.

**DEMYELINATING DISEASES****What is the most common demyelinating disorder?**

Multiple sclerosis (MS)

**Who is at higher risk for developing MS?**

Those with a family history of MS, those who lived up until puberty in northern latitudes or temperate climates, female sex (incidence is 2:1 female:male)

**What age is the peak age of MS presentation?**

Age 20-40

**What is the typical course of the disease?**

Multiple progressive neurologic alterations that wax and wane and cannot be explained by a single lesion

**What are some of the signs and symptoms of MS?**

Limb weakness, paresthesias, optic neuritis, **nystagmus**, **scanning speech**, **intranuclear ophthalmoplegia**, vertigo, diplopia

### **What is Lhermitte sign?**

Shock-like sensation down the spine when patient flexes their neck. Also known as the “barber chair phenomenon.”

### **What can be seen on MRI on a patient with MS?**

MRI shows multiple, asymmetric, periventricular plaques with multiple areas of demyelination.

### **What does the CSF show in an MS patient?**

Oligoclonal bands; elevated IgG

### **What is the treatment for MS?**

Steroids during acute episodes and interferon- $\beta$  to prolong remission

### **What is the other name for amyotrophic lateral sclerosis (ALS)?**

Lou Gehrig disease

### **What is the underlying pathology in ALS?**

Slowly progressive loss of upper and lower motor neurons in the CNS

### **What are the clinical signs and symptoms of ALS?**

Asymmetric, progressive muscle weakness initially with fasciculations which present clinically as difficulty swallowing. Patients also have upper motor neuron and lower motor neuron signs on physical examination. They do not have bowel or bladder involvement.

### **Give examples of both upper and lower motor neuron signs?**

Upper motor neuron signs: spastic paralysis, hyperreflexia, upgoing Babinski

Lower motor neuron signs: flaccid paralysis, fasciculations, absent Babinski

### **How is ALS diagnosed?**

Clinically there should be a combination of upper motor neuron and lower motor neuron symptoms in three or more extremities. An electromyogram (EMG) will show widespread denervation and fibrillation potentials in at least three limbs.

### **What is the main treatment for ALS?**

Supportive care

### **What do ALS patients ultimately die from?**

Respiratory failure

### **What is Guillain-Barré syndrome?**

An autoimmune, acute demyelinating disorder affecting the **peripheral nerves** (particularly motor fibers)

### **What bacterial infection is Guillain-Barré syndrome associated with?**

*Campylobacter jejuni*

### **What often precedes Guillain-Barré syndrome?**

A bacterial infection causing diarrhea, specifically with *Campylobacter*, viral infection, or vaccination

### **Clinically, how does Guillain-Barré syndrome present?**

**Symmetric ascending paralysis.** Symptoms usually begin with distal weakness and progress to proximal

weakness with hyporeflexia and facial diplegia. It can eventually progress to paralysis of the diaphragm, leading to respiratory failure.

**What tests would you do to diagnose Guillain-Barré syndrome?**

Lumbar puncture and EMG

**What would you see in the CSF after a lumbar puncture?**

↑↑protein; normal cell count—this is known as **albuminocytologic dissociation**

**What interventions should be undertaken in a patient with Guillain-Barré syndrome?**

Monitor respiratory function very closely and **intubate** if needed. Medical treatment includes plasmapheresis and intravenous immunoglobulin (IVIG).

**What is the prognosis?**

Good prognosis

## **COGNITIVE DISORDERS**

**What is dementia?**

A syndrome of global intellectual and cognitive deficits which are constant and progressive. Patients have no sensory abnormalities (no auditory or visual hallucinations)

**What specific type of cognitive deficit is dementia usually characterized by?**

**Memory loss** (Remember: dementia)

**What types of cognitive impairments characterize dementia?**

Impairments in memory, abstract thought, planning and organization as well as aphasia, apraxia, and agnosia

**What are the causes of dementia?**

Alzheimer; Parkinson, Huntington; seizure disorder; stroke; B<sub>12</sub> deficiency; thiamine deficiency; folate deficiency; alcoholism; head trauma (especially repetitive); neurotoxins; CNS infections such as syphilis; CNS malignancies; normal pressure hydrocephalus

**Degenerative disorders** (Alzheimer, Parkinson, Huntington) (Remember the mnemonic: **DEMENTIAS**)

**Electrolyte imbalances/Endocrine**

**Mass effect**

**Epilepsy**

**Neurotoxins**

**Trauma**

**Infection**

Alzheimer is most common (70%-80%)

Stroke

**What tests would you order if you suspected dementia in a patient?**

Head CT, CBC, electrolytes, BUN, creatinine, AST, ALT, B<sub>12</sub>, folate, rapid plasma reaction (RPR), thyroid-stimulating hormone (TSH), urine toxicology screen

**What medical problem can mimic dementia?**

Depression can present as pseudodementia.

**What class of medications should be avoided in demented patients?**



Benzodiazepines

**What is the general treatment for dementia?**

Treat underlying cause if one is found, otherwise supportive treatment. Patients should also learn to use environmental clues.

**What is delirium?**

Sudden and transient global cognitive deficits that **wax and wane**

**What specific clinical symptom distinguishes delirium from dementia?**

Patients with delirium have sensory deficits which include **auditory and visual hallucinations**.

**What are the symptoms of delirium?**

**Waxing and waning levels of consciousness and sensory disturbances**. Patients are often found to be anxious, combative, have poor memory, and have decreased attention span.

**What are the main etiologies of delirium?**

Remember the mnemonic **HIDE**:

**H**ypoxia

**I**nfection

**D**rugs

**E**lectrolyte abnormalities

**What tests would you order if you suspected delirium?**

CBC, electrolytes, glucose, BUN, creatinine, AST, ALT, TSH, thiamine, B12, urinalysis, chest x-ray (CXR), urine toxicology screen, pulse oximetry, possibly a head CT

**What else would be very important to examine in a patient with delirium?**

Patient's medication list

**What two-drug classes are often found to cause delirium?**

1. Anticholinergics
2. Benzodiazepines

**What is the most common infection leading to delirium in the elderly?**

Urinary tract infection (UTI)

**What is the main treatment for delirium?**

Treat the underlying cause. Antipsychotics can be used to help control symptoms.

**How can dementia be distinguished from delirium?**

See [Table 4-4](#).

**Table 4-4** Characteristics of Dementia Vs Delirium

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## Dementia

## Delirium

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Constant cognitive deficits which are progressive over time

**Waxing and waning** of cognitive deficits (usually worse at night) called "**sundowning**"

No audio/visual hallucinations

Hallucinations common

Deficits are irreversible

Deficits can be reversed if insulting factors removed

No alteration in the level of consciousness

Altered level of consciousness

---

**What is the most common cause of dementia?**

Alzheimer

**What is found in the cerebral cortex in patients with Alzheimer?**

**Amyloid plaques and neurofibrillary tangles**

**What is the most common symptom of Alzheimer?**

Memory deficits

**What can be seen on CT in a patient with Alzheimer?**

Cortical atrophy

**What genotype is Alzheimer associated with?**

**Apolipoprotein E**

**How can Alzheimer be diagnosed?**

It is a clinical diagnosis because it can only be diagnosed definitively at autopsy.

**What medications can slow the cognitive decline in Alzheimer?**

Anticholinesterase inhibitors: donepezil (Aricept), tacrine

**What is the underlying pathology in Parkinson disease?**

Degeneration of dopaminergic neurons in the **substantia nigra**

**What are the pathognomonic symptoms of Parkinson disease?**

**Cogwheel rigidity, resting tremor, bradykinesia, shuffling gait, mask-like faces, postural instability**

**What are the treatment options for Parkinson disease?**

Amantadine; Sinemet (levodopa/carbidopa); benztropine, selegiline, bromocriptine

**What is the mechanism of amantadine and what symptom is it best for?**

Blocks dopamine reuptake in presynaptic neurons and treats **bradykinesia** mainly in mild disease

**What is the mechanism of Sinemet and what symptom does it best treat?**

Sinemet is a combination of levodopa and carbidopa. Levodopa is converted into dopamine in the substantia

nigra. Carbidopa is necessary because it cannot cross the blood-brain barrier and prevents levodopa metabolism by peripheral tissues. It is also best for treating bradykinesia.

**Name some of the anticholinergic drugs.**

Benzotropine, trihexyphenidyl

**What symptom of Parkinson disease do anticholinergics best treat?**

Tremor

**What is the mechanism of selegiline?**

Monoamine oxidase (MAO) inhibitor which blocks dopamine metabolism

**What is the mechanism of bromocriptine?**

Dopamine agonist

**What kind of genetic pattern does Huntington disease follow?**

Autosomal dominant

**On what chromosome is the genetic alteration found and what is the genetic defect?**

Chromosome 4; triple repeat of CAG

**In what age range does Huntington disease usually present?**

Between 30 and 50 years of age

**What is the underlying pathophysiology of Huntington disease?**

Atrophy of the caudate nucleus

**What are the typical signs and symptoms of Huntington disease?**

Choreiform movements, dementia, schizophreniform changes, ataxic gait

**What is the treatment for Huntington disease?**

Supportive treatment. Antipsychotics can be used as needed for psychotic symptoms.

**What is the problem in Wilson disease?**

Defect in copper metabolism

**What are the symptoms of Wilson disease?**

Tremors and rigidity as well as psychiatric changes such as schizophrenia, manic depression; patients have parkinsonian features

**What is the pathognomonic physical examination finding in Wilson disease?**

Kayser-Fleischer ring around the cornea

**How is Wilson disease diagnosed?**

Elevated serum ceruloplasmin

**What is the treatment for Wilson disease?**

Penicillamine with pyridoxine (vitamin B<sub>6</sub>) and zinc. Liver transplantation is the final treatment if patient fails medical therapy.

**HEADACHE**

**What is the most common type of headache?**

Tension headache

**What are signs and symptoms of a tension headache?**

Bilateral, band-like, dull, most intense at neck/occiput, worsened with stress

**What psychiatric disorder is it most commonly associated with?**

Depression

**What is the most common age group with this type of headache?**

Between 20 and 50 years of age

**What type of headache is characterized by rhinorrhea, being unilateral, stabbing, retro-orbital pain, ipsilateral lacrimation, ptosis, and nasal congestion?**

Cluster headache

**What type of headache is characterized by photophobia, nausea, aura, and being unilateral?**

Migraine headache

**What are some common triggers for migraines?**

Menstruation, stress, foods, alcohol

**What type of headache is associated with jaw claudicating?**

Temporal arteritis (usually a unilateral temporal headache with temporal artery tenderness)

**What is the predilection for temporal arteritis?**

Female > male

**What are the risks of temporal arteritis?**

Optic neuritis and blindness if not treated

**What is it associated with?**

Polymyalgia rheumatica

**How is it diagnosed?**

Must do a temporal artery biopsy; elevated ESR is just a screening test

**What is the treatment for temporal arteritis?**

High-dose steroids

## **INTRACRANIAL BLEEDING**

**What is “the worst headache of my life”?**

Subarachnoid hemorrhage (SAH)

**What is the most common cause of SAH?**

Head trauma

**What is the most common underlying cause of a spontaneous SAH?**

Aneurysm rupture

**What is the most common heritable disorder associated with SAH?**

Autosomal dominant polycystic kidney disease

**How is an SAH diagnosed?**

CT scan shows subarachnoid blood (dark); lumbar puncture shows bloody CSF with xanthochromia; cerebral angiography can be done to find berry aneurysms.

**What is the immediate treatment for an SAH?**

ICU admission. Goal is to decrease intracranial pressure (ICP). Give nimodipine to decrease chance of vasospasm by controlling blood pressure, raise the head of the bed, and administer IV fluids as needed.

**What is the second-line treatment for an SAH?**

Surgical evacuation of blood via burr holes

**What is a berry aneurysm?**

Outpouching of vessels in the circle of Willis, usually at bifurcations (looks like a berry)

**What medical condition is a berry aneurism associated with?**

Polycystic kidney disease, Marfan disease

**What is a symptom of berry aneurysm rupture?**

Third nerve palsy

**What is the most common location for a berry aneurysm?**

Anterior communicating artery (30%), followed by posterior communicating artery, then middle cerebral artery

**What type of hemorrhage is associated with a lateral skull fracture?**

Epidural hematoma

**What artery is involved in an epidural hematoma?**

**Middle meningeal artery**

**What is the sequence of events in an epidural hematoma?**

The patient has a lucid interval lasting from minutes to hours followed by a loss of consciousness and hemiparesis.

**What can cause a “blown” pupil in a patient with an epidural hematoma?**

Uncal herniation

**What is seen on CT in a patient with an epidural hematoma?**

**Convex (lens shaped) hyperdensity** that does **not** cross the midline

**What is the treatment for an epidural hematoma?**

Surgical evacuation of the hematoma via burr holes

**What vessels are involved in a subdural hemorrhage?**

**Bridging veins**

**In what population are subdural hematomas most common?**

The elderly and alcoholics

**What is the course of events in a subdural hematoma?**

Patient can have symptoms similar to dementia since mental status changes and hemiparesis can present subacutely.

**What is seen on CT in a patient with a subdural hematoma?**

Crescent-shaped, concave hyperdensity that may cross the midline

## **VERTIGO**

**What type of vertigo is characterized by horizontal nystagmus?**

Peripheral vertigo

**What type of vertigo is characterized by vertical nystagmus?**

Central vertigo

**What is the most common cause of vertigo?**

Benign positional vertigo

**What are the signs of benign positional vertigo?**

Sudden, episodic vertigo that occurs with quick head movement and lasts for **seconds**

**How is benign positional vertigo diagnosed?**

Dix-Hallpike maneuver—From a sitting position, the physician turns the patients head 45° to the right as the patient lies back to the supine position. After 30 seconds the patient is returned to the sitting position and observed. Vertigo with or without nystagmus is a positive test.

**What is the treatment of benign positional vertigo?**

Epley maneuvers

**What is the etiology of Meniere disease?**

Excess endolymph causes dilation of the membranous labyrinth

**What is the triad of symptoms?**

1. Tinnitus
2. Hearing loss
3. Episodic vertigo lasting **hours**

**What does audiometry show in Meniere disease?**

Low-frequency pure-tone hearing loss

**What is the treatment for Meniere disease?**

Low salt intake and acetazolamide. If acute, you could use antihistamines, anticholinergics, or antiemetics. Surgery may be necessary.

**What type of vertigo follows a viral respiratory illness?**

Viral labyrinthitis

**How long does the vertigo last?**

Days to weeks

**What is the treatment for viral labyrinthitis?**

Meclizine

## **CLINICAL VIGNETTES**

**A 64-year-old male smoker with past medical history of hypertension, hyperlipidemia, and type 2 diabetes presents to the ER with a right-sided facial droop as well as weakness of the right arm and leg. Symptoms began about 3 hours prior. The patient currently takes aspirin 81 mg as a part of his daily regimen. What is this patient's strongest modifiable risk factor for his current condition?**

Hypertension

**A 22-year-old female patient with no past medical history comes to your office complaining of increased "fatigue" particularly with repeated effort of muscle use or activity. She has noticed that her vision is blurry lately and that her eye lids seem to be droopy. You examine her and find that her muscle strength seems to deteriorate with repeated efforts. Sensation is normal. What condition do you initially suspect?**

Myasthenia gravis

**A 36-year-old male with a past medical history of psoriasis comes in complaining of "dizziness." He is particularly dizzy and nauseous when he lies in bed and turns his head from left to right. He denies any tinnitus or hearing loss or any other neurologic symptoms. You suspect he has benign positional vertigo. What physical examination test could help with this diagnosis?**

Dix-Hallpike maneuver

**An 85-year-old female presents to your office complaining of new-onset headache over the past month. Headache tends to be on the left side only. She denies any problems with her vision. She has no photophobia with headaches nor is she bothered by sound. On review of symptoms she does complain of some jaw pain. What condition should be ruled out in this case?**

Temporal arteritis

**A 76-year-old female who lives in a retirement community is admitted for an UTI. In the evening time, the patient becomes combative and disoriented. What is the most likely diagnosis?**

Delirium





# CHAPTER 5

## Gastroenterology

### ESOPHAGEAL DISORDERS

#### What is dysphagia?

Difficulty swallowing

#### What is odynophagia?

Pain with swallowing

#### How does oropharyngeal dysphagia present?

More difficulty initiating the swallowing of liquids than solids

#### How does esophageal dysphagia present in terms of swallowing?

Difficulty swallowing both liquids and solids

#### What are the causes of oropharyngeal dysphagia?

Neurologic disorders (muscular, cranial nerve diseases), Zenker diverticulum, thyromegaly, sphincter dysfunction, oropharyngeal cancers

#### What is a Zenker diverticulum?

Lower pharyngeal outpouching of the muscular wall. Pulsion diverticulum secondary to pressure from swallowing.

#### What are the signs and symptoms of Zenker diverticulum?

Halitosis, neck mass on the left, dysphagia, aspiration

#### How is Zenker diverticulum diagnosed?

Clinical palpation of a left-sided neck mass or a barium swallow

#### What is the treatment for Zenker diverticulum?

Cricopharyngeal myotomy or surgical excision

#### What are the causes of esophageal dysphagia?

1. Mechanical obstruction: esophageal cancer, Schatzki ring, peptic stricture
2. Problem with esophageal motility: achalasia, diffuse esophageal spasm, or scleroderma

#### How do symptoms of mechanical dysphagia differ from dysphagia secondary to motility problems?

Patients with mechanical dysphagia have more difficulty with solids than liquids whereas motility disorders cause difficulty with both solids and liquids.

#### What is the most common motility disorder often seen in patients with scleroderma?

Esophageal hypomotility

#### What defines achalasia?

Loss of esophageal peristalsis with an inability of the lower esophageal sphincter to relax due to ganglionic loss of **Auerbach plexus**.

**What is the diagnostic feature seen on barium swallow in a patient with achalasia?**

“Bird’s beak” appearance (dilation of the proximal esophagus with narrowing of the distal esophagus)

**What would manometry demonstrate in a patient with achalasia?**

Increased pressure at the lower esophageal sphincter with no relaxation with swallowing

**How is achalasia treated?**

Balloon dilatation, sphincter myotomy, local botulinum toxin

**What is the diagnostic feature seen on barium swallow in a patient with diffuse esophageal spasm?**

“Corkscrew pattern”

**What is the treatment for diffuse esophageal spasm?**

Nitroglycerin, calcium channel blockers

**What is Schatzki ring?**

Narrowing of the lower esophageal ring

**What is Plummer-Vinson syndrome?**

Esophageal webs, atrophic glossitis, and dysphagia associated with iron deficiency anemia

## **GASTROESOPHAGEAL REFLUX DISEASE**

**What are the underlying causes of gastroesophageal reflux disease (GERD)?**

Incompetent lower esophageal sphincter, obesity, hiatal hernia, pregnancy, decreased esophageal motility, delayed gastric emptying

**What are the signs and symptoms of GERD?**

Postprandial epigastric (chest) burning worse in supine position, cough, hoarse voice, regurgitation

**How is GERD diagnosed?**

It is a clinical diagnosis.

**What is the treatment for GERD?**

First-line treatment is lifestyle modification; weight loss; avoidance of instigating foods such as caffeine, fatty foods; avoid eating right before going to sleep

Second-line treatment: H2 blockers Third-line treatment: If H2 blockers fail, try proton pump inhibitors (PPIs)

Last resort: Nissen fundoplication

**What can be the long-term effects of chronic GERD?**

Barrett esophagus, peptic stricture, and esophageal cancer

**What is Barrett esophagus?**

Transformation of normal squamous epithelium to columnar epithelium

**What is the risk with Barrett esophagus?**

10% lifetime risk of transforming into esophageal adenocarcinoma

## **GASTRITIS**

## What is gastritis?

Inflammation of the gastric mucosa

Name the type of gastritis that matches the statement below:

Gastritis most likely to be found in the fundus	Type A
Gastritis most likely to be found in the antrum of the stomach	Type B
Associated with autoimmune causes, achlorhydria, pernicious anemia	Type A
Most common cause is nonsteroidal anti-inflammatory drug (NSAID) use	Type B
Can be caused by <i>Helicobacter pylori</i> infection	Type B
Associated with risk for peptic ulcer disease and gastric cancer	Type B

## What are the signs and symptoms of gastritis?

May be asymptomatic; otherwise symptoms are epigastric pain, weight loss, nausea, vomiting, hematemesis, coffee ground emesis

## How is gastritis diagnosed?

Endoscopy

## What is the treatment for gastritis?

It depends on the etiology.

If caused by *H pylori*—triple therapy with PPI, two antibiotics, and bismuth compound

If caused by NSAID use—discontinue NSAID use; start sucralfate, PPI, or H2 blocker

If caused by post-procedure, hospitalization stress—intravenous (IV) H2 blocker

If caused by pernicious anemia—vitamin B<sub>12</sub> treatment

## PEPTIC ULCERS

### What are the two types of peptic ulcers?

1. Duodenal ulcer
2. Gastric ulcer

### Which type of ulcer is more common?

Duodenal ulcers are twice as common.

**What is the underlying pathology in a patient with a duodenal ulcer?**

Most have increased acid production.

**How does the underlying pathology of gastric ulcers differ from that of duodenal ulcers?**

Gastric ulcers are not caused by increased acid production. Patients are more likely to have decreased mucosal protection.

**What bacterial infection is found in 90% of patients with duodenal ulcers?**

*H pylori*

**What percentage of gastric ulcers are associated with *H pylori* infection?**

70%

**What test can determine if a patient may be infected with *H pylori*?**

Stool *H pylori* antigen, urea breath test, serum IgG test

**What is the drawback of the *H pylori* blood test?**

It does not indicate an **active** infection. It will be positive even if the patient was infected in the past and is not currently infected. The test also has a low sensitivity.

**What are the two most common causes of peptic ulcer disease?**

1. *H pylori* infection
2. Frequent NSAID use

**What are the risk factors for a peptic ulcer?**

Smoking, significant alcohol use, frequent NSAID use, significant physiologic stress (examples are surgery, trauma, burns), and hypersecretory states

**Name three hypersecretory states.**

1. Zollinger-Ellison syndrome
2. Multiple endocrine neoplasia type I (MEN I)
3. Antral G-cell hyperplasia

**What are the signs and symptoms of a duodenal ulcer?**

Burning epigastric pain that is usually 2-3 hours postprandially; relieved by food or antacids; pain may radiate to the back; pain awakens patient at night; nausea and sometimes vomiting; hematemesis/melena if patient has a gastrointestinal (GI) bleed

**What are the signs and symptoms of a gastric ulcer?**

Same as that for a duodenal ulcer except that pain is greater with meals, so patients often lose weight

**What tests would you order if you suspected a peptic ulcer?**

Complete blood count (CBC) to make sure patient is not anemic; upper GI endoscopy or upper GI series; *H pylori* screening

**What should be ruled out in a patient with a gastric ulcer?**

Malignancy

**How can malignancy be ruled out?**

A biopsy of the ulcerated region should be done during endoscopy

**What is a gastric ulcer in a burn patient called?**

Curling ulcer

**What is a gastric ulcer in a patient with central nervous system (CNS) damage called?**

Cushing ulcer

**How is peptic ulcer disease treated?**

Avoidance of instigating factors such as smoking and NSAIDs; H2 blockers or PPIs, mucosal protectors such as bismuth, and antibiotics if the patient is infected with *H pylori*

**How is an *H pylori* infection treated?**

**Triple therapy:** PPI + bismuth compound + two antibiotics for 14 days For example: omeprazole + amoxicillin (or metronidazole) + clarithromycin + bismuth compound

**What are some complications of peptic ulcer disease?**

Hemorrhage, obstruction, perforation

**When would you suspect a perforated duodenal ulcer?**

Severe epigastric pain that radiates to the back

**What studies would you order if you suspected a perforated ulcer?**

Abdominal series or upper GI series with contrast (**do not use barium**)

**What would you expect to see on an abdominal series if there was a perforated ulcer?**

Free air under the diaphragm

**What is the treatment for a perforated ulcer?**

Npo (nothing by mouth), IV fluids, antibiotics, emergent surgery

**What are the typical symptoms of gastric outlet obstruction?**

Nausea, vomiting, weight loss, distended abdomen, loud bowel sounds

**What is the most serious complication of a posterior duodenal ulcer?**

Erosion into the gastroduodenal artery can lead to a massive hemorrhage.

**What symptoms could be a red flag for a gastric malignancy?**

Early satiety with weight loss

**What are the risk factors for gastric cancer?**

Diets with high nitrosamines or salt content, history of chronic gastritis, low-fiber diets, gastric ulcer, smoking, blood group A, Japanese ethnicity

**What blood group type is more likely to develop gastric cancer?**

Type A

**In what part of the stomach is gastric cancer usually found?**

In the antrum of the stomach

**What is the most common type of gastric cancer?**

Adenocarcinoma

**Name the physical findings associated with metastatic gastric cancer described below:**

**Palpable left supraclavicular lymph node**

Virchow node

**Hard lymph nodule palpable at the umbilicus**

Sister Mary Joseph sign

**Palpable ovarian mass that originates from the metastasis of signet-ring cells**

Krukenberg tumor

**Lymph node that can be palpated on a rectal examination due to metastasis to the pouch of Douglas**

Blumer shelf

**What is the most fatal form of gastric cancer?**

Linitis plastica (diffusely infiltrating gastric cancer)

## **GI BLEED**

**What are signs of an upper GI bleed?**

Hematemesis, coffee ground emesis, melena (black, tarry stools), bright red blood per rectum (BRBPR) only if the bleed is very brisk

**What are the six main causes of upper GI bleeds?**

Remember the mnemonic **PAGE ME!**

1. **P**eptic ulcer
2. **A**trioventricular (AV) malformation
3. **G**astritis
4. **E**sophageal varices
5. **M**allory-Weiss tear
6. **E**sophagitis

**What is a Mallory-Weiss tear?**

Small esophageal tear usually near the gastroesophageal (GE) junction that is caused by vomiting or retching

**What blood tests would you order in a patient you thought may have a GI bleed?**

CBC (look for anemia, platelet abnormality), blood urea nitrogen (BUN) (fresh bleeding may lead to elevated BUN), prothrombin time (PT), partial thromboplastin time (PTT), international normalized ratio (INR), bleeding abnormalities

**What is the best diagnostic test in a patient with upper GI bleed?**

Endoscopy

**How are bleeding varices treated?**

Ligation or injection of vessels with sclerosing or vasoconstrictive agents

**How should all GI bleeds be treated?**

Emergency airway, breathing, circulation (ABCs) as well as IV fluid resuscitation, gastric lavage and

nasogastric (NG) tube if needed

**What are the signs of a lower GI bleed?**

BRBPR, maroon or dark red stool, anemia

**What are the six most common causes of lower GI bleeding?**

1. **Diverticulosis**
2. **AV malformation**
3. **Hemorrhoids**
4. **Colitis**
5. **Colon cancer**
6. **Colonic polyps**

**What is the most common cause of a major lower GI bleed in a patient older than 60?**

Diverticulosis

**What physical examination and imaging study would you do on a patient with suspected lower GI bleed?**

Always do a rectal examination; colonoscopy

**If no clear source is found, what other studies can be done?**

Endoscopy to rule out an upper GI source, tagged red blood cell (RBC) scan; arteriography, gastric lavage; barium enema (but not if there is acute blood loss)

## **COLON**

**What is a true diverticulum?**

Colonic herniation involving the full thickness of bowel wall

**What is a false diverticulum?**

Colonic mucosal herniation through the muscular layer which is acquired

**Which type of diverticulum is more common?**

False

**In what part of the colon are diverticula most commonly found?**

Sigmoid

**What is diverticulosis?**

Presence of multiple diverticula in the colon

**What is thought to be an important risk factor for the development of diverticulosis?**

Low-fiber diet

**Why do diverticula bleed?**

Diverticula which are inflamed erode through an artery and cause profuse bleeding that usually subsides on its own.

**What is the treatment for diverticulosis?**

Increase of fiber in diet and decrease of obstructing foods such as seeds and fatty foods

**What is diverticulitis?**

“-itis” implies inflammation. Diverticulitis is inflammation of a diverticulum secondary to infection.

**What is the most common symptom of diverticulitis?**

The most common presenting symptom is left **lower quadrant abdominal pain**.

**What are other signs and symptoms of diverticulitis?**

Constipation, fever, elevated white blood cells (WBCs), bleeding is much less common than with diverticulosis

**What are the four serious complications of diverticulitis?**

1. Perforation through the bowel wall causing peritonitis
2. Fistula formation
3. Abscess
4. Obstruction

**How do patients who develop a colovesicular fistula present?**

Multiple urinary tract infections (UTIs)

**What is the best imaging test to diagnose diverticulitis?**

Computed tomography (CT) of the abdomen and pelvis

**What studies are contraindicated in diverticulitis?**

Colonoscopy, contrast enema

**What is the treatment for diverticulitis?**

Npo, IV fluids, antibiotics to cover anaerobes and enteric organisms

**What is the treatment for recurrent bouts of diverticulitis or severe cases?**

Elective sigmoid colectomy

**How would you treat an abscess secondary to diverticulitis?**

CT or ultrasound-guided percutaneous drainage

**How do you treat obstruction or perforation secondary to diverticulitis?**

Surgical resection of affected bowel with a colostomy that is usually temporary

**What is the most common nosocomial enteric infection?**

*Clostridium difficile*

**What can a *C difficile* infection lead to?**

**Pseudomembranous colitis**

**What antibiotic is classically associated with *C difficile* infection?**

**Clindamycin**

**What are the symptoms of *C difficile* infection?**

Diarrhea and abdominal cramping/pain

**How is a *C difficile* infection diagnosed?**

*C difficile* stool toxin, stool leukocytes

**How is a *C difficile* infection treated?**

Stop the offending agent and treat with po metronidazole or vancomycin.



**How is pseudomembranous colitis confirmed?**

On colonoscopy or sigmoidoscopy, a yellow plaque adherent to the colonic mucosa can be seen.

**What is volvulus?**

Twisting of the bowel around the mesenteric base

**What is the most common location of volvulus?**

Sigmoid colon

**What is the second most common location of volvulus?**

Cecum

**What are the symptoms of a volvulus?**

Painful, distended abdomen; high-pitched bowel sounds; tympany on percussion

**What is the classic sign of volvulus on an abdominal series?**

Dilated loops of bowel with a **kidney-bean** appearance

**What is the sign of volvulus on a barium enema?**

Bird's beak appearance with the beak pointing to the area where the rotation has occurred

**What is the treatment for volvulus?**

Sigmoidoscopy or colonoscopy is usually therapeutic for decompression.

**What is the second most common cancer causing death in the United States?**

Colon cancer

**What are the risk factors for colon cancer?**

Family history

Low-fiber diet

Familial adenomatous polyposis (FAP)

Hereditary nonpolyposis colorectal cancer

High-fat diet

Colonic adenomas

Age >50

Inflammatory bowel disease

**What are the general signs and symptoms of colon cancer?**

Weight loss, fatigue, iron deficiency anemia in a male >50 years of age is colon cancer (CA) until proven otherwise; GI bleed, constipation, distended abdomen secondary to obstruction, pencil-thin stools

**How do the symptoms of right-sided-and left-sided colon cancer differ?**

Left-sided colon cancer presents as constipation.

Right-sided colon cancer presents as anemia secondary to blood loss.

**What are the recommendations for colon cancer screening?**

Starting age 50, a colonoscopy every 10 years or a sigmoidoscopy every 5 years with annual digital rectal and hemoccult examination

**How are the screening recommendations different in patients with a family history of colon cancer?**

Start screening 10 years prior to the age that the family member was diagnosed with cancer.

**How is colon cancer diagnosed?**

Biopsy of the lesion on colonoscopy/sigmoidoscopy

**What laboratory marker can be used to help follow the progression of colon cancer and its treatments?**

Carcinoembryonic antigen (CEA)—but it cannot be used as a screening test

**How is colon cancer staged and what is the prognosis of each stage?**

TNM (tumor node metastasis) classification ([Tables 5-1A](#) and [5-1B](#))

**Table 5-1A** Colon Cancer Staging

Staging of Primary Tumor	Nodal Involvement	Metastasis
Tis: Carcinoma in situ	N0: No regional node involvement	M0: No metastasis
T1: Tumor invades submucosa	N1: Metastasis in one to three regional lymph nodes	M1: Distant metastasis present
T2: Tumor invades muscularis propria	N2: Metastasis in four or more regional lymph nodes	
T3: Tumor invades the subserosa or into the nonperitoneal pericolic or perirectal tissues		
T4: Tumor perforates the visceral peritoneum or directly invades other organs		

**Table 5-1B** Colon Cancer Prognosis Based on Staging

Stage	T	N	M	Approximate 5-Year Prognosis
Stage 0	Tis	N0	M0	>90%
Stage I	T1	N0	M0	>90%
	T2	N0	M0	
Stage II A	T3	N0	M0	70%-85%
II B	T4	N0	M0	55%-65%
Stage III A	T1, T2	N1	M0	45%-55%
III B	T3, T4	N1	M0	20%-35%
III C	Any T	N2	M0	
Stage IV	Any T	Any N	M1	<5%

### What is the treatment of colon cancer?

Surgical resection; radiation therapy (if rectal cancer), and chemotherapy for stages B and C

## INFLAMMATORY BOWEL

### What is ulcerative colitis (UC)?

Inflammatory bowel disease that affects the colon

### What classic symptom is associated with UC?

**Bloody diarrhea**

### What other serious symptom can sometimes occur with UC?

Toxic megacolon

### Where are lesions found in UC?

Large intestine only

### Where do the lesions usually first appear?

Rectum

### How do lesions spread in UC?

Proximally from the rectum

### How is UC diagnosed?

Colonoscopy with biopsy

### What is seen on colonoscopic biopsy in a patient with UC?

**Crypt abscess**; distorted cells

**How is the mucosa of the colon described in a patient with UC?**

Friable mucosa with erosions and erythema

**On biopsy, what is the depth of involvement of the lesions?**

Mucosa and submucosa only

**What is ulcerative proctitis?**

A subtype of UC in which only the rectum is involved

**What is the treatment for each of the following severities of UC:**

**Distal colitis (mild)**

**Mesalamine**

**Moderate colitis**

Mesalamine + sulfasalazine ± corticosteroids

**Severe colitis**

IV corticosteroids + azathioprine ; resistant cases try Remicade; unresponsive cases require resection

**Fulminant colitis?**

Broad-spectrum antibiotics, surgery

**What is Crohn disease?**

Inflammatory bowel disease that affects the GI tract; there could be an infectious etiology

**What part of the GI tract can Crohn disease involve?**

From the mouth to the rectum, but often with rectal sparing

**What is the classic symptom of Crohn disease?**

**Bloody or watery diarrhea** (although the diarrhea does not always have to be bloody)

**What are some other physical examination findings in Crohn disease?**

Fistulas, fissures, fever, abdominal pain

**How is Crohn disease diagnosed?**

Colonoscopy and biopsy

**How are the lesions classically spread in Crohn disease?**

There are **skip lesions**, which means that there is no contiguous spread. The lesions are disseminated through the entire colon.

**What is the depth of the lesions on biopsy?**

Lesions go through all layers—they are **transmural**.

**On physical examination, what type of lesion is often found in the mouth of a patient with Crohn disease?**

Aphthous ulcer

**What is the mnemonic to remember Crohn disease?**

The old, **Crohn** skipped over the **cobblestone**.

### What is the treatment for Crohn disease?

Sulfasalazine, corticosteroids; for unresponsive patients, try mercaptopurine, azathioprine, infliximab

### What are the differences between UC and Crohn disease?

See [Table 5-2](#).

**Table 5-2** Crohn Disease Vs Ulcerative Colitis

<b>Crohn Disease</b>	<b>Ulcerative Colitis</b>
Lesions in small and large intestine	Lesions only in large intestine
Rectal involvement uncommon	Rectal involvement common
Transmural	Submucosa/mucosa only
Skip lesions	Lesions are contiguous
Fissures and fistulas common	No fissures or fistulas
Lower risk for colon cancer	High risk for colon cancer

### Name six extraintestinal manifestations of both UC and Crohn disease?

1. Erythema nodosum
2. Pyoderma gangrenosum
3. Uveitis
4. **Ankylosing spondylitis**
5. Primary sclerosing cholangitis
6. Arthritis

## DIARRHEA

### What is the definition of diarrhea?

Daily stool weighing >200 g

### What are the most common causes of bacterial and parasitic bloody diarrhea?

Remember the mnemonic **whY CaSES**:

*Yersinia*

*Campylobacter*, cholera

*Shigella*

*Escherichia coli*, *Entamoeba histolytica*

*Salmonella*

### What is the treatment for bacterial bloody diarrhea?

Ciprofloxacin or bactrim

### What are viral causes of bloody diarrhea?

Rotavirus and Norwalk virus

**What is the treatment for bloody diarrhea caused by a virus?**

IV fluids

**What is the treatment for parasitic bloody diarrhea?**

Metronidazole

**What studies would you order in a patient with bloody diarrhea?**

CBC, stool for ova and parasites, stool for fecal leukocytes, stool culture

**What acid-base disorder can you expect to see in a patient with severe diarrhea?**

Metabolic acidosis

## **MALABSORPTION DISORDERS**

**Name the malabsorption disorder described below:**

**Gluten-induced enteropathy**

Celiac sprue

**Caused by tropical infection**

Tropical sprue

**Protein-losing enteropathy with large gastric folds seen on barium swallow**

Menetrier disease

**Most common malabsorptive disorder of adulthood**

Lactase deficiency

**Caused by infection with *Tropheryma whippelii*, a gram-negative rod**

Whipple disease

**Affects the jejunum**

Tropical sprue

**Diagnosed with antigliadin IgG and IgA antibodies, endomysial antibody, antireticulin antibody; and small bowel biopsy shows blunting of intestinal villi**

Celiac sprue

<b>Periodic acid-Schiff (PAS) + macrophages in intestines</b>	Whipple disease
<b>Classic rash of dermatitis herpetiformis</b>	Celiac sprue
<b>Causes signs and symptoms of folic acid deficiency including cheilosis, glossitis, stomatitis</b>	Tropical sprue
<b>Flatulence after consumption of lactose-containing products</b>	Lactase deficiency
<b>Signs and symptoms include hyperpigmentation, arthralgias, rash, diarrhea, endocarditis, ophthalmoplegia, memory deficits, and altered mental status</b>	Whipple disease
<b>Avoidance of wheat, rye, and barley will help treat the disorder</b>	Celiac sprue
<b>Treated with penicillin</b>	Whipple disease

## **PANCREAS**

### **What is pancreatitis?**

Inflammation of the pancreas

### **What are the two most common causes of pancreatitis?**

1. Alcoholic pancreatitis
2. Gallstone pancreatitis

### **What is the mnemonic for the causes of pancreatitis?**

#### **I GET SMASHED**

**I**diopathic

**G**allstones

**E**thanol

**T**rauma

**S**teroids

**M**umps

**A**utoimmune

**S**corpion bites

**H**yperlipidemia

**E**ndoscopic retrograde cholangiopancreatography (ERCP)

**D**rugs (such as thiazide diuretics)

**What are the signs and symptoms of pancreatitis?**

Epigastric pain that radiates to the back; nausea, vomiting, decreased bowel sounds, fever

**What are signs of retroperitoneal bleeding?**

**Grey Turner sign and Cullen sign**

**What is Grey Turner sign?**

Ecchymosis seen on the patient flank in hemorrhagic pancreatitis

**What is Cullen sign?**

Periumbilical ecchymosis seen in hemorrhagic pancreatitis

**What laboratory findings are consistent with pancreatitis?**

↑ amylase, ↑ lipase, hypocalcemia

**What would you expect to see on an abdominal x-ray?**

Sentinel loop or colon cutoff sign

**What is a sentinel loop?**

Dilated bowel or air fluid levels near the pancreas

**What is the colon cutoff sign?**

Transverse colon distended with no colonic gas distal to the splenic flexure

**What is the best study to evaluate pancreatitis?**

Abdominal CT

**What test should be ordered if there is a suspicion of gallstone pancreatitis?**

Right upper quadrant (RUQ) ultrasound

**What is the treatment for pancreatitis?**

Npo, NG tube for ileus or vomiting, IV fluid hydration, and treat the underlying cause

**What do we use to determine the prognosis of a patient with pancreatitis?**

Ranson criteria (predicts risk of mortality based on risk factors)

**What are Ranson criteria on admission?**

Remember the mnemonic **GA LAW**

**G**lucose >200

**A**ge >55

**L**actate dehydrogenase (LDH) >350

**A**spartate aminotransferase (AST) >250

**W**BC >16,000

**What are Ranson criteria after 48 hours?**

Remember the mnemonic: **C and HOBBS**

**C**alcium <8

**H**ematocrit (Hct) drop >10%

**O**xygen <60 mm

**B**UN >5

**B**ase deficit >4

**S**equestration of fluid >6 L

**How is the risk of mortality calculated based on Ranson criteria?**

<3 risk factors: 1% mortality



3-4 risk factors: 16% mortality  
5-6 risk factors: 40% mortality  
7-8 risk factors: close to 100% mortality

## **BILIARY TRACT**

### **What is cholelithiasis?**

Gallstones

### **What are the four classic risk factors for cholelithiasis?**

1. **Female**
2. **Fat**
3. **Fertile**
4. **Forty**

### **What is the most common type of stone?**

Cholesterol stone

### **What other type of stone can be found?**

Pigment stone

### **What is the predisposition to pigment stones?**

Hemolytic anemia or hemoglobinopathies

### **Which type of stone is radiopaque?**

Pigment stones

### **What are the common signs and symptoms of cholelithiasis?**

RUQ pain, nausea, and vomiting especially after a fatty meal

### **What is the most specific and sensitive test to diagnose cholelithiasis?**

RUQ ultrasound

### **When should cholelithiasis be treated?**

Only if the patient is symptomatic

### **What is the treatment for cholelithiasis?**

Elective cholecystectomy

### **What is cholecystitis?**

Gallbladder inflammation secondary to infection caused by an obstructing stone

### **What bacteria cause cholecystitis?**

Remember the mnemonic **KEEEP**:

*Klebsiella*

*E coli*

*Enterococcus*

*Enterobacter*

*Pseudomonas*

### **What are the symptoms of cholecystitis?**

**Prolonged RUQ pain, fever, nausea, vomiting, referred pain to subscapular region on the right + Murphy's sign**

**What is Murphy's sign?**

Acute pain and inspiratory arrest with deep palpation of RUQ during inspiration

**How is cholecystitis diagnosed?**

RUQ ultrasound, which will show gallstones, gallbladder wall thickening, pericholecystic fluid, and sonographic Murphy's sign

**What imaging study should be performed if the ultrasound results are equivocal?**

Hepatobiliary iminodiacetic acid (HIDA) scan

**What is the treatment for cholecystitis?**

Npo, IV fluids, IV antibiotics (third-generation cephalosporin + aminoglycoside + metronidazole, cholecystectomy

**What pain medicine has historically been referred to as being more appropriate to treat pain from cholecystitis and why?**

Demerol because morphine is thought to cause spasm of the sphincter of Oddi; however, this is not always done in clinical practice

**What is choledocholithiasis?**

Gallstones in the common bile duct

**What are the signs and symptoms of choledocholithiasis/cholangitis?**

Jaundice secondary to obstruction, RUQ pain, Murphy's sign, hypercholesterolemia, ↑ alkaline phosphatase, ↑ bilirubin, ↑ alanine aminotransferase (ALT)

**What is the treatment for choledocholithiasis?**

1. ERCP with papillotomy and stone removal
2. Common bile duct exploration at time of surgery

**What are the complications of choledocholithiasis?**

Ascending cholangitis and pancreatitis

**What is ascending cholangitis?**

Bacterial infection of the biliary tract secondary to obstruction

**What is the most common organism causing cholangitis?**

*E coli*

**What is Courvoisier sign?**

Gallbladder enlargement with jaundice secondary to carcinoma of the head of the pancreas leading to a firm palpable gallbladder

**What are the classic symptoms of ascending cholangitis?**

**Charcot triad:**

1. Jaundice
2. Fever
3. RUQ tenderness

*Or*

**Reynold's pentad (Charcot triad + altered mental status and shock)**

**What are the laboratory findings consistent with ascending cholangitis?**

↑ WBC, ↑ alkaline phosphatase, ↑ direct bilirubin, ↑ ALT

**How is ascending cholangitis definitively diagnosed?**

ERCP or percutaneous transhepatic cholangiogram (PTC)

**What is the treatment for ascending cholangitis?**

Npo, IV fluids, IV antibiotics (ampicillin + aminoglycoside + metronidazole), and ERCP to remove stones

**What is primary sclerosing cholangitis?**

Chronic inflammation and fibrosis of the biliary tree

**What is a common medical diagnosis that patients with sclerosing cholangitis also have?**

UC

**LIVER**

**What is cirrhosis?**

Chronic hepatic injury leading to fibrosis, necrosis, and nodular regeneration

**What is the most common cause of cirrhosis?**

Alcoholism

**What are some nonalcoholic causes of cirrhosis?**

Alpha-1 antitrypsin deficiency, hemochromatosis, primary or secondary biliary cirrhosis, Wilson disease, hepatitis B, hepatitis C

**What are the signs and symptoms of cirrhosis?**

Jaundice, ascites, asterixis, bleeding, edema, hepatomegaly, encephalopathy, palmar erythema, spider angiomas on the abdomen

**What is asterixis?**

Downward flapping of hands when held in a dorsiflexed position

**Why do cirrhotic patients get ascites?**

Because they have low albumin

**What is SAAG?**

Serum-ascites albumin gradient

**How is SAAG calculated?**

Albumin concentration of serum – albumin concentration of ascites fluid

**What is SAAG >1.1g/dL indicative of?**

Ascites related to portal hypertension

**What is a SAAG <1.1 g/dL indicative of?**

Non-portal hypertension etiologies of ascites such as nephrotic syndrome, malignancy, tuberculous peritonitis, biliary or pancreatic ascites

**How can the ascites be treated?**

Spironolactone and paracentesis

**What is a major complication of ascites?**

Spontaneous bacterial peritonitis (SBP)

**What is the most common organism causing SBP?**

*E coli*

**What is the most classic sign of SBP?**

Rebound abdominal tenderness in a patient with ascites

**How is SBP diagnosed?**

Paracentesis with fluid sent for cell count and Gram stain, culture, and sensitivity

**What are the diagnostic criteria for SBP?**

Ascites fluid neutrophil count  $>250$  and positive Gram stain/culture *OR* ascites fluid neutrophil count  $>500$

**What is the treatment for SBP?**

Third-generation cephalosporin with albumin

**Why do cirrhotic patients tend to bleed?**

PT is elevated and platelets are low.

**What is the treatment for cirrhosis?**

Stop alcohol consumption; multivitamin including thiamine and B<sub>12</sub>; and nutrition

**What marker can detect an alcohol binge?**

Gamma-glutamyltransferase (GGT)

**What is portal hypertension?**

Elevated portal vascular resistance secondary to presinusoidal, postsinusoidal, or sinusoidal obstruction

Presinusoidal: portal vein thrombosis, schistosomiasis

Postsinusoidal: hepatic vein thrombosis, right heart failure

Sinusoidal: cirrhosis

**Internationally, what is the most common cause of portal hypertension?**

Schistosomiasis

**What are the classic physical examination findings in a patient with portal hypertension?**

Remember the mnemonic **CHASE**:

Caput medusa

Hemorrhoids

Ascites

Splenomegaly

Esophageal varices

**What are the treatments for portal hypertension?**

Decrease portal pressure with propranolol; transjugular intrahepatic portosystemic shunt (TIPS); last resort is a liver transplant

**What is a common cause of hematemesis in a patient with portal hypertension?**

Variceal bleeding

**How is a variceal bleed diagnosed?**

Esophagogastroduodenoscopy (EGD)

**What is the treatment for a variceal bleed?**

Start with emergent therapy assessing airway, breathing and circulation, initiate IV fluids, if indicated correct clotting factors with fresh frozen plasma (FFP), vitamin K. Vasoactive drugs such as octreotide, somatostatin, or vasopressin have been found to be safer than sclerotherapy to control the bleeding. Sclerotherapy and variceal banding are also options.

Nonselective beta blockers such as propranolol, timolol, and nadolol.

**What is the treatment for esophageal varices with no history of bleeding?**

If contraindicated—long-acting nitrates

Alternative—variceal ligation

**What are some treatments for hepatic encephalopathy?**

Lactulose to decrease absorption of ammonia, neomycin, and protein-restricted diet

**What is hepatorenal syndrome?**

Patients with advanced hepatic disease develop acute renal failure.

**How is hepatorenal syndrome diagnosed?**

Elevated BUN/creatinine (CR), hyponatremia, oliguria, hypotension, and urine Na <10

**What are the three different etiologic categories of hepatitis?**

1. Viral (elevated ALT; ALT:AST 2:1)
2. Alcoholic (elevated AST; AST:ALT 2:1)
3. Toxin-induced (Tylenol) (elevated AST)

**What is a mnemonic to remember the etiological differences in hepatitis?**

vir**ALT**

Drugs bl**AST**

**Name the hepatitis viruses transmitted via the fecal-oral route.**

Hepatitis A and E

**Name the hepatitis viruses transmitted via blood and sexual contact.**

Hepatitis B, C, D

**Name the only DNA hepatic virus.**

Hepatitis B

**Which hepatitis viruses have a chronic carrier state?**

Hepatitis B, C, D

**Which hepatitis viruses have a vaccine available?**

Hepatitis A and B (and D)

**Which hepatitis viruses have a vaccine available?**

Hepatitis A and B (and D)

**How can you detect an acute hepatitis A infection?**

Anti-hepatitis A virus (HAV) IgM

**How can you detect immunity to hepatitis A?**

Anti-HAV IgG

**How is hepatitis A treated?**

It is a self-limiting disease.

**Which disease state does each of the following hepatitis B markers detect?**

<b>HBsAg (hepatitis B surface antigen)</b>	Active hepatitis or carrier
<b>HBeAg</b>	Chronic hepatitis that is highly infective
<b>HBcAg</b>	Early infection
<b>Anti-HBc IgM</b>	Acute infection (1.5-6 months)
<b>Anti-HBe</b>	Very low infectivity
<b>Anti-HBs</b>	Immune state
<b>Anti-HBc IgG</b>	Remote infection from 6 months to 1 year ago

**What can be given to a patient exposed to hepatitis B to prevent infection?**

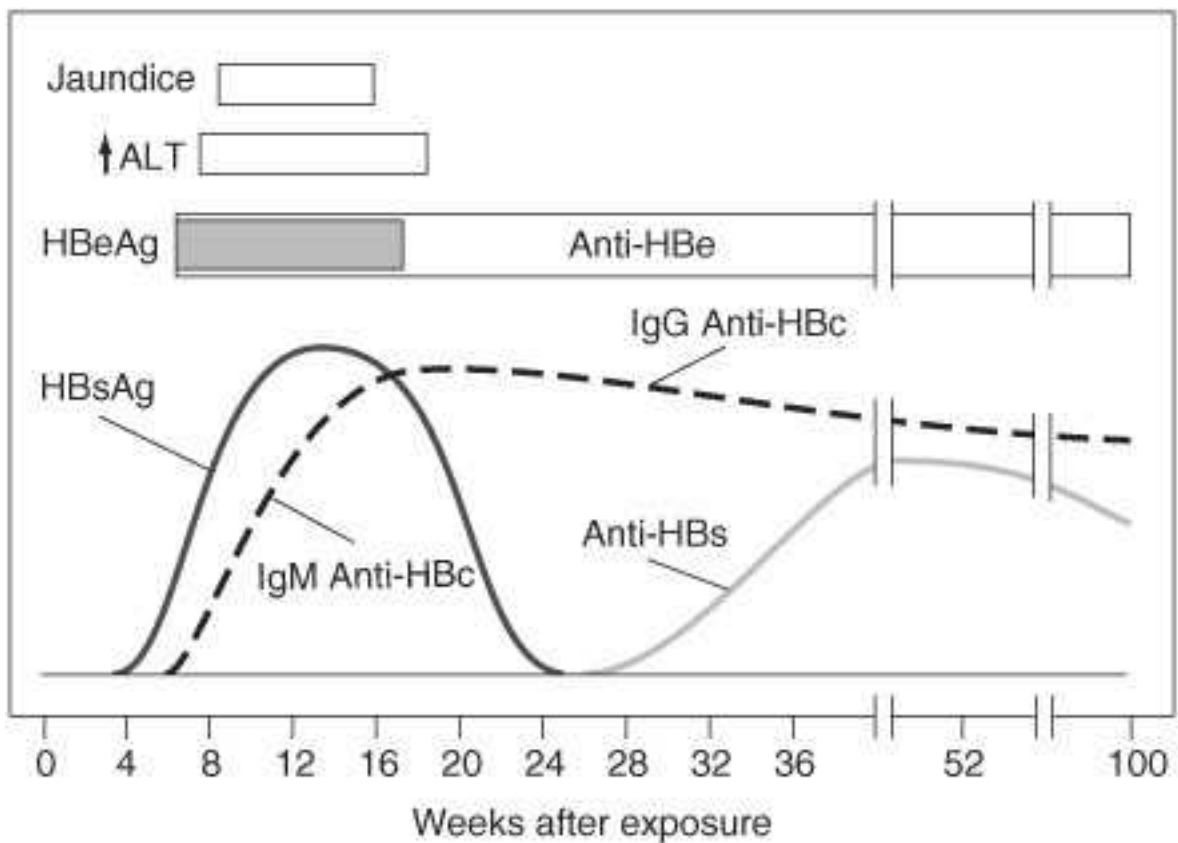
Hepatitis B immunoglobulin (HBIG)

**What is the treatment for a person infected with hepatitis B?**

Interferon, lamivudine, adefovir

**When is the window period for hepatitis B?**

The time when HBsAg has become undetectable but HBsAb is not yet detectable ([Fig 5-1](#))



**Figure 5-1** Scheme of typical clinical and laboratory features of acute hepatitis B. (*Reproduced, with permission, from Fauci AS, Braunwald E, Kasper DL. Harrison's Principles of Internal Medicine. 17th ed. New York: McGraw-Hill; 2008:1934.*)

**What is the worst complication of hepatitis B?**

Hepatocellular carcinoma

**Which hepatitis virus carries the highest risk of developing into hepatocellular carcinoma?**

Hepatitis B

**What is the treatment for a person infected with hepatitis C?**

Interferon + ribavirin

**Which hepatitis virus must have concomitant infection with hepatitis B?**

Hepatitis D

## CLINICAL VIGNETTES

**A 19-year-old male presents to your office complaining of abdominal pain. He describes it as being crampy pain and furthermore he has had diarrhea that is runny in nature. He thinks he has had fever on some occasions as well. You examine the patient and find that this thin male has lower abdominal tenderness with no rebound or guarding. Stool for occult blood is tested and found to be negative. In his mouth you find an aphthous ulcer. What is the most likely diagnosis?**

Crohn disease

**A 40-year-old obese female presents to the ER complaining of abdominal pain with nausea and vomiting that began 5 hours ago after she ate a large hamburger and French fries. She has had similar symptoms in**

**the past but none that ever lasted this long. Her examination demonstrated the following:**

**Temp: 101.9°F; BP: 143/85 mm Hg; HR: 80 beats/min; RR: 18; O<sub>2</sub> sat: 100%**

**General: appears to be in pain**

**Cardiovascular (CV): regular rate and rhythm, no murmurs**

**Pulmonary: clear bilaterally**

**Abdomen: soft, tender to palpation in the right upper quadrant; normal bowel sounds**

**Ext: no clubbing, cyanosis, or edema**

**What imaging modality would you utilize to try to make the diagnosis?**

Ultrasound—It is highly sensitive and specific for detecting cholecystitis.

**Your patient complains of midepigastric pain relieve by food for several months. He also complains of nausea and occasional back pain. He is under an immense amount of stress because of the failing economy and all his expenses. A stool *H pylori* comes back positive. What is the appropriate treatment?**

Triple therapy: amoxicillin and clarithromycin + bismuth compound + proton pump inhibitor. This patient is also at risk for a duodenal ulcer and should have CBC as well as upper GI endoscopy.

**A 35-year-old female comes to the ER complaining of epigastric pain that radiates to the back along with 2 days of nausea, vomiting, and documented fever. The patient admits to drinking two “fifths” of vodka every day. She smells strongly of alcohol. A blood draw demonstrates megaloblastic anemia on CBC, normal kidney function. Liver function tests (LFTs) are elevated also with elevated amylase and lipase. What is the best diagnostic test to make the diagnosis?**

Abdominal CT to look for pancreatitis

**A 56-year-old male with a history of alcoholism presents to the ER with hematemesis. On examination the patient has a fluid wave, and there are spider angiomas present on his abdomen. He is also clearly jaundiced. His blood pressure is 90/50 with a heart rate of 105 beats/min. You suspect that he has a variceal bleed. What is your first step in treating this patient?**

ABCs—Airway establishment, breathing, circulation as well as volume resuscitation with IV fluids





# CHAPTER 6

## Hematology-Oncology

### ANEMIA

**What are the three basic categories of anemia?**

1. Microcytic (mean corpuscular volume [MCV] <80)
2. Macrocytic (MCV>100)
3. Normocytic (MCV between 80 and 100)

**Match the following anemias with their correct category (microcytic, macrocytic, or normocytic):**

See [Table 6-1](#).

**Iron deficiency anemia**

**Thalassemia**

**Folate deficiency**

**Sideroblastic anemia**

**Anemia of chronic disease**

**Lead poisoning**

**B<sub>12</sub> deficiency**

**Chronic renal failure**

**Table 6-1** Etiologies of Different Types of Anemia

<b>Microcytic (Mnemonic: LISTS)</b>	<b>Macrocytic</b>	<b>Normocytic</b>
Lead poisoning	B <sub>12</sub> deficiency	Chronic disease
Iron deficiency	Folate deficiency	Renal failure
Sickle cell anemia	Alcoholism	Aplastic anemia
Thalassemias		Spherocytosis
Sideroblastic		Autoimmune destruction
		Mechanical destruction

### MICROCYTIC ANEMIAS

**What is the most likely etiology of iron deficiency anemia?**

In women of childbearing age, it is most likely because of menses; in children it is usually a dietary deficiency; and in the elderly it is colon cancer until proven otherwise.

**A 68-year-old man with iron deficiency anemia presents to your clinic and denies any hematochezia or melena. What is the first thing you would do?**

Screen for colon cancer (iron deficiency anemia in the older population is cancer until proven otherwise.)

**What are the symptoms of iron deficiency anemia?**

Pallor, tachycardia, easy fatigability, **Pica, esophageal webs**

**What is the triad for Plummer-Vinson?**

1. Microcytosis
2. Atrophic glossitis
3. Esophageal webs

**What are the laboratory findings seen in iron deficiency anemia?**

↓ iron, ↓ ferritin, ↑ **total iron-binding capacity (TIBC)**, ↓ reticulocyte count  
(**Think:** Since there is less iron in the body, there is greater capacity for binding iron.)

**How is iron deficiency anemia treated?**

Ferrous sulfate

**What is sideroblastic anemia?**

Anemia caused by a disorder of the porphyrin pathway leading to ineffective erythropoiesis

**What drugs commonly cause sideroblastic anemia?**

Isoniazid; chloramphenicol, copper chelators, lead

**What are some other causes of sideroblastic anemia?**

Alcoholism, heredity

**What are laboratory findings?**

↑ **Iron**, ↑ ferritin, ↑ **TIBC**

**How is it diagnosed?**

Iron stain of bone marrow shows ringed sideroblasts with Prussian blue stain

**What is the treatment?**

Withdraw the offending agent, if one is identified, and give pyridoxine (B<sub>6</sub>)

**What type of anemia is sickle cell anemia?**

Microcytic

**What kind of genetic inheritance pattern does sickle cell anemia exhibit?**

It is an autosomal recessive disorder

**What causes “sickling” of red blood cells (RBCs)?**

Hemoglobin S tetramer polymerizes when RBCs are deoxygenated.

**What are some signs and symptoms of sickle cell anemia?**

**Pain crisis** caused by vaso-occlusion  
Infarcts of the lungs, kidneys, bone, spleen  
Intravascular hemolysis

Osteomyelitis caused by *Salmonella*

**Aplastic anemia from parvovirus B19 infection**

Myocardopathy

“Fish mouth” vertebrae

Splenomegaly

Priapism

Stroke, transient ischemic attack (TIA)

**What kind of infection are sickle cell patients with an autosplenectomy at risk for?**

Infection with **encapsulated bacteria** which include pneumococcus, meningococcus, and *Haemophilus influenzae*

**What can intravascular hemolysis lead to in children?**

“Pigment” gallstones

**How is sickle cell anemia diagnosed?**

Hemoglobin electrophoresis shows hemoglobin S.

**How is sickle cell treated?**

Remember the mnemonic **HOPE**:

**H**ydroxyurea—to prevent pain crises

**O**xxygen—to prevent sickling of cells

**P**neumococcal vaccine

**E**xchange transfusion—when hydroxyurea ineffective

**What are thalassemias?**

Hereditary diseases in which there is a decreased production of globins causing a decrease in the production of hemoglobin

**What causes alpha-thalassemia?**

A decrease in the alpha-globin chain production. There are four alpha alleles and anywhere from one to all four of these alleles may be affected.

**Match the alpha-thalassemia to the correct number of affected alleles and all the matching characteristics.**

See [Table 6-2](#).

<b>Alpha-thalassemia minor</b>	<b>One affected allele</b>	<b>Hemoglobin Bart (<math>\beta_4</math> hemoglobin)</b>
<b>Carrier</b>	<b>Two affected alleles</b>	<b>Mild microcytic anemia</b>
<b>Hydrops fetalis</b>	<b>Three affected alleles</b>	<b>Asymptomatic, no anemia</b>
<b>Hgb H disease</b>	<b>Four affected alleles</b>	<b>Fetal demise Intraerythrocytic inclusions</b>

**Table 6-2** Alpha-Thalassemia

	Alleles	Characteristics
Carrier	One allele affected	Asymptomatic
Alpha-thalassemia minor	Two alleles affected	Mild microcytic anemia
Hgb H disease	Three alleles affected	Intraerythrocytic inclusions
Hydrops fetalis	All four alleles affected	Barts; fetal demise

**In what ethnicity is alpha-thalassemia most likely to be found?**

More common in Asians. Also seen in people of Mediterranean and African descent.

**What causes beta-thalassemia?**

A decrease in the synthesis of one or both of the beta chains (there are two beta-chains in hemoglobin.)

**In what ethnicities is beta-thalassemia most likely to be found?**

African and Mediterranean descent

**Match the description below to the correct beta-thalassemia:**

<b>Missing both beta chains</b>	Beta-thalassemia major
<b>Missing one beta chain</b>	Beta-thalassemia minor
<b>Asymptomatic</b>	Beta-thalassemia minor
<b>Splenomegaly, frontal bossing, iron overload</b>	Beta-thalassemia major
<b>Treatment is folate supplementation</b>	Beta-thalassemia major
<b>Avoid oxidative stress</b>	Beta-thalassemia minor
<b>Electrophoresis shows increased fetal hemoglobin (Hgb F)</b>	Beta-thalassemia major
<b>Bone marrow transplant</b>	Beta-thalassemia major

**How is beta-thalassemia definitively diagnosed?**

Through gel electrophoresis. **Thalassemia major will have increased levels of Hgb F** as well as very decreased Hgb A; while thalassemia minor will have normal levels of Hgb F with somewhat decreased Hgb A.

**MACROCYTIC ANEMIAS**

**What are five different etiologies of macrocytic anemia?**

1. Folate deficiency
2. Vitamin B<sub>12</sub> deficiency
3. Alcoholism
4. Liver disease
5. Hypothyroidism

**Where is vitamin B<sub>12</sub> absorbed?**

In the terminal ileum

**What factor is needed for vitamin B<sub>12</sub> absorption?**

Intrinsic factor

**What are the signs and symptoms of vitamin B<sub>12</sub> deficiency?**

**Neurologic symptoms** such as ataxia, parasthesias, demyelination of corticospinal tract and dorsal columns. Memory problems can also develop.

**What is the most common cause of vitamin B<sub>12</sub> deficiency?**

Pernicious anemia

**What is the underlying pathology in pernicious anemia?**

In pernicious anemia, there is a decreased production of intrinsic factor because the gastric parietal cells are destroyed by autoantibodies; there is atrophic gastritis.

**How is pernicious anemia diagnosed?**

↑ Methylmalonic acid

↑ Homocysteine levels

Atrophic gastritis on esophagogastroduodenoscopy (EGD)

**Abnormal Schilling test** (not used as much any more)

**What are other causes of vitamin B<sub>12</sub> deficiency?**

Malabsorption because of resection of the terminal ileum or gastric resection, celiac sprue, Crohn disease, infection with *Diphyllobothrium latum* or *Giardia lamblia*. Rarely, B<sub>12</sub> deficiency is due to hypoalimentation. This can be seen in strict vegetarians or alcoholics.

**How is vitamin B<sub>12</sub> deficiency treated?**

Vitamin B<sub>12</sub> supplementation

**What foods contain folic acid?**

Green leafy vegetables

**Where is folate mainly absorbed?**

Jejunum

**What is the most common cause of folate deficiency?**

Hypoalimentation

**What are other causes of folate deficiency?**

Pregnancy, tropical sprue, hemolytic anemia, long-term treatment with bactrim, methotrexate use, 5-flourouricil use

**What can folate deficiency in pregnancy cause?**

Neural tube defects in the developing fetus

**How can the diagnosis of folate deficiency be differentiated from that of B<sub>12</sub> deficiency?**

**Normal methylmalonic acid**

↑ Homocysteine levels

**No neurologic symptoms**

## **NORMOCYTIC ANEMIA**

**What are the most common causes of normocytic anemia?**

Anemia of chronic disease, aplastic anemia, renal disease, hemolytic anemia, acute blood loss

**How is anemia of chronic disease diagnosed?**

↓ Iron; ↓ **TIBC**, normal ferritin

**Why does renal failure cause anemia?**

Erythropoietin is produced by the kidneys, and in chronic renal failure, erythropoietin levels are low.

**What is the treatment of anemia in a patient with renal failure?**

Erythropoietin supplementation

**What is aplastic anemia?**

Bone marrow failure leading to **pancytopenia**

**Name six different etiologies of aplastic anemia.**

1. Parvovirus B19 in the presence of sickle cell anemia
2. Hepatitis
3. Chloramphenicol
4. Benzene
5. Radiation therapy
6. Idiopathic

**How is aplastic anemia diagnosed?**

Normocytic, normochromic pancytopenia; hypocellular bone marrow in a bone marrow biopsy

**What are the two main treatments for aplastic anemia?**

1. Bone marrow transplant
2. Immunosuppression

**What is the most common enzyme deficiency that causes hemolytic anemia?**

G6PD deficiency

**Why is G6PD important?**

It is part of the hexose monophosphate pathway which reduces glutathione which is used to protect RBCs against oxidative damage.

**How is G6PD deficiency genetically transferred?**

It is sex-linked.

**In what ethnicities is G6PD deficiency most common?**

Sephardic Jews, Mediterraneans, Middle Easterners, Africans, Asians

**What are the signs and symptoms of G6PD deficiency?**

Signs of hemolysis, which include dark urine, jaundice, weakness, pallor, abdominal and back pain caused by mesenteric/renal ischemia, hepatosplenomegaly.

**What can trigger an attack in a patient with G6PD deficiency?**

Infection, **fava beans**, dapsons, sulfa drugs, primaquine, nonsteroidal anti-inflammatory drugs (NSAIDs)

**What is the pathognomonic G6PD deficiency diagnostic feature?**

Peripheral smear shows **Heinz bodies, schistocytes, and bite cells.**

**What are Heinz bodies?**

**Inclusions within red blood cells made of denatured hemoglobin**

**What is the treatment for anemia caused by G6PD deficiency?**

It is usually self-limited. Remove inciting factors such as drugs. Transfuse only in very severe cases.

**What two infections are associated with cold autoimmune hemolytic anemia?**

*Mycoplasma pneumoniae* and mononucleosis

**Cold autoimmune hemolytic anemia is mediated by which immunoglobulin (Ig)?**

IgM

**How is cold autoimmune hemolytic anemia diagnosed?**

A positive cold agglutinin test or positive indirect Coombs test

**How is cold autoimmune hemolytic anemia treated?**

Staying warm as well as immunosuppressives

**What general lab results would be seen in hemolytic anemia?**

Unconjugated bilirubinemia, hemoglobinuria, elevated urine urobilinogen

## **COAGULOPATHIES**

**What does partial thromboplastin time (PTT) measure?**

Intrinsic pathway

**What does prothrombin time (PT) measure?**

Extrinsic and common pathway

**Which pathway does heparin affect?**

Intrinsic pathway

**Which pathway does warfarin affect?**

Extrinsic pathway

**What are some causes of PT elevation?**

Warfarin treatment, vitamin K deficiency, liver disease

**What are the many causes of thrombocytopenia?**

Two categories:

1. ↑ Destruction/sequestration



Platelet disorders: TTP, ITP, DIC, HUS Splenomegaly

Drugs (heparin, aspirin, chemotherapy)

2. ↓ Production

Leukemia

Liver disease/alcohol

Aplastic anemia

**At what platelet level does significant bleeding begin?**

20,000

**At what platelet level is a patient at risk for an intracranial bleed?**

10,000

**At what platelet level is there an increased risk for bleeding?**

≤50,000

**Name the platelet disorder associated with the following features:**

**Autoimmune-mediated platelet destruction; often occurs after a viral infection in children and is self-limited, can be chronic in adults**

ITP (immune thrombocytopenic purpura)

**Triad of thrombocytopenia, hemolytic anemia, and acute renal failure**

HUS (hemolytic uremic syndrome)

**Often in children with bloody diarrhea infected by *Escherichia coli***

HUS

**Pentad of fever, anemia, thrombocytopenia, renal failure, and neurologic changes**

TTP (thrombotic thrombocytopenic purpura); (Note: **FAT RN**—Fever, Anemia, Thrombocytopenia, Renal failure, Neurologic changes)

**Seen in adenocarcinoma, trauma, septic shock, leukemia**

DIC (Disseminated intravascular coagulation)

**Often associated with human immunodeficiency virus (HIV), malignancy, autoimmune disorders, pregnancy**

TTP

**Petechiae and purpura over trunk and limbs**

TTP, ITP, DIC

**Caused by the deposition of abnormal von Willebrand factor (vWF) multimers**

TTP

Describe how each of the following platelet disorders can be diagnosed:

<b>TTP</b>	Pentad of <b>Fever, Anemia, Thrombocytopenia, Renal failure, Neurologic changes</b> in addition to peripheral smear with <b>schistocytosis, helmet cells</b> ; ↓ haptoglobin, ↑ lactate dehydrogenase (LDH); may have ↑ blood urea nitrogen/creatinine (BUN/CR), ↑ unconjugated bilirubin
<b>ITP</b>	Diagnosis of exclusion; no fever as in TTP; no schistocytosis on peripheral smear; positive Coombs test
<b>DIC</b>	↑ <b>Fibrin split products</b> , ↑ <b>D-dimer</b> , ↓ fibrinogen, ↑ PT/PTT, ↓ hematocrit
<b>HUS</b>	Stool is hemoccult positive, ↑ BUN/CR, peripheral smear with schistocytosis, helmet cells; clinically different from TTP because there is no change in mental status

What is the treatment for each of the following platelet disorders?

<b>TTP</b>	Plasmapheresis or intravenous immunoglobulin (IVIG) are first-line treatments. Splenectomy in refractory cases. Platelet transfusion is contraindicated because it just causes more consumption of platelets and more symptoms.
<b>ITP</b>	Corticosteroids are first-line treatment; second line is IVIG, splenectomy, or cyclophosphamide
<b>DIC</b>	Treat underlying cause. Platelet transfusion and fresh frozen plasma (FFP) can be given to stop bleeding as first line and aminocaproic acid as second line.

What is the most common genetic coagulopathy?

von Willebrand factor deficiency

**How is vWF deficiency inherited?**

Autosomal dominant pattern

**What are the signs and symptoms of vWF deficiency?**

Easy bruisability as well as mucosal and gastrointestinal (GI) bleeding

**How is vWF deficiency diagnosed?**

Normal PT/PTT, ↑ bleeding time, ↓ **factor VIII antigen**, normal platelet count, ↓ ristocetin platelet study

**What is the treatment for vWF deficiency**

Desmopressin (DDAVP) in mild cases; severe cases need factor VIII concentrate, cryoprecipitate for bleeding

**Name the hemophilia described below:**

<b>X-linked recessive</b>	Hemophilia A
<b>Autosomal recessive</b>	Hemophilia B
<b>Factor IX deficiency</b>	Hemophilia B
<b>Factor VIII deficiency</b>	Hemophilia A
<b>Christmas disease</b>	Hemophilia B

**What are the clinical signs and symptoms of the hemophilias?**

**Hemarthroses**; bleeding with minimal trauma, multiple ecchymosis

**How are the hemophilias diagnosed?**

↑ PTT, normal PT, normal **bleeding time**, normal vWF; factor VIII deficiency in hemophilia A and factor IX deficiency in hemophilia B

**What is the treatment for each of the hemophilias?**

Hemophilia A: factor VIII concentrate

Hemophilia B: factor IX concentrate

**What treatment can be given to a patient with hemophilia A prior to a surgical procedure?**

Desmopressin—It increases the production of endogenous factor VIII

## **LEUKEMIAS**

**What are the signs and symptoms of leukemia?**

Pallor, fatigue, anemia, infection, petechiae

**Name the type of leukemia described below:**

<b>Proliferation of immature blast cells</b>	Acute leukemias
<b>Proliferation of mature, differentiated cells</b>	Chronic leukemias
<b>Associated with benzene</b>	Acute myelogenous leukemia (AML)
<b>Most common leukemia in <i>children</i></b>	Acute lymphoblastic leukemia (ALL)
<b>Most common leukemia in <i>adulthood</i></b>	AML
<b>Bimodal distribution</b>	Acute leukemias
<b>90% have the Philadelphia chromosome t(9; 22)</b>	Chronic myelogenous leukemia (CML)
<b>30% have the Philadelphia chromosome t(9; 22)</b>	ALL
<b>Auer rods, Sudan black positive, myeloperoxidase positive</b>	AML
<b>Terminal deoxynucleotidyl transferase (TdT) positive</b>	ALL
<b>Blast crisis</b>	CML

**What is the peak age of ALL?**

Age 3-4 (most common cancer in children)

**What are the subtypes of ALL?**

L1, L2, L3

**What subtype is most common in children?**

80% are L1.

**Of the adult cases of ALL, what subtype is most common?**

L2

**What is the L3 subtype morphologically identical?**

Burkitt lymphoma

**How is ALL diagnosed?**

Peripheral blood smear with increased blast cells and TdT+, **periodic acid-Schiff positive (PAS+), CALLA+**

**What is the treatment plan for ALL?**

Induction with chemotherapy (4-5 drugs)

Consolidation

Maintenance—radiation or low-dose chemotherapy

**What is a poor prognostic factor in ALL?**

Presence of Philadelphia chromosome

**What is the treatment in patients who have the presence of the Philadelphia chromosome?**

Bone marrow transplant

**What is the prognosis of ALL in children?**

80% remission

**What is the prognosis in adults?**

30% remission

**What is the most common leukemia in adults?**

AML

**At what age does AML peak?**

Age 15-39

**What are the subtypes of AML?**

M1-M7

M1-M3 granulocyte differentiation

M4-M5 monocytic precursors

M6 erythroblasts

M7 megakaryocytes

**What hematologic disorder is the M3 subtype associated with?**

DIC

**How is AML diagnosed?**

Peripheral blood smear with increased blast cells. Myeloblasts are **myeloperoxidase+**, **Auer rod+**, **Sudan black**.

**What is the treatment for AML?**

Induction with daunorubicin and cytarabine; add all-trans retinoic acid for M3 subtype

Consolidation—continue chemotherapy Maintenance

**What is the prognosis in adults with AML?**

Those younger than age 60 have about a 70%-80% remission rate.

**What age group does chronic lymphocytic leukemia (CLL) affect?**

65 and older

**Which blood cell type does CLL mainly affect?**

B cells

**How is CLL usually diagnosed?**

Bone marrow infiltrated with lymphocytes, lymphocytes express **CD5 protein**, lymphocytosis on complete blood count (CBC)

**What is the progression of the disease?**

Very slow progression

**What is the treatment for CLL?**

Supportive therapy because early therapy does not prolong life. Later there are the COP and CHOP regimens. COP: cyclophosphamide, vincristine, prednisone/prednisolone; CHOP: COP plus doxorubicin.

**What age group does CML most commonly affect?**

40-60 years of age

**What carcinogenic agent might CML be associated with?**

Prior exposure to radiation

**What are the unique signs and symptoms of CML?**

Abdominal pain/fullness, anorexia, diaphoresis, bone pain

**What chromosomal abnormality is CML associated with?**

90% have the Philadelphia chromosome.

**What is the Philadelphia chromosome?**

Translocation of the *ABL* gene from chromosome 9 to *BCR* gene on chromosome 22

**How is CML diagnosed?**

90% have the Philadelphia chromosome; peripheral blood smear shows increased myeloblasts but less than 30%, basophils, and white blood cells. Low leukocyte alkaline phosphatase.

**What are the different phases of CML?**

1. Chronic phase: hepatosplenomegaly and increase in WBCs
2. Accelerated phase: platelet and RBC decrease while patient develops symptoms of night sweats, fever, bone pain, and weight loss
3. Blastic phase: acute phase of the disease; blood and marrow are rapidly filled with proliferating blast cells

**What is a blast crisis?**

Acute phase of the disease in which the blood and marrow are rapidly filled with proliferating blast cells; this takes about 3-4 years to develop and death is usually within 3-6 months.

**What is the treatment for CML?**

Bone marrow transplant is main treatment. Hydroxyurea and interferon alfa can reduce WBC count. Chemotherapy is for patient who cannot have bone marrow transplant.

**What is the prognosis after a bone marrow transplant in CML?**

About 60% of patients go into remission.

**What can CML progress to?**

AML

**Which type of leukemia has peripheral leukocytes with tartrate-resistant acid phosphatase and cytoplasmic projections?**

Hairy cell leukemia

**What is the treatment for hairy cell leukemia?**

Interferon alfa, splenectomy

**LYMPHOMA**

**Name the type of lymphoma (Hodgkin lymphoma vs non-Hodgkin lymphoma [NHL]) described below:**

<b>Bimodal distribution—peaks in the thirties and seventies, more common in women</b>	Hodgkin lymphoma
<b>Bimodal distribution, more common in men</b>	NHL
<b>Mediastinal lymphadenopathy, contiguous spread</b>	Hodgkin lymphoma
<b>B cells transform to become malignant</b>	Hodgkin lymphoma
<b>Mostly originate from B cells but could also involve T cells</b>	NHL
<b>Peripheral lymphadenopathy, noncontiguous spread</b>	NHL
<b>Associated with Epstein-Barr virus (EBV) infection</b>	NHL—Burkitt lymphoma
<b>Associated with HIV</b>	NHL
<b>Increased pruritus with alcohol consumption</b>	Hodgkin lymphoma
<b>Reed-Sternberg cells</b>	Hodgkin lymphoma
<b>Bone marrow with “starry sky” appearance</b>	NHL—Burkitt lymphoma

**What are the four subtypes of Hodgkin lymphoma?**

1. Nodular sclerosing
2. Lymphocyte predominating
3. Mixed cellularity
4. Lymphocyte depleted

**What is the most common type of Hodgkin lymphoma?**

Nodular sclerosing

**Which of the four subtypes of Hodgkin lymphoma has the worst prognosis?**

Lymphocyte depleted

**What clinical feature distinguishes Hodgkin lymphoma from NHL**

Adenopathy is regional rather than systemic.

**What are the symptoms of Hodgkin lymphoma and what are they called?**

“B” symptoms—fever, night sweats, malaise, weight loss

**How is Hodgkin lymphoma diagnosed?**

Lymph node biopsy will show Reed-Sternberg cells.

**What are the next steps to be taken after a biopsy determines a lymphoma is present?**

Chest x-ray (CXR) to see extent of involvement as well as possible bone marrow biopsy and computed tomographic (CT) scan

**What is the staging of Hodgkin lymphoma?**

Stage 1: one lymph node

Stage 2: two or more lymph nodes on the same side of the diaphragm

Stage 3: involvement on both sides of the diaphragm

Stage 4: dissemination to organs and tissues

**What is the treatment for Hodgkin lymphoma?**

Radiation therapy for localized disease (stages 1 and 2) and chemotherapy for more extensive disease (stages 3 and 4)

**What chemotherapy regimens are most commonly used?**

ABVD: adriamycin, bleomycin, vincristine, dacarbazine

MOPP: meclorothamine, oncovin, procarbazine, prednisone

**How are the different types of NHL characterized?**

Low, intermediate, and high grade

**Name the most common subtypes of NHL?**

Low grade: follicular small cleaved cell

Intermediate grade: diffuse large-cell lymphoma

High grade: lymphoblastic lymphoma

Burkitt lymphoma: American type and African type

**Name the subtype of NHL described below:**



**High-grade lymphoma more common in children**

Burkitt lymphoma

**Burkitt lymphoma with jaw involvement**

African Burkitt lymphoma

**Burkitt lymphoma with abdominal involvement**

American Burkitt

**Translocation involving *BCL2* gene**

Follicular small cleaved cell

**Can involve the GI tract as well as the head and neck**

Diffuse large cell lymphoma

**Can involve the central nervous system (CNS) and bone marrow**

Lymphoblastic lymphoma

**Derived from thymic T cells**

Lymphoblastic lymphoma

**How is NHL diagnosed?**

Biopsy of lymph node

**What are the next diagnostic studies to consider after the biopsy?**

CXR, CT scan, bone marrow biopsy to determine the extent of the disease

**What is the prognostic factor in NHL?**

Histologic subtype is a more prognostic factor than the extent of spread of disease.

**How is the adenopathy in NHL described?**

Painless adenopathy

**What is the treatment for NHL?**

Radiation and chemotherapy depending on subtype

## **MYELOPROLIFERATIVE DISEASES**

**What are myeloproliferative diseases?**

A number of diseases in which there is excessive production of differentiated myeloid cell lines

**What can the myeloproliferative diseases transform into?**

Acute leukemias

**What is polycythemia vera?**

A myeloproliferative disorder in which there is excess production of **ALL** blood cell lines but especially **red blood cells**

**What are the different etiologies of polycythemia vera?**

It can be a primary disorder which is idiopathic in nature or it can be secondary to hypoxia, dehydration, low erythropoietin production, and smoking.

**What is the peak of onset of polycythemia vera?**

Age >60

**In what sex is polycythemia vera most commonly seen?**

Males

**What are the signs and symptoms of polycythemia vera?**

Pruritis after showering due to basophilia, epistaxis, plethora, blurred vision, splenomegaly, gout, basophilia, headache, retinal hemorrhages, cerebrovascular accidents (CVA), gastric ulcers

**How is polycythemia vera diagnosed?**

On CBC excess of all blood cell lines especially red blood cells. Patient may have low erythropoietin and low erythrocyte sedimentation rate (ESR).

**What is the treatment for polycythemia vera?**

Serial phlebotomy to decrease the volume of blood; hydroxyurea to suppress excess blood cell production; aspirin to thin the blood

**What is a possible long-term complication that occurs in about 20% of patients with polycythemia vera?**

Fibrosis of the bone marrow

**What is essential thrombocytosis?**

Disease in which there is an idiopathic increase of platelets to  $>5 \times 10^5$  cells/ $\mu$ L

**What are the clinical signs and symptoms of essential thrombocytosis?**

Burning and throbbing hands and feet as well as splenomegaly; bleeding from nose and gums due to platelet dysfunction

**What are the main treatments for essential thrombocytosis?**

Platelet exchange, hydroxyurea, anagrelide

**What is idiopathic myelofibrosis?**

Disorder in which there is extensive extramedullary hematopoiesis causing replacement of marrow with fibrous connective tissue

**What is the pathognomonic sign of myelofibrosis?**

Peripheral smear shows **tear drop cells**.

**What is the treatment for myelofibrosis?**

The prognosis is poor and the treatment is mainly supportive.

**What is multiple myeloma?**

Malignant disease of plasma cells which produce **monoclonal immunoglobulins or light chains**

**What is the ratio of white to African Americans who have multiple myeloma?**

1:2

**What can be seen on an x-ray of a patient with multiple myeloma?**

**Lytic lesions** ("punched out" areas of bone)

**What are the signs and symptoms of multiple myeloma?**

Bone pain, pathologic fractures due to **lytic lesions**; anemia, hypercalcemia, renal failure

### **What is the triad that is often seen in multiple myeloma?**

1. Anemia
2. Back pain
3. Renal failure

### **How can multiple myeloma be diagnosed?**

24-hours urine collection followed by urine protein electrophoresis (UPEP) and serum protein electrophoresis (SPEP). These studies will demonstrate free kappa and lambda light chains known as **Bence Jones proteins**, and monoclonal elevation of one cell line. There will be an “M-spike” (or a peak) in the SPEP if there is whole antibody-made. There will be an “M-spike” in the UPEP if light chains only are made. To make the diagnosis there should be a spike in the SPEP or UPEP as well as one of the following: lytic lesions, Bence Jones proteinuria, or increased plasma cells in the bone marrow.

### **What is the treatment for multiple myeloma?**

Chemotherapy in addition to bisphosphonates and allopurinol as needed for hypercalcemia and elevated uric acid, respectively. Bone Marrow stem cell transplantation is available to some patients. Patients with spinal cord compression are given corticosteroids and/or radiation. Radiation can also be used to treat lesions that are symptomatic.

### **What is the most common type of plasma cell dyscrasia?**

Monoclonal gammopathy of undetermined significance (MGUS)

### **What is MGUS?**

Presence of monoclonal immunoglobulin or M-protein in serum or urine without evidence of any other lymphoproliferative disorder

### **What are the characteristics that distinguish MGUS from other lymphoproliferative diseases?**

Serum M-protein <3 g/dL; no lytic bone lesions, very little or no Bence Jones proteins in urine; bone marrow contains <10% plasma cells, no signs of end-organ damage; patients are asymptomatic

### **What condition can MGUS patients suddenly develop?**

Multiple myeloma

### **What is the treatment for MGUS?**

No treatment is necessary but patients should be followed to make sure they do not develop other lymphoproliferative disorders since these patients are at higher risk.

## **CLINICAL VIGNETTES**

**A 30-year-old male who is known to have atrophic gastritis is found to have anemia on a CBC. His MCV is 105. He also has an elevated methylmalonic acid level and elevated homocysteine level. His vitamin B<sub>12</sub> level is low. What is the most likely cause of his anemia?**

Pernicious anemia

**An asymptomatic 50-year-old female is found to have serum M-protein of 4 g/dL. On further examination she is found to have neither Bence Jones proteins on urinalysis nor any evidence of lytic bone lesions on radiographic imaging. Her renal function and liver function tests are within normal limits. What is the most likely diagnosis?**

MGUS (monoclonal gammopathy of undetermined significance)

**A 20-year-old female presents with a rash on her skin and gingival mucosa. On examination you find that she has petechiae. You also find that she has bruising in many parts of her body. On review of systems she states that she has felt very tired recently. A CBC demonstrated an elevated white blood cell count. A peripheral blood smear was done and showed blast cells as well as Auer rods. What is the diagnosis?**

Acute myelogenous leukemia

**A 28-year-old female with a past history of HIV is brought in by her brother. He states that she has been acting strangely recently. He states that she seems “confused” recently. He noted a fever as well as petechiae and purpura on her chest. On examination you find hemoglobin of 7 and platelet count of 50,000. Her creatinine is also significantly elevated. What diagnosis do you suspect?**

TTP

**A 63-year-old male who seems to have a “reddish” complexion presents to your office with complaints of headache and blurred vision. His past medical history is significant for diabetes, stroke, and gastric ulcer. On examination you find him to have a blood pressure of 160/95 and splenomegaly. A CBC demonstrates thrombocytosis. What is this patient’s condition called?**

Polycythemia vera



# CHAPTER 7

## Rheumatology

### ARTHROPATHIES

#### What is rheumatoid arthritis (RA)?

An autoimmune symmetric inflammatory arthritis

#### What HLA type is RA associated with?

HLA-DR4

#### In what sex is RA more common?

Females

#### What classical physical examination findings can be found in RA?

Boutonniere deformity; swan neck deformity; ulnar deviation; pain in the **proximal interphalangeal (PIP) and metacarpophalangeal (MCP) joints**; rheumatoid nodules

#### What are the seven diagnostic criteria for RA?

1. Morning stiffness >1 hour
2. Three or more joints with arthritis
3. One hand joint with arthritis
4. Symmetric arthritis
5. Rheumatoid nodules
6. Elevated serum rheumatoid factor (RF)
7. Radiographic evidence of erosive arthritis

#### How many of the criteria must be positive for a diagnosis of RA?

Four

#### How long does each of the criteria need to be present to make a diagnosis?

At least 6 weeks

#### What is a boutonniere deformity?

Hyperextension of distal interphalangeal (DIP) and flexion of PIP joints ([Fig 7-1](#))



**Figure 7-1** Boutonniere deformity. (Reproduced, with permission, from Wilson FC, Lin PP. General Orthopedics. New York: McGraw-Hill; 1997:413.)

**What is a swan neck deformity?**

Flexion of DIP and extension of PIP joints ([Fig 7-2](#))



**Figure 7-2** Swan neck deformity. (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB. Atlas of Emergency Medicine. New York: McGraw-Hill; 1997:291.)

**What laboratory findings could you expect in a patient with RA?**

↑ RF, ↑ erythrocyte sedimentation rate (ESR)

**What is the treatment for pain associated with RA?**

First-line: nonsteroidal anti-inflammatory drugs (NSAIDs) to decrease inflammation Second-line: corticosteroids

**What disease-modifying agents are available for patients with RA?**

Methotrexate, hydroxychloroquine, gold compounds

**What are some newer biologic agents used to treat RA?**

Infliximab, etanercept, abatacept, Rituxan

## What is the most common type of arthritis?

Osteoarthritis (OA)

## What is the main underlying cause of OA?

Degenerative changes of the joints

## What are the two classic physical examination findings in OA?

1. **Heberden nodules** which affect the DIP joints
2. **Bouchard nodes** which affect the PIP joints ([Fig 7-3](#))



**Figure 7-3** Bouchard nodes. (Reproduced, with permission, from Knoop KJ, Stack LB, Storrow AB. Atlas of Emergency Medicine. New York: McGraw-Hill; 1997:291.)

## How do the symptoms of OA differ from RA?

Morning stiffness resolves within 30 minutes; outer joints of the hand are mainly affected (DIP joints in addition to MCP and PIP joints).

## What are the x-ray findings seen in OA?

Narrowed joint spaces, **osteophyte formation**

## What is the treatment for OA?

NSAIDs to relieve pain; muscle-strengthening exercises; steroid joint injection; last resort is joint replacement

## What is gout?

Arthropathy caused by urate crystal deposit in a single joint

## What are the etiologies of gout?

Decreased uric acid excretion (high-protein diet, alcohol use, diuretic use) or increased uric acid production (genetic diseases, hemolysis, cancer)

## What are the signs and symptoms of gout?

Acute pain accompanied by redness and swelling of a joint

## What is the most common joint to be affected?



First metatarsophalangeal joint

**What is podagra?**

Inflammation of the first metatarsophalangeal joint of the foot which is of sudden onset

**What are tophi?**

Aggregates of gouty crystal and giant cells secondary to chronic gout

**What is the classic radiographic finding in advanced gout?**

“Rat-bite” appearance

**How is gout diagnosed?**

Fluid aspirated from the joint would reveal **needle-shaped** monosodium urate crystals with **negative birefringence** under polarized light

**How is acute gout treated?**

Colchicine and NSAIDs for pain

**What is used for maintenance therapy of gout?**

Allopurinol to prevent production; probenecid to increase excretion; low-protein diet; refrain from alcohol

**What is pseudogout?**

Deposition of calcium pyrophosphate crystals in joints, causing inflammation

**What are the risk factors for pseudogout?**

Advanced age; gout, hemochromatosis, extensive osteoarthritis, diabetes, hyperparathyroidism, hypothyroidism, hypomagnesemia, neuropathic joint

**What are the signs and symptoms of pseudogout?**

May present as an acute arthritis affecting one or multiple joints like gout, or it may present as a chronic polyarthritis similar to OA or RA

**What does joint fluid aspiration in pseudogout demonstrate?**

**Positively birefringent rhomboid crystals**

**What is the treatment for pseudogout?**

NSAIDs

**Name the autoimmune disorder which is characterized by sacroiliitis, with fusion of adjacent vertebral bodies.**

Ankylosing spondylitis

**What HLA type is ankylosing spondylitis associated with?**

HLA-B27

**What joint is always affected in ankylosing spondylitis?**

**Sacroiliac joint**

**What are the typical symptoms?**

Chronic lower back pain in young men lasting more than 1 hour and relieved with rest

**What is the classic x-ray finding seen with ankylosing spondylitis?**

**Bamboo spine** ([Fig 7-4](#))



**Figure 7-4** Bamboo spine. (Reproduced, with permission, from Wilson FC, Lin PP. General Orthopedics. New York: McGraw-Hill; 1997:454.)

**What other disorder is ankylosing spondylitis associated with?**

Ulcerative colitis

## **SYSTEMIC DISORDERS**

**What are the signs and symptoms of systemic lupus erythematosus (SLE)?**

Fatigue, malaise, malar rash, arthralgias, pericarditis, endocarditis, neurologic symptoms, polyarthritis

**What is the sex distribution of SLE?**

90% female predominance

**How is SLE distributed based on race?**

Black > white

**What is the mnemonic for diagnosing SLE?**

**DOPAMINE RASH:**

Discoid rash: raised, erythematous circular rash with scale

Oral ulcers

Photosensitivity

Arthritis > 2 joints

Malar rash: butterfly rash on cheeks

Immunologic criteria: anti-Sm Ab, anti-double-stranded DNA, false-positive venereal disease research laboratory (VDRL) test

Neurologic symptoms: seizures, psychosis

ESR elevated (not part of the 11 criteria)

Renal disease

Antinuclear antibody (ANA) positive

Serositis : pericarditis, pleurisy

Hematologic disorder: hemolytic anemia, leukopenia, thrombocytopenia, lymphopenia

**How many of the criteria must be present to make the diagnosis of SLE?**

Four or more

**What is the pathognomonic heart disorder seen in SLE patients?**

**Libman-Sacks endocarditis (LSE)**

**What autoantibody is most sensitive for SLE?**

ANA (it is not specific)

**Which autoantibody is most specific for SLE?**

Anti-double-stranded-DNA (very high titers are associated with renal involvement), anti-SM antibody

**What other autoantibodies are associated with SLE?**

Anti-La antibody

Anti-Ro antibody

**What are lupus anticoagulant and anticardiolipin associated with?**

Thrombosis, central nervous system (CNS) lupus, thrombocytopenia, valvular heart disease, fetal loss

**What serologies can be falsely positive in patients with SLE?**

Rapid plasma reagin (RPR)/VDRL

**Anticardiolipin can cause a falsely elevated result with which lab test?**

Elevated partial thromboplastin time (PTT), but in reality SLE patients are more likely to develop blood clots

**What are the treatments for SLE?**

Avoid sun exposure, NSAIDs for joint pain, systemic steroids, immunosuppressives such as cyclophosphamide in refractory cases with more advanced development of disease

**How is drug-induced lupus different from SLE?**

Symptoms resolve with discontinuation of the drug *and* **anti-histone antibody positive**

**What drugs are known to cause drug-induced SLE?**

**SIQ CHaMP:**

Sulfasalazine

Isoniazid (INH)

Quinidine

Chlorpromazine

Hydralazine

a

Methyldopa, minocycline

Procainamide, penicillamine

**What is the most common drug to cause lupus-like symptoms?**

**Procainamide**

**What autoimmune disorder is characterized by systemic fibrosis secondary to excess collagen and extracellular matrix production?**

Scleroderma

**What are the signs and symptoms of scleroderma?**

Tight, thick skin; Raynaud phenomenon; dysphagia; renal artery fibrosis; pulmonary hypertension secondary to fibrosis; telangiectasias

**What is a more limited form of scleroderma called?**

CREST syndrome

**What does CREST stand for?**

Calcinosis

Raynaud phenomenon

Esophageal dysmotility

Sclerodactyly

Telangiectasias

**What laboratory test is 80% sensitive for CREST syndrome?**

Anticentromere antibody

**What laboratory test is highly specific to scleroderma?**

Anti-Scl-70 antibody

**What is the treatment for scleroderma?**

**Remember the mnemonic CAPS:**

Calcium channel blocker

Ace inhibitor (captopril)

Penicillamine

Steroids

**What systemic disease is characterized by noncaseating granulomas in the lung?**

Sarcoidosis

**What race is more predisposed to sarcoidosis?**

African Americans

**What are some findings associated with sarcoidosis?**

**Remember the mnemonic GRUELING:**

Granulomas

RA

Uveitis

Erythema nodosum

Lymphadenopathy

Interstitial fibrosis

Negative TB test

Gamma-globulinemia

**What renal problem is associated with sarcoidosis?**

Nephrolithiasis because of hypercalciuria

**What is the most important component of diagnosing sarcoidosis?**

Transbronchial biopsy showing noncaseating granuloma

**What is seen on a chest x-ray (CXR) of a patient with sarcoidosis?**

Bilateral hilar adenopathy with perihilar calcifications

**What classic laboratory findings are seen in sarcoidosis?**

Hypercalcemia and ↑ angiotensin-converting enzyme (ACE)

**What is the main treatment for sarcoidosis?**

Symptomatic treatment and corticosteroids

**What autoimmune disorder is associated with the following triad: keratoconjunctivitis sicca, xerostomia, and arthritis?**

Sjögren syndrome

**What HLA type is Sjögren syndrome associated with?**

HLA-DR3

**What type of cancer are patients with Sjögren syndrome at high risk for?**

Non-Hodgkin lymphoma

**What autoantibodies is Sjögren syndrome associated with?**

Anti-single-stranded (SS)-A (Ro) and anti-SS-B (La)

**What is the treatment for Sjögren syndrome?**

Corticosteroids

**Name the syndrome associated with the following: conjunctivitis, uveitis, urethritis, and asymmetric arthritis.**

Reiter syndrome

**What is the mnemonic used to remember the associated findings of Reiter syndrome?**

“Can’t see. Can’t Pee. Can’t climb a tree.”

Can’t see: conjunctivitis, uveitis

Can’t pee: urethritis

Can’t climb a tree : arthritis

**What HLA type is Reiter syndrome associated with?**

HLA-B27

**What are the two forms of Reiter syndrome?**

1. Sexually transmitted
2. Postinfectious: *Campylobacter*, *Yersinia*, *Salmonella*, *Shigella*

**What will a urethral culture often grow out in a patient with Reiter syndrome?**

*Chlamydia trachomatis*

**What is the treatment for Reiter syndrome?**

Doxycycline to cover for *Chlamydia* and NSAIDs for pain

**What is the autoimmune syndrome associated with the following: aphthous ulcers, genital ulcers, arthritis, uveitis, psychiatric symptoms**

Behçet syndrome

## **MUSCLE DISORDERS**

**What is polymyositis?**

Autoimmune disease which causes proximal muscle weakness

**How is polymyositis different from dermatomyositis?**

Dermatomyositis includes rash as a symptom, whereas with polymyositis there is no rash.

**What sex is more likely to have polymyositis?**

Females are twice as likely

**What are the signs and symptoms of polymyositis?**

**Symmetric proximal muscle weakness**, dysphonia, and dysphagia; patients have difficulty standing up from a chair or brushing their hair

**What are the classic signs of dermatomyositis?**

Symmetric proximal muscle weakness, **heliotropic periorbital rash**, **shawl sign** (erythematous macules on shoulders and upper back), **Gottron papules** (violaceous papules on DIP joints)

**What autoantibody is associated with polymyositis and dermatomyositis?**

Anti-Jo-1

**What are the four criteria for polymyositis?**

1. ↑ Creatine phosphokinase (CPK)
2. Proximal muscle weakness
3. Low-amplitude potentials and fibrillations on electromyogram (EMG)
4. ↑ Muscle fiber size on muscle biopsy

**What is the treatment for polymyositis and dermatomyositis?**

Corticosteroids and methotrexate or cyclophosphamide in refractory cases

**What is myasthenia gravis?**

Autoimmune disease in which autoantibodies block the postsynaptic acetylcholine receptors preventing acetylcholine from binding leading to muscle weakness

**What are the two peak incidences of myasthenia gravis?**

Women: second to third decades of life Men: fifth to sixth decades of life

**What can myasthenia gravis be associated with?**

Thymomas or other autoimmune diseases

**What are the signs and symptoms of myasthenia gravis?**

Muscle weakness and increasing fatigue with use, proximal muscle weakness, ptosis, diplopia, dysphagia

**What is the “classic” test used to diagnose myasthenia gravis?**

Edrophonium test (Tensilon test)

**How does the test work?**

Edrophonium inhibits acetylcholinesterase allowing for higher levels of acetylcholine to be available to stimulate receptors and, therefore, if the patient has myasthenia gravis, edrophonium administration will lead to improved muscle strength.

**What are the newer diagnostic methods for myasthenia gravis?**

Single-fiber EMG; anti-acetylcholine receptor antibody test

**Myasthenia gravis is often associated with what other finding?**

Thymoma

**What blood test in the presence of myasthenia gravis is highly associated with the presence of a thymoma?**

Anti-striated muscle (SM) antibody—present in >80% of patients younger than 40 with thymoma

**What is the treatment for myasthenia gravis?**

Pyridostigmine and acetylcholinesterase inhibitor as well as steroids

**What is the pathology in Lambert-Eaton syndrome?**

There are autoantibodies to presynaptic calcium channels.

**How does Lambert-Eaton syndrome differ from myasthenia gravis?**

Increased muscle use improves symptoms making muscles stronger.

**VASCULITIS****Name the vasculitis associated with the following:**

<b>Small and medium vessel vasculitis with no pulmonary involvement that often presents abdominal pain and is associated with hepatitis B antigenemia and perinuclear antineutrophil cytoplasmic antibodies positive (p-ANCA +)</b>	Polyarteritis nodosa (PAN)
<b>Medium vessel arteritis with prominent pulmonary findings and associated with eosinophilia and asthma</b>	Churg-Strauss disease
<b>Granulomatous vasculitis mainly of the upper and lower respiratory tract that often presents with hemoptysis and can lead to glomerulonephritis</b>	Wegener granulomatosis
<b>Cytoplasmic antineutrophil cytoplasmic antibody (c-ANCA) positive</b>	Wegener granulomatosis
<b>Medium and large vessel arteritis that is most commonly seen in young Asian individuals</b>	Takayasu arteritis
<b>Arteritis that is characterized by loss of pulses in arms and carotids, Raynaud phenomenon, and signs of ischemia such as blindness</b>	Takayasu arteritis
<b>Also known as giant cell arteritis and affects the temporal artery</b>	Temporal arteritis

## CLINICAL VIGNETTES

**A 58-year-old male states that the previous evening he had sudden pain and swelling in the great toe of his right foot. Joint fluid aspiration demonstrates negatively birefringent needle-shaped crystals. What is the treatment for an acute attack?**

NSAIDs (Colchicine classically)

**A 22-year-old male presents with a history of low back pain for the past 6 months. He does not recall any trauma to that area. Rest does not seem to relieve the pain but exercise seems to be helpful. He has decreased range of motion in the lumbar spine. An x-ray demonstrates a “bamboo spine.” What is the diagnosis?**

Ankylosing spondylitis



**A 35-year-old female has photosensitivity, rash on her cheeks, arthritis, and oral ulcers. She also has a positive ANA. You suspect SLE. What serology may be falsely positive in this patient?**

RPR/VDRL

**A 48-year-old female presents with difficulty swallowing. You notice that her skin appears very shiny, thick, and tight. On review of systems, she mentions that the tips of her fingers become blue and painful in the cold. What laboratory test is specific for the diagnosis of her condition?**

Anti-scl-70 antibody to test for scleroderma

**An 83-year-old female complains of new-onset headaches. They are unilateral and often unrelieved with NSAIDs. She points to her right temple when asked to describe where the pain is. Her laboratory evaluation demonstrates a significantly elevated ESR. What test would you suggest next to make a diagnosis?**

Temporal artery biopsy to evaluate for temporal arteritis



# CHAPTER 8

## Nephrology

### ACUTE RENAL FAILURE

#### What is azotemia?

A high level of urea or other nitrogen-containing compounds in the blood usually secondary to renal failure

#### What is acute renal failure (ARF)?

Newly increased azotemia with an increase in blood urea nitrogen (BUN) and creatinine

#### What are the three categories of acute renal failure?

- Prerenal**
- Renal**
- Postrenal**

#### What causes prerenal ARF?

Low perfusion

#### What are examples of prerenal causes of ARF?

- Congestive heart failure (CHF)
- Volume loss
- Hypotension
- Sepsis
- Burns
- Low blood flow to the kidneys (renal artery stenosis [RAS])

#### What is the underlying cause of intrinsic ARF?

Injury to the nephron due to ischemia or toxins

#### What is the most common cause of intrinsic renal failure?

**Acute tubular necrosis (ATN)**

#### What are some other causes of intrinsic ARF?

- Acute interstitial nephritis (AIN)
- Glomerulonephritis (GN)
- Ischemia
- Vasculitis

#### What are some causes of postrenal acute renal failure?

- Obstruction caused by:
  - Kidney stones
  - Enlarged prostate (BPH)
  - Tumors such as bladder cancer (CA), cervical CA, prostate CA

#### What are some signs and symptoms of ARF secondary to uremia?

Asterixis, nausea, vomiting, anemia, pericarditis, pruritis, urea crystals on the skin (“uremic frost”), fatigue,

oliguria

**What are some signs and symptoms of ARF not secondary to uremia?**

- Metabolic acidosis
- Hyperkalemia → arrhythmias
- Fluid overload → pulmonary edema, CHF, hypertension
- Hyperphosphatemia
- Hypertension 2° excess renin secretion

**What defines oliguria?**

Urine output of <400 cc/24 h

**What tests would you initially order to evaluate for ARF?**

Urine/serum electrolytes; urine/serum BUN/creatinine (Cr); urinalysis including urine osmolality

**What is FE<sub>Na</sub>?**

FE<sub>Na</sub> stands for fractional sodium excretion and is the best diagnostic test to help discriminate between the different types of ARF.

**How is FE<sub>Na</sub> calculated?**

$$FE_{Na} = \frac{(\text{urine Na} / \text{plasma Na})}{(\text{urine creatinine} / \text{plasma creatinine})} \times 100\%$$

**How do you distinguish between prerenal, renal, and postrenal ARF?**

See [Table 8-1](#).

**Table 8-1** ARF: Laboratory Differences Between Prerenal, Renal, and Postrenal Etiologies

Study	Prerenal	Renal	Postrenal
FE <sub>Na</sub>	<1%	>2%	>4%
Urine Na	<20	>20	>40
BUN/Cr	>20	<15	>15
Urine osmolality	>500	<350	<350

**Name the type of ARF associated with the following urinary sediment findings:**

- Red cell casts** GN
- Urine eosinophils** AIN
- White blood cell (WBC) casts** AIN
- Granular casts** ATN

**What are the causes of ATN?**

There are two categories:

1. Ischemic: shock, trauma, hypoxia, hemorrhage, sepsis
2. Toxic: medications, rhabdomyolysis (which causes myoglobinuria), IV contrast

### **What medications classically cause ATN?**

Remember the mnemonic **CLAAP**:

**C**ontrast

**L**ithium

**A**minoglycosides

**A**mphotericin

**P**entamine

### **How is ATN treated?**

Remove insulting agent, IV fluids to maintain urine output, IV diuretic therapy to increase urinary output and prevent overload, protein-restricted diet, close monitoring of electrolytes; dialysis if needed

### **What are the causes of AIN?**

Inflammation of the renal parenchyma caused by:

1. Medications: diuretics, nonsteroidal anti-inflammatory drugs (NSAIDs), penicillin
2. Infection: cytomegalovirus (CMV), Epstein-Barr virus (EBV), toxoplasmosis, syphilis
3. Systemic diseases: Sjögren syndrome, sarcoidosis

### **Name the cause of ARF classically indicated by the following serologic tests:**

**Anti-neutrophil cytoplasmic antibodies + (ANCA +)**

**Wegener, polyarteritis nodosa, other vasculitis**

**Antiglomerular basement membrane antibody (anti-GBM)**

**Goodpasture syndrome**

### **How is AIN treated?**

Treatment is the same as ATN.

## **CHRONIC RENAL FAILURE**

### **What is chronic renal failure (CRF)?**

Progressive loss of nephrons

### **What is the most common cause of CRF?**

Diabetes

### **What is uremia?**

Clinical manifestations of elevated levels of urea in the blood usually secondary to renal failure

### **What characterizes uremic syndrome?**

Uremic syndrome is chronic renal failure that has effects on multiple organs and systems.

Cardiovascular: hypertension, pericarditis

Pulmonary: pleural effusions, pulmonary edema

Central nervous system (CNS): asterixis, clonus

Hematology: anemia because of low erythropoietin; increased bleeding time due to platelet dysfunction

Gastrointestinal (GI): nausea; vomiting

Metabolic: acidosis, electrolyte imbalances (especially hyperkalemia), hypocalcemia (lack of vitamin D), azotemia

### **What can be used to measure the severity of CRF?**

Glomerular filtration rate (GFR); the lower the GFR the worse the renal function

### **How is GFR estimated?**

Creatinine clearance is approximately equal to GFR.

### **How is creatinine clearance calculated?**

Urine creatinine × urine volume in millimeter/serum creatinine × time in minutes

$$\frac{(140 - \text{age}) \times (\text{weight in kg}) (\text{for females} \times 0.85)}{\text{serum creatinine} \times 72}$$

Estimated creatinine clearance =

### **In CRF, there is decreased synthesis of what two entities?**

1. Vitamin D
2. Erythropoietin

### **What electrolyte abnormalities are seen in CRF?**

Hyperkalemia  
Hypocalcemia  
Hyperphosphatemia

### **What is the treatment for chronic renal failure?**

Dialysis: either hemodialysis or peritoneal dialysis

### **How should medications prescribed to patients in CRF be adjusted?**

They should be renally dosed.

### **What are the indications for dialysis?**

Remember the mnemonic **AEIOU**:

**A**cidosis  
**E**lectrolyte abnormalities  
**I**ngestion of toxins  
**O**verload of fluid  
**U**remic symptoms

### **How is vascular access achieved in a hemodialysis patient?**

There are three possible types of access:

1. Arteriovenous (AV) fistula: A shunt between an artery and a vein usually placed in the forearm. Healing may take up to 4 months before it can be used, but once it is healed it may be used for several years.
2. Arteriovenous graft: Often used in patients with small veins that won't properly turn into a fistula. It is a shunt between an artery and a vein using plastic tubing.
3. Catheter: Not permanent. Used until the AV fistula or graft is healed and ready for use.

### **How is peritoneal dialysis achieved?**

Patient gets a permanent catheter in the peritoneum and the peritoneum is used as a membrane through which dialysis is achieved. Dialysis fluid is infused rapidly, then allowed to stay in the peritoneal cavity for several hours, then drained and new fluid infused.

**What kind of infection are patients on peritoneal dialysis classically at risk for?**

Bacterial peritonitis

**How is bacterial peritonitis treated?**

Intraperitoneal vancomycin or antibiotics based on culture sensitivity

## **GLOMERULONEPHROPATHIES**

**What is nephrotic syndrome?**

Nephrotic syndrome is glomerular damage leading to **proteinuria (>3.5 g/day)**

**What are other defining features of nephrotic syndrome?**

Hypoalbuminemia, generalized edema, hyperlipidemia, hypercoagulable state (because of loss of protein C and S), immunocompromised state

**What is nephritic syndrome?**

Glomerular disease leading to syndrome of hematuria, edema, and often hypertension (HTN)

**How can urinary cholesterol be identified?**

If urine is seen under polarized light, there will be “maltese crosses.”

**What are some causes of nephrotic syndrome?**

Minimal change disease (MCD)

Focal segmental glomerulosclerosis

Membranous glomerulonephritis

Membranoproliferative glomerulonephritis

**What are the other names for minimal change disease?**

Nil disease, lipoid nephrosis

**Name the nephrotic syndrome associated with each of the following:**

**Loss of epithelial foot processes seen under electron microscopy**

Minimal change disease

**Idiopathic etiology**

Minimal change disease

**Most common primary cause of nephrotic syndrome in adults**

Membranous glomerulonephritis

**Most common primary cause of nephrotic syndrome in children**

Minimal change disease

**Two forms, Type I is slowly progressive and Type II has autoantibodies against C3 and is more rapidly progressive**

Membranoproliferative glomerulonephritis

**Associated with refractory HTN**

Focal segmental glomerulosclerosis

**Frequently recurs**

Minimal change disease

**Granular deposits of IgG and C3**

Membranous glomerulonephritis

**Often seen in children**

Minimal change disease

**Presents in young, black men with refractory hypertension**

Focal segmental glomerulosclerosis

**Associated with HIV, IV drug abuse, sickle cell anemia**

Focal segmental glomerulosclerosis

**"Spike and dome" on histology due to excess basement membrane**

Membranous glomerulonephritis

**Slowly progressive disease with minimal response to corticosteroid therapy**

Membranous glomerulonephritis

**Does not progress to chronic renal failure**

Minimal change disease

**Associated with hepatitis, systemic lupus erythematosus (SLE), syphilis, malaria, penicillamine, gold salts, CA**

Membranous glomerulonephritis

**What is the main treatment for each of the following?**



**Minimal change disease**

Corticosteroids

**Focal segmental glomerulosclerosis**

Corticosteroid with cyclophosphamide (prognosis is poor)

**Membranous glomerulonephritis**

Corticosteroids, can add cyclophosphamide in refractory cases

**Membranoproliferative glomerulonephritis**

Corticosteroids. Plasmapheresis can be added.

**Name the systemic diseases that can lead to nephritic syndrome.**

SLE, sickle cell anemia, HIV, diabetes, multiple myeloma

**What is nephritic syndrome?**

Glomerulonephropathy also known as glomerulonephritis in which there is acute-onset hematuria, azotemia, hypertension, edema, and mild proteinuria

**What is classically seen on microscopy in nephritic syndrome?**

Red blood cell (RBC) casts

**Name the five types of glomerulonephritis.**

1. Poststreptococcal glomerulonephritis (PSGN)
2. Rapidly progressive glomerulonephritis
3. Mesangial proliferative glomerulonephritis
4. Membranoproliferative glomerulonephritis
5. IgA nephropathy

**Name the nephritic syndrome associated with the following:**

<b>Follows group A beta-hemolytic <i>Streptococcus</i> or another infectious agent</b>	PSGN
<b>Henoch-Schönlein purpura</b>	IgA nephropathy
<b>Self-limiting disease</b>	PSGN, Henoch-Schönlein purpura
<b>Also known as crescentic glomerulonephritis</b>	Rapidly progressive glomerulonephritis
<b>Goodpasture disease</b>	Rapidly progressive glomerulonephritis
<b>Often diagnosed with elevated ASO titer</b>	PSGN
<b>Buerger disease</b>	IgA nephropathy
<b>Coarse, granular IgG or C3 deposits</b>	PSGN
<b>Smooth, linear IgG deposits</b>	Rapidly progressive glomerulonephritis
<b>Anti-GBM antibody disease</b>	Rapidly progressive glomerulonephritis

**What is the most common glomerulonephropathy?**

Buerger disease

**What is Goodpasture disease?**

Glomerulonephritis with pneumonitis

**When is the peak incidence of Goodpasture disease?**

Males in the second decade of life

**What is the most common presenting symptom of Goodpasture disease?**

Hemoptysis

## URINARY TRACT

**What is nephrolithiasis?**

Kidney stones

**What are the classic signs and symptoms of nephrolithiasis?**

Back pain or flank pain that radiates to groin, nausea, vomiting, microscopic vs gross hematuria

**What is the most common type of kidney stone?**

Calcium pyrophosphate

**What is the underlying etiology?**

Hypercalciuria

**What is the treatment for calcium pyrophosphate stones?**

Hydration and thiazide diuretics; lithotripsy if stone is too large to pass

**What is the second most common type of kidney stone?**

Ammonium magnesium phosphate

**What is another name for ammonium magnesium phosphate stones?**

Struvite stones

**What are the underlying bacterial etiologies of ammonium magnesium phosphate stones?**

*Proteus, Pseudomonas, Providencia, or Staphylococcus saprophyticus*

**How are struvite stones treated?**

Treat the underlying infection and lower the urinary pH

**Which type of stone is radiolucent?**

Uric acid stones

**What disorders are often an underlying cause of uric acid stones?**

Gout or myeloproliferative disease

**How are uric acid stones treated?**

Raise urinary pH

**Which type of stone is radiopaque?**

Calcium pyrophosphate and ammonium magnesium phosphate

**How is nephrolithiasis diagnosed?**

Plain films can identify radiopaque stones. Renal ultrasound (US) can visualize hydronephrosis; IV pyelogram is another option. Noncontrast helical computed tomography (CT) scan can visualize small stones and is the gold standard for diagnosis.

**What is the most common pathogen in urinary tract infections (UTIs)?**

*Escherichia coli*

**What is the mnemonic for common pathogens causing UTIs?**

**KEEPS:**

*Klebsiella*

*E coli*

*Enterobacter*

*Proteus*

*S saprophyticus*

**What are the signs and symptoms of UTI?**

Urinary urgency, frequency; burning with urination; hematuria; sense of incomplete bladder emptying

**How is a UTI diagnosed?**

Urinalysis can demonstrate a high number of WBCs, positive leukocyte esterase, positive nitrites, and moderate to large number of bacteria.

**What is the indication of a contaminated urinalysis?**

Many epithelial cells or many types of bacteria present

**Other than urinalysis, what test should be ordered in a patient suspected to have a UTI?**

Urine culture, Gram stain, and sensitivity

**What is the first-line treatment for UTI?**

3-day course of trimethoprim-sulfamethoxazole (TMP-SMX); however, in areas of high resistance to TMP-SMX, fluoroquinolones, typically ciprofloxacin, have become first line

**In what type of patient should fluoroquinolones be avoided?**

Pregnant patients

**What would you suspect in a patient with urinary frequency, burning on urination, costovertebral angle tenderness as well as fever and chills?**

Pyelonephritis

**What is the treatment for pyelonephritis?**

po or IV antibiotics

## ACID-BASE DISORDERS

**What are the normal lab values for each of the following components of an arterial blood gas (ABG)?**

<b>pH</b>	7.35-7.45
<b>PaCO<sub>2</sub></b>	35-45
<b>PaO<sub>2</sub></b>	80-100
<b>HCO<sub>3</sub></b>	21-27
<b>O<sub>2</sub> saturation</b>	95-100
<b>Base excess</b>	-2 to +2

**How is anion gap calculated and what is a normal range?**

$Na - (Cl + HCO_3)$ . Normal range is 9-14.

**What is the definition of metabolic acidosis?**

↓ pH with ↓ HCO<sub>3</sub>

**What is Winter's formula?**

It determines if there was appropriate compensation in the setting of metabolic acidosis:  $1.5 \times (HCO_3^-) + 8 \pm 2 = P_{CO_2}$ .

**What are the causes of anion gap metabolic acidosis?**

Remember the mnemonic **MUD PILES**:

**M**ethanol, **M**etformin

**U**remia

**D**KA (diabetic ketoacidosis)

**P**araldehyde

**I**NH (isoniazid), iron tablets

**L**actic acidosis

Ethanol  
Salicylates

**How is the etiology of the metabolic acidosis determined?**

Check for ketonuria.

**Which of the etiologies are present with and without ketonuria?**

See [Table 8-2](#).

**Table 8-2** Anion Gap Metabolic Acidosis Etiologies

<b>Ketonuria Present</b>	<b>Ketonuria Absent</b>
DKA	Lactic acidosis
Paraldehyde ingestion	Methanol
Isopropyl alcohol ingestion	Ethylene glycol
Starvation	Salicylate poisoning

**What are the causes of normal anion gap metabolic acidosis?**

Renal tubular acidosis, diarrhea, colostomy, ileostomy, ingestion of magnesium sulfate, calcium chloride, acetazolamide, hyperparathyroidism

**What is the treatment for metabolic acidosis?**

Correct the underlying cause.

**What is the definition of respiratory acidosis?**

Hypoventilation causing  $P_{aCO_2}$  and  $\downarrow$  pH

**What is the treatment for respiratory acidosis?**

Treat the underlying cause and mechanical hyperventilation can help to release some  $CO_2$ .

**What is the definition of metabolic alkalosis?**

$\uparrow$  pH,  $\uparrow$  plasma bicarbonate, and compensatory  $\uparrow$   $PaCO_2$

**What are the underlying causes of metabolic acidosis?**

Vomiting, diarrhea, nasogastric (NG) tube suction for prolonged period, diuretic use, hypomagnesemia, hypokalemia, licorice, tobacco use, Cushing syndrome, RAS

**What is the treatment for metabolic acidosis?**

Treat the underlying cause. These patients are usually volume-depleted so rehydration is needed. Replete potassium and magnesium as needed.

**What is the definition of respiratory alkalosis?**

Hyperventilation causing  $\uparrow$  arterial pH,  $\downarrow$   $P_{CO_2}$ ,  $\downarrow$  serum bicarbonate

**What is the treatment of respiratory alkalosis?**

Decrease the rate of breathing.

# RENAL ARTERY STENOSIS

## What are the classic findings in renal artery stenosis (RAS)?

Hypertension that is poorly controlled despite multiple medications, often with hypokalemia

## What are the underlying causes of RAS?

Atherosclerosis or fibromuscular dysplasia

## What is the more common cause of RAS in females?

Fibromuscular dysplasia

## What is in the differential diagnosis when a patient has the classic finding of hypertension with hypokalemia?

Conn hyperaldosteronism vs secondary hyperaldosteronism due to renal artery stenosis

## How is RAS diagnosed?

Imaging via renal arteriogram, magnetic resonance angiography, or Doppler ultrasonography

## How is RAS treated?

Angioplasty and in some cases surgery

# CLINICAL VIGNETTES

**Your patient is hospitalized for abdominal pain. During the workup a CT of the abdomen and pelvis is done with contrast. His initial labs showed a slightly elevated WBC count, but otherwise his electrolytes, BUN, creatinine, glucose, AST, ALT, amylase, and lipase were all within normal limits. The following morning, you check the labs and find that the creatinine has suddenly risen dramatically. You check a urinalysis and find that there are granular casts. What class of acute renal failure do you suspect?**

Acute tubular necrosis

**A 48-year-old male with a past medical history of hypertension and hyperlipidemia rushes to your office. He just had hematuria and he is very concerned. He has also had a very bad sore throat in the last few days. An ASO titer is elevated. What is the most likely reason for this person's hematuria?**

Poststreptococcal glomerulonephritis

**A 31-year-old female patient comes for follow-up on her hypertension. Despite three different medications, her blood pressure is 148/92. She states that she is very frustrated. She has been trying so hard to follow her low sodium diet, she has been exercising and taking her medications religiously but despite all that her blood pressure is still high. She is also hypokalemic. You suspect renal artery stenosis. What test could be used to definitively diagnose this condition?**

Renal angiography

**In the patient described in the previous vignette, you find through testing that she does indeed have renal artery stenosis. What is the most likely underlying cause in this particular patient?**

Fibromuscular dysplasia

**Your patient develops acute renal failure. In your workup you check some labs and calculate a  $FE_{Na}$  of 0.5%; urine sodium of 15; urine osmolality above 500. What category of ARF etiologies would you place**

**this patient in?**

Prerenal cause





# CHAPTER 9

## Endocrinology

### DIABETES

#### What is the pathophysiology of type 1 diabetes?

Insulin deficiency due to autoinflammatory destruction of pancreatic B cells

#### What is the pathophysiology of type 2 diabetes?

Insulin resistance and relative insulin deficiency

#### What is the age of onset of type 1 and type 2 diabetes?

Type 1 usually begins in childhood/adolescence and type 2 usually begins in adulthood.

#### Which of the two types of diabetes has a stronger genetic factor?

**Type 2 diabetes** (seems counterintuitive)

#### What are the early symptoms of diabetes?

“The three polys”: polyuria, polydipsia, and polyphagia; **and** weight loss

#### What are chronic complications of diabetes?

Retinopathy, nephropathy, neuropathy, cerebrovascular disease, coronary artery disease (CAD), peripheral vascular disease

#### What type of fatal fungal infection can diabetics get?

*Mucor*, especially **sinusitis** (Note: They love to ask this on the boards!)

#### What is the histologic description of *Mucor*?

Nonseptate hyphae with branching at 90° (looks like the letter M)

#### What are the diagnostic criteria for diabetes?

Both types of diabetes are diagnosed based on the same criteria.

Fasting glucose over 126 two separate times

Random glucose over 200 with symptoms of diabetes

*Or*

Glucose tolerance test (2-hour test with 75-g glucose load) over 200

#### What is the treatment for type 1 diabetes?

Insulin replacement. Since these individuals do not have insulin, hypoglycemics will not work.

For each of the following types of insulin, describe the peak and duration of action:

- Lispro (Humalog)
- NPH
- Glargine (Lantus)
- Lente
- Levemir
- Regular insulin
- Ultralente
- Aspart (NovoLog)

Rapid Acting	Peak	Duration
Lispro	30-90 min	3-5 h
Aspart	40-50 min	3-5h
Short Acting		
Regular	2-5 h	5-8 h
Intermediate Acting		
NPH	4-12 h	18-24 h
Lente	3-10 h	18-24 h
Long Acting		
Lantus	No peak	20-24 h
Levemir	6-8 h	Up to 24 h
Ultralente	10-20 h	20-36 h

Define each of the following complications of insulin treatment:

**Somogyi effect**

Nocturnal hypoglycemia causing elevated morning glucose due to release of counterregulatory hormones; treat with less insulin

**Dawn phenomenon**

Early morning hyperglycemia secondary to nocturnal growth hormone (GH) release

**What is the first-line treatment for type 2 diabetes?**

Metformin

**In what patients would metformin be absolutely contraindicated?**

In patients who have compromised kidney function because of concern for lactic acidosis

**How do we believe metformin works?**

Increases sensitivity to insulin

**Give an example of each of the following classes of hypoglycemic agents, how they work, and major side effects:**

## **Sulfonylureas**

Examples: glipizide, glyburide

(Note: **Start** with GL or end with IDE.)

How they work: increased insulin secretion by B cells

Side effects: hypoglycemia and teratogenic (except glyburide)

## **Thiazolidinediones**

Examples: rosiglitazone (Avandia), pioglitazone (Actose) (end with glitazone).

How they work: increases sensitivity to insulin.

(Note: The **zone** for sensitivity to insulin is increased.)

Side effects: Hepatitis—patients on this class of drugs should have liver enzymes monitored for first year that they are on the drug. Exacerbation of CHF—contraindicated in class III and IV CHF.

### **When is it most appropriate to treat a type 2 diabetic with insulin?**

Refractory to oral hypoglycemic agents

### **What medication slows the progression of nephropathy in diabetes?**

Angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs)

### **Other than medication, what other therapy is important in diabetes?**

Nutrition education

### **What is HgA1c?**

Blood marker of glucose control over the last 3 months. HgA1c <7 is ideal.

### **What preventative measures are recommended to minimize diabetic complications?**

Lipid control (low-density lipoprotein [LDL] <70, TG <150).

BP control <130/80.

HgA1c <7.

Annual foot examinations.

Check for microalbuminuria and proteinuria.

Annual fundoscopic examination.

### **What is the appropriate treatment in a diabetic patient with microalbuminuria?**

ACE inhibitor or ARB

### **What is the major complication of type 1 diabetes?**

Diabetic ketoacidosis (DKA)

### **What are the signs and symptoms of DKA?**

Severe hyperglycemia (glucose often >500), ketoacidosis, hyperkalemia, fruity breath, slow deep breaths, abdominal pain, dehydration, lethargy

**What are slow deep breaths in DKA called?**

**Kussmaul hyperpnea**

**What is the most important treatment in DKA?**

**Intravenous (IV) fluid hydration** (usually with normal saline)

**What are the other treatments in DKA?**

Insulin drip. Add potassium if potassium is low or normal **and** add glucose when blood sugar reaches 250 because insulin needs to be continued to be given despite normal glucose until ketones are no longer present.

**What are the most severe complications of DKA treatment?**

Cerebral edema or cardiac arrest due to hyperkalemia

**What is the major complication of type 2 diabetes?**

Hyperosmolar hyperglycemic nonketotic (HHNK) coma; although on rare occasions type 2 diabetics can also go into DKA

**What are some of the signs and symptoms of HHNK?**

Hypovolemia, hyperglycemia (glucose can be >1000), **no ketoacidosis**, renal failure, altered mental status, seizure, disseminated intravascular coagulation (DIC); often precipitated by acute stress such as trauma or infection.

The difference between HHNK and DKA is that in HHNK there is no ketoacidosis.

**What is the treatment for HHNK?**

The mortality is >50%; as a consequence, immediate treatment is urgent.

Treatment includes rapid IV fluid resuscitation; insulin and potassium are usually needed earlier than in DKA because the intracellular shift of plasma potassium during therapy is accelerated in the absence of acidosis.

## **PITUITARY**

**What hormones are secreted from the anterior pituitary?**

Follicle-stimulating hormone (FSH), luteinizing hormone (LH), adrenocorticotrophic hormone (ACTH), thyroid-stimulating hormone (TSH), prolactin, GH

(Note: **FAST P:G**)

**What hormones are secreted from the posterior pituitary?**

Vasopressin (antidiuretic hormone), oxytocin

**What is the action of each of the following hormones?**

<b>FSH</b>	Spermatogenesis in males, ovarian follicle growth in females
<b>LH</b>	Testosterone secretion in males and ovulation in females
<b>ACTH</b>	Stimulates adrenal cortex to make cortisol, aldosterone, and sex hormones
<b>TSH</b>	T3 and T4 production as well as thyroid gland maturation
<b>Prolactin</b>	Milk production (lactation)
<b>GH</b>	Insulin-like growth factor secretion causing protein and fat metabolism
<b>Antidiuretic hormone (ADH), vasopressin</b>	Production of concentrated urine by sodium and water retention
<b>Oxytocin</b>	Uterine contractions, milk letdown

**What is the most common type of pituitary tumor?**

Prolactinoma

**What type of tumor is a prolactinoma?**

A pituitary adenoma which secretes prolactin

**What are the two mechanisms by which a prolactinoma causes symptoms?**

1. Endocrine effect: due to hyperprolactinemia
2. Mass effect: pressure of the tumor on surrounding tissues

**What are some signs and symptoms of a prolactinoma?**

Headache, diplopia, hypogonadism, amenorrhea, gynecomastia, galactorrhea, hypopituitarism

**What cranial nerve (CN) can be affected by a prolactinoma?**

CN III

**How is a prolactinoma diagnosed?**

Magnetic resonance imaging (MRI)/computed tomography (CT)

**What is the first-line treatment for a prolactinoma?**

Dopamine agonist such as bromocriptine

**What are other treatment options?**

Surgical resection or radiation therapy if tumor is very large or refractory to medical treatment

**Other than a prolactinoma, what are other causes of hypopituitarism?**

Sheehan syndrome (postpartum pituitary necrosis), hemochromatosis, neurosyphilis, tuberculosis (TB), surgical destruction of pituitary

**What disorder is seen with elevated levels of GH?**

## Acromegaly

### **What is the most likely underlying cause of acromegaly?**

Pituitary adenoma secreting GH

### **When must there be an elevation in GH in order for acromegaly to result?**

Elevated levels of GH must be present after epiphyseal closure.

### **What results if there is excess GH secretion before epiphyseal closure?**

Gigantism

### **What are the signs and symptoms of acromegaly?**

Coarse facial features, large hands and feet, large jaw, deepening of voice, decreased peripheral vision due to compression of optic chiasm, hyperhidrosis

### **How is acromegaly diagnosed?**

1. MRI/CT demonstrating pituitary tumor,
2. Nonsuppressibility of GH after an oral glucose challenge
3. Elevated IGF-1 (insulin-like growth factor)

### **What are the treatment options for acromegaly?**

Surgery or radiation of pituitary tumor, or medical treatment with octreotide or somatostatin, which blocks GH or dopamine agonists

### **What malignancy are patients with acromegaly at increased risk for?**

Colon cancer

## **THYROID**

### **What is hyperthyroidism?**

Increased secretion of thyroid hormones

### **In what sex is hyperthyroidism more common?**

Ten times more common in women than men

### **What is the most common cause of hyperthyroidism?**

Graves disease (80%-90% of US cases)

### **What are some other causes of hyperthyroidism?**

Plummer disease; toxic multinodular goiter; subacute thyroiditis; amiodarone therapy

### **What are some of the signs and symptoms of hyperthyroidism?**

**Heat intolerance, weight loss, exophthalmos, tachycardia, anxiety, palpitations, atrial fibrillation, tremor, sweating, fatigue, weakness, diarrhea, increased reflex amplitude**

### **What is Graves disease?**

Autoimmune disease causing hyperthyroidism. It is due to antibody stimulation of TSH receptors causing excess secretion of free thyroid hormone.

### **What are the two symptoms only seen in Graves disease?**

1. Pretibial myxedema

## 2. Infiltrative ophthalmopathy (exophthalmos)

### What is pretibial myxedema?

Pruritic, nonpitting edema found on shins that usually remits spontaneously

### What is infiltrative ophthalmopathy?

Exophthalmos that may not resolve despite treatment of Graves disease most likely due to autoimmune damage in extraocular muscles

### How is Graves disease diagnosed?

All hyperthyroidism is diagnosed via measurement of TSH, free T4, and free T3. In Graves disease, since there is excess stimulation of the thyroid gland causing increased production of thyroid hormone, laboratory tests show high levels of free T4 and free T3, and low levels of TSH (because of negative feedback) ([Table 9-1](#)). Also, a radioactive iodine uptake scan should be done. If uptake is low, then thyroiditis or medication-induced hyperthyroidism is considered.

**Table 9-1** Thyroid Function Evaluation

<b>Hyperthyroid</b>	<b>TSH</b>	<b>Free T4</b>	<b>TRH</b>
Graves disease	↓	↑	↑
Pituitary tumor	↑	↑	↓
Plummer disease	↓	↑	↑
<b>Hypothyroid</b>			
Primary	↑	↓	↑
Secondary	↓ or normal	↓	↑
Tertiary	↓ or normal	↓	↓
Hashimoto	↑	↓	↑ or normal

TRH, thyrotropin-releasing hormone.

### What is another name for toxic multinodular goiter?

Plummer disease

### What is the underlying cause of hyperthyroidism in Plummer disease?

Multiple thyroid nodules develop autonomous T4 secretion and, therefore, more T4 is released.

### How is Plummer disease diagnosed?

Radioactive iodine uptake tests show “hot” nodules with the rest of the gland being “cold”; also, clinically, nodules can sometimes be felt.

**What is another name for subacute thyroiditis?**

de Quervain thyroiditis

**What are the signs and symptoms of subacute thyroiditis?**

Prodrome of viral upper respiratory infection (URI) followed by rapid onset of thyroid swelling and **tenderness** as well as hyperthyroid symptoms that can later turn into a hypothyroid state

**What is the treatment for de Quervain thyroiditis?**

Usually self-limiting, but aspirin and corticosteroids may be indicated to control inflammation.

**What are the treatment options for a hyperthyroid state?**

1. Medication: propylthiouracil (PTU) or methimazole
2. Radioactive iodine ablation
3. Surgery: subtotal thyroidectomy

**What is the first-line treatment for Graves disease?**

Radioactive iodine ablation except in children and pregnant women

**What is radioactive iodine ablation?**

Radioactive iodine is concentrated in the gland and destroys tissue.

**What are the possible side effects of radioactive iodine ablation?**

Hypothyroidism; thyrotoxic crisis secondary to the release of thyroid hormone into the blood stream

**What is the mechanism by which PTU works?**

It inhibits the peripheral conversion of T4 to T3, decreases iodine uptake, and decreases T4 synthesis.

**Do patients need to be on therapy for the rest of their lives?**

No. After a 1-2 year course of treatment about 50% no longer need to be treated.

**What are the potential side effects of PTU?**

Leukopenia, rash, nausea

**What other adjunctive treatment is given to patients with hyperthyroidism?**

Beta-blocker, usually propranolol, to control symptoms

**What is the most serious complication of hyperthyroidism?**

Thyroid storm

**What can induce thyroid storm?**

Infection, surgery, trauma, abrupt stop of antithyroid medication, serious acute medical problems such as cerebrovascular accident (CVA) or myocardial infarction (MI)

**What are the signs and symptoms of thyroid storm?**

Exaggerated symptoms of hyperthyroidism are tachycardia, high output **congestive heart failure (CHF)**, abdominal pain, hyperpyrexia >104, altered mental status (ultimately coma)

**What is the mortality rate of thyroid storm?**

Up to 50%

**What is the initial treatment for thyroid storm?**

It is an emergency, so think of the ABCs:  
Airway stabilization



Breathing/oxygen administration

Circulation (check pulse/blood pressure [BP]) and start IV fluids

### **After primary stabilization of the patient, what is the medical management of thyroid storm?**

The goal of therapy is to decrease circulating thyroid hormone and treat the patient's symptoms.

1. Prevent hormone synthesis: methimazole or PTU
2. Prevent hormone release: cold iodine (about 2 hours after PTU to prevent worsening symptoms)
3. Prevent conversion of T4 to T3: glucocorticoids and beta-blockers
4. Symptomatic treatment: beta-blockers and Tylenol (for fever)

### **What are the signs and symptoms of hypothyroidism?**

Cold intolerance, fatigue, lethargy, weakness, **constipation**, **weight gain**, arthralgias, hoarse voice, skin is dry, coarse, and with nonpitting edema, loss of outer third of eyebrows, delayed relaxation phase of deep tendon reflexes

### **What is primary hypothyroidism?**

Thyroid gland dysfunction

### **What are some examples of primary hypothyroidism?**

Hashimoto thyroiditis, thyroid ablation or neck radiation therapy in the past, subacute thyroiditis, iodine excess or deficiency, medication-induced

### **What medication can cause hypothyroidism?**

Lithium

### **What is the most sensitive lab test for primary hypothyroidism?**

Elevated TSH

### **What other lab results are present in primary hypothyroidism?**

Low T3 and T4

### **What is Hashimoto thyroiditis?**

**Painless** chronic autoimmune thyroid inflammation of autoimmune etiology

### **What lab results can help diagnose Hashimoto thyroiditis?**

Elevated antithyroglobulin and antimicrosomal antibody titers

### **What is subacute thyroiditis?**

**Tender**, enlarged thyroid; often postviral infection can begin with hyperthyroid symptoms, then hypothyroid symptoms

### **How can you distinguish Hashimoto from subacute thyroiditis?**

On clinical examination, in Hashimoto the thyroid gland is **not** tender to palpation but in subacute thyroiditis it is **tender** to palpation.

### **How can Graves disease and Hashimoto thyroiditis be distinguished?**

Radioactive iodine uptake is **increased** with Graves and **decreased** with Hashimoto.

### **What is secondary hypothyroidism?**

Hypothyroidism caused by pituitary dysfunction

### **What are some examples of secondary hypothyroidism?**

Sheehan syndrome, pituitary neoplasm, TB

**What is Sheehan syndrome?**

Postpartum pituitary necrosis

**What lab results indicate a secondary hypothyroidism?**

Low to normal TSH as well as **normal thyrotropin-releasing enzyme (TRH)**, low levels of T3 and T4

**What is tertiary hypothyroidism?**

Deficiency of TRH

**What is an example of tertiary hypothyroidism?**

Hypothalamic radiation

**Other than TSH, TRH, T3, T4, what other abnormal lab tests may be found in a hypothyroid patient?**

Elevated serum cholesterol (TG, LDL, total cholesterol); elevated aspartate aminotransferase (AST) and alanine aminotransferase (ALT); anemia; hyponatremia

**What is the treatment for hypothyroidism?**

Levothyroxine

**What is subclinical hypothyroidism?**

Elevated TSH levels but with normal thyroid hormone levels and with no clinical symptoms

**What is the life-threatening complication of hypothyroidism called?**

Myxedema coma

**What are the signs and symptoms of myxedema coma?**

Severe lethargy or coma, hypothermia, areflexia, bradycardia

**What causes myxedema coma?**

Prolonged cold exposure, infection, sedatives, narcotics, trauma, or surgery

**What is the treatment for myxedema coma?**

This is an emergency, so start with ABCs (airway, breathing, circulation); IV fluids, steroids, levothyroxine, treat any precipitating causes

**What is the initial appropriate workup of a thyroid mass?**

Fine-needle biopsy and TSH

**What other studies are done to workup a thyroid mass?**

Thyroid ultrasound to determine the number and sizes of masses; and thyroid technetium 99m scan

**What is a hot nodule and a cold nodule on a thyroid scan?**

Hot nodule indicates a hyperactive nodule and is **less** likely to be malignant. A cold nodule indicates a hypoactive nodule that is **more** likely to be malignant.

**What is the most common type of thyroid cancer?**

Papillary cancer

**What is the prognosis for papillary cancer?**

85%, 5-year survival

**What is seen on pathology?**

**Psammoma** bodies, Orphan Annie nucleus

**Which type of thyroid carcinoma is associated with multiple endocrine neoplasia types 2 and 3 (MEN 2 and 3)?**

Medullary cancer

**What can be used to monitor medullary carcinoma?**

Calcitonin, because it is a calcitonin-secreting tumor

**Which type of thyroid carcinoma has the worst prognosis?**

Anaplastic cancer

**In what patient population is anaplastic carcinoma usually found?**

Older patients

**What is the 5-year prognosis for anaplastic carcinoma?**

5%-14% survival at 5 years

**Which thyroid cancer has the second worst prognosis?**

Medullary cancer

**Which thyroid carcinoma often has metastasis to the bone and lungs?**

Follicular cancer

**Name the tumors that are part of each of the MEN syndromes.**

1. MEN 1: Wermer syndrome: three Ps: **prolactinoma, parathyroid, pancreatoma**
2. MEN 2: Sipple syndrome: **pheochromocytoma, medullary thyroid, parathyroid**
3. MEN 3: same as MEN 2B: **pheochromocytoma, medullary thyroid, mucocutaneous neuromas**

## **PARATHYROID**

**What is primary hyperparathyroidism?**

Increased secretion of parathyroid hormone (PTH)

**What is the most common cause of primary hyperparathyroidism?**

Adenoma is the most common cause; however, other etiologies include hyperplasia, carcinoma, MEN 2 or 3.

**What does elevated PTH cause?**

There is an ultimate increase in serum calcium (**hypercalcemia**) because PTH leads to increased vitamin D hydroxylation and, therefore, increased calcium resorption as well as decreased resorption of phosphate (**hypophosphatemia**). Calcium levels are also increased because of increased osteoclastic activity (**osteoporosis**).

**What are the signs and symptoms of hyperparathyroidism?**

Same as those for hypercalcemia: “**Stones, moans, groans, and psychiatric overtones.**” Because of the osteoclastic activity it can also lead to osteoporosis.

**What EKG finding could you expect with hyperparathyroidism?**

Shortened QT, because of hypercalcemia

**How is hyperparathyroidism diagnosed?**

Hypercalcemia, hypophosphatemia, hypercalciuria, and PTH level

**What other differential diagnoses should be considered with hypercalcemia?**

Neoplasm, sarcoidosis, thiazide diuretic treatment, Paget disease, vitamin D intoxication, milk alkali syndrome, myeloma

**What is the acute medical treatment for hyperparathyroidism?**

Asymptomatic patients with calcium levels below 13 should just be watched. However, symptomatic patients or those with higher calcium levels should be treated with furosemide and bisphosphonates to decrease bone resorption and prevent osteoporosis. Calcitonin can be used as well.

**What long-term treatment must be considered in hyperparathyroidism?**

Surgical treatment. Adenomas should be removed. In hyperplasia, all four parathyroids are removed and a small piece is placed usually near the sternocleidomastoid for functionality.

**What are the most common complications of parathyroidectomy?**

Hoarseness because of damage of the recurrent laryngeal nerve and hypocalcemia

**What is secondary hyperparathyroidism?**

Increased PTH secretion secondary to chronic renal failure or vitamin D deficiency

**What is hypoparathyroidism?**

Decreased PTH

**What are the causes of hypoparathyroidism?**

Idiopathic, DiGeorge syndrome, hypomagnesemia, secondary to surgery or neck irradiation

**Why does hypomagnesemia lead to hypoparathyroidism?**

Because magnesium is necessary for the parathyroid to secrete PTH.

**In what conditions is low magnesium seen?**

Syndrome of inappropriate secretion of antidiuretic hormone (SIADH), pancreatitis, alcoholism

**How is hypoparathyroidism diagnosed?**

Hypocalcemia, hyperphosphatemia, low PTH

**What are the signs and symptoms of hypoparathyroidism?**

Same as that for hypocalcemia: perioral paresthesias, tetany, seizures, Trousseau sign, Chvostek sign, anxiety

**What EKG findings could you expect in hypoparathyroidism?**

Prolonged QT interval because of the hypocalcemia

**What is Trousseau sign?**

Carpal spasm with arterial occlusion with BP cuff

**What is Chvostek sign?**

Spasm of the facial nerve upon tapping

**How is hypoparathyroidism treated?**

Emergently treat with IV calcium, then treat with vitamin D and oral calcium for maintenance treatment.

**ADRENALS**

**What are the two main parts of the adrenal gland and what is the secretory product of each part?**

1. Adrenal cortex
2. Adrenal medulla

The cortex secretes aldosterone, cortisol, and sex hormones and the medulla secretes the catecholamines including epinephrine and norepinephrine.

**What is the function of aldosterone?**

Kidney resorption of sodium and secretion of potassium and hydrogen ions

**What is Addison disease?**

Primary adrenal insufficiency caused by the destruction of the adrenal cortex leading to a deficiency in both mineralocorticoids as well as glucocorticoids

**What is secondary adrenal insufficiency?**

Decreased secretion of ACTH by the pituitary gland; the adrenal gland is functional

**What is the cause of tertiary adrenal insufficiency?**

Decreased hypothalamic function

**What is the most likely etiology of Addison disease in the United States?**

Autoimmune destruction of the adrenal gland

**What are some other causes of Addison disease?**

TB, amyloidosis, sarcoidosis, HIV, adrenal hemorrhage secondary to DIC or trauma, Waterhouse-Friderichsen syndrome, congenital adrenal hyperplasia, metastasis to the adrenals

**What is Waterhouse-Friderichsen syndrome?**

Endotoxin-mediated adrenal hemorrhage usually caused by meningococemia that leads to fulminant adrenal failure

**What is the most likely cause of secondary adrenal insufficiency?**

Hypothalamic-pituitary axis disturbance, usually by sudden cessation of exogenous corticosteroids, which leads to decreased ACTH secretion

**What are some other causes of secondary adrenal insufficiency?**

Pituitary infarction, Sheehan syndrome, pituitary adenoma

**What are some signs and symptoms of Addison disease?**

Because of low aldosterone and cortisol there are hyponatremia, hyperkalemia, pica (craving for salt), weakness, anorexia, hypotension, nausea, vomiting, and hyperpigmentation.

**What is the test used to diagnose adrenal insufficiency?**

**Hyperpigmentation**, ↑ACTH, ↓cortisol and aldosterone response to ACTH challenge

**Why do patients get hyperpigmentation?**

**ACTH stimulates melanin secretion.**

**What are the diagnostic findings in primary adrenal insufficiency?**

ACTH (Cortrosyn) test in which a dose of ACTH is given to the patient and then serum cortisol levels as well as serum ACTH levels are measured about half an hour later

Primary adrenal insufficiency: ↑**cortisol** levels in response to ACTH and ↑**aldosterone** levels

Secondary adrenal insufficiency: ↑**cortisol** levels (more than double normal limits) in response to ACTH and **normal aldosterone** levels

**How is the diagnosis of secondary adrenal insufficiency distinguished from primary adrenal insufficiency?**

No hyperpigmentation, ↑cortisol response, ↑ACTH

**What kind of metabolic disturbance is seen in primary adrenal insufficiency?**

Metabolic acidosis due to aldosterone and cortisol deficiency and, therefore, lack of secretion of hydrogen ions

**What is the treatment for adrenal insufficiency?**

Glucocorticoid replacement. Extra glucocorticoids should be given in times of physical stress such as infection. You should instruct patients to taper off this extra replacement slowly as to prevent an adrenal crisis.

**What is Cushing syndrome?**

A term used to describe the symptoms caused by hypercortisolism

**How is Cushing syndrome different from Cushing disease?**

Cushing disease refers to a type of Cushing syndrome caused specifically by ACTH hypersecretion by the pituitary.

**What are the different causes of hypercortisolism?**

Exogenous glucocorticoids Pituitary hypersecretion of ACTH Hypersecretion of cortisol due to adrenal hyperplasia/neoplasm Ectopic ACTH production such as with small cell lung carcinoma

**What is the most common cause of Cushing syndrome?**

Exogenous corticosteroids

**What is the most common cause of endogenous hypercortisolism?**

Cushing disease (pituitary hypersecretion of ACTH)

**What are the signs and symptoms of Cushing syndrome?**

**Buffalo hump**, moon facies, truncal obesity, striae, virilization/menstrual disorders, hyperglycemia, hypertension, hypokalemia, immune suppression, osteoporosis, hirsutism, acne

**What tests are used to diagnose hypercortisolism?**

24-hour urine-free cortisol and the dexamethasone suppression tests, ACTH level, diurnal cortisol variation

**What is the dexamethasone suppression test?**

First a low dose of dexamethasone is given and cortisol is measured. If cortisol is not elevated then Cushing is ruled out; if it is elevated then a high-dose dexamethasone suppression test is done and ACTH is measured. If ACTH is decreased then the pituitary has good feedback and, therefore, it must be an adrenal etiology. However, if the ACTH is high or normal then it is probably ectopic ACTH; and if it is only partially suppressed, then the pituitary is the etiology. Dexamethasone → ↑ACTH (ectopic/pituitary) ↓ACTH (adrenal)

**What are some other studies to consider to localize the lesion in hypercortisolism?**

A CT scan can look for an adrenal mass and an MRI can look for a pituitary mass.

**What is the treatment for hypercortisolism?**

Treat the underlying cause. If it is a resectable tumor, tumor resection with postoperative glucocorticoids. In nonresectable tumors, medical therapy with ketoconazole, mitotane, metyrapone, or aminoglutethimide. If the etiology is exogenous glucocorticoids; taper off the glucocorticoids and eventually stop.

**What is Conn syndrome?**

Primary hyperaldosteronism

**What is the etiology of Conn syndrome?**

Either hyperplasia of the zona glomerulosa or aldosterone-producing adenoma

**What are the signs and symptoms of Conn syndrome?**

**Hypertension**, muscle cramps, palpitations, polyuria, polydipsia, hypokalemia

**What percent of hypertensive patients have Conn syndrome?**

1%-2%

**What are some of the laboratory findings in Conn syndrome?**

↑Na, ↑Cl, ↓K (muscle cramps, palpitations), ↓renin-angiotensin feedback, metabolic alkalosis

**What are some ways to diagnose Conn syndrome?**

**Captopril stimulation test; fludrocortisone suppression test; sodium loading**

**What is the captopril stimulation test?**

Captopril (an ACE inhibitor) is administered and then serum renin and aldosterone levels are measured. ↑aldosterone and ↓ **renin** confirm the diagnosis.

**What is the fludrocortisone suppression test?**

Fludrocortisone, a synthetic corticosteroid, is administered to the patient. Serum aldosterone levels are then measured. In a normal patient it would be expected that aldosterone levels would be suppressed but not in a patient with Conn syndrome.

**What is the sodium loading test?**

The patient is loaded with sodium via IV saline and then urinary aldosterone levels are tested. No decrease in urinary aldosterone confirms diagnosis.

**What is the renin level in Conn syndrome?**

**Low renin**

**What other study can help in the diagnosis of Conn syndrome?**

CT demonstrating an adrenal nodule or hyperplasia

**What is the treatment for Conn syndrome?**

Adrenal adenoma: resection of tumor; unilateral adrenal hyperplasia: unilateral adrenalectomy; bilateral adrenal hyperplasia: spironolactone (potassium-sparing diuretic) or ACE inhibitor to control blood pressure

**What is secondary hyperaldosteronism?**

Elevated aldosterone levels due to elevated renin levels secondary to renal ischemia in CHF, renal artery stenosis, shock, renal tumor.

**How is secondary hyperaldosteronism diagnosed?**

↓**Renin**

**What can be measured to differentiate primary from secondary hyperaldosteronism?**

**Renin** (this is very important)

**What is the treatment for secondary hyperaldosteronism?**

Treat the hypertension with a potassium-sparing diuretic, a beta-blocker, and treat the underlying cause.

### **What is a pheochromocytoma?**

Tumor of the adrenal **medulla** that produces excess **catecholamines**

### **What percentage of people with hypertension have a pheochromocytoma?**

0.5%

### **What are the possible etiologies for a pheochromocytoma?**

MEN 2 or 3, von Hippel-Lindau disease, Recklinghausen disease, neurofibromatosis

### **What are the five Ps of pheochromocytoma?**

- 1. Pain (headache)**
- 2. Pressure**
- 3. Perspiration**
- 4. Palpitation**
- 5. Pallor** and hypertension

### **What is the most common sign of a pheochromocytoma?**

**Hypertension**

### **What is the diagnostic test for a pheochromocytoma?**

Urine screen for elevated **VMA** (vanillylmandelic acid), a urine catecholamine; as well as elevated urine and serum epinephrine and norepinephrine levels

### **What other test can be done to localize a pheochromocytoma?**

A CT scan can identify a **suprarenal mass** (adrenal mass).

### **What are some other laboratory findings in a pheochromocytoma?**

Hyperglycemia, polycythemia

### **What is the “rule of 10s” for a pheochromocytoma?**

- 10% malignant
- 10% bilateral
- 10% extrarenal
- 10% familial
- 10% in kids
- 10% multiple tumors
- 10% calcified

### **What must be ruled out in a patient with a pheochromocytoma?**

MEN type 2 or 3 or

### **What is the treatment for a pheochromocytoma?**

In operative cases preoperative alpha-blockers and beta-blockers, then surgical resection; in inoperable cases **phenoxybenzamine** or **phentolamine**

### **Why treat with preoperative alpha-blockers and beta-blockers?**

To prevent unopposed vasoconstriction, and thus volume depletion

## **BONES**

### **What is osteoporosis?**



Reduction in bone mass leading to increased risk of fracture

**What are the risk factors for osteoporosis?**

Female, postmenopausal or low estrogen state, hypercortisolism, hyperthyroidism, calcium deficiency, low physical activity, smoking

**What are the typical fractures that occur in osteoporosis?**

Hip, vertebrae, and Colle fractures

**How is osteoporosis diagnosed?**

Dual-energy x-ray absorptiometry (DEXA) scan which shows low bone density or an incidental fracture in the elderly

**What are the treatments for osteoporosis?**

Bisphosphonates, calcitonin, selective estrogen receptor modulators, calcium

**How much calcium should be taken daily?**

1500 mg daily with vitamin D

**What is the calcitonin most useful for?**

Treating bone pain; however, it cannot be used chronically because the effects wear off

**What are some examples of selective estrogen modulators?**

Tamoxifen, raloxifene

**What do the selective estrogen modulators increase the risk for?**

Thromboembolism

**What is osteomalacia?**

Vitamin D deficiency in adults

**What is osteomalacia called in children?**

Rickets

**What are the signs and symptoms in children?**

**Pigeon breast, craniotables** (thin skull bones), **rachitic rosary** (costochondral thickening)

**How is osteomalacia diagnosed?**

Low levels of vitamin D as well as diffuse osteopenia on x-ray

**How is osteomalacia treated?**

Vitamin D supplementation

**What is Paget disease of the bone?**

Localized hyperactivity of the bone which leads to disordered bone matrix being replaced with soft, enlarged bone

**What is the etiology of Paget?**

Unknown, but some think it may be viral

**What are the signs and symptoms of Paget disease of the bone?**

**Hearing loss** (impingement of cranial nerve [CN] VIII), multiple fractures, bone pain, high-output cardiac failure, **increased hat size**

**What is the typical finding on x-ray?**

Hyperlucent area surrounded by hyperdense border-sclerotic lesions

**How is Paget diagnosed?**

Elevated alkaline phosphatase, sclerotic lesions on bone scans/x-rays

**What are the complications associated with Paget disease of the bone?**

Pathologic fractures, high-output cardiac failure, hearing loss, kidney stones, sarcoma, spinal cord compression

**What is the treatment for Paget disease?**

Most patients do not need treatment; however, patients with complications associated with Paget disease are treated with bisphosphonates as first line and calcitonin as second line.

**CLINICAL VIGNETTES**

**You diagnose a patient with type 2 diabetes. You check a urine microalbumin and find that it is elevated. With what class of medication would you treat this patient?**

ACE inhibitor

**A 24-year-old male comes to your office complaining of terrible headaches over the past several months. His only past medical history is GERD. He has no past surgical history. The only family history is prostate cancer in his grandfather, otherwise the rest of his family is healthy. On review of systems, he complains of chest palpitations and says that he sweats a lot. His vitals demonstrate a BP of 173/98. On examination you notice that he appears somewhat pale. His cardiovascular, pulmonary, and abdominal examinations are unremarkable. His electrolytes are within normal limits. You suspect a secondary cause of hypertension. What specific diagnostic test would help you screen for your suspected diagnosis?**

Urine VMA to screen for pheochromocytoma

**Your patient has weight loss, heat intolerance, and palpitations. She complains of swelling and tenderness of her neck. She just got over a head cold. What is the suspected diagnosis?**

Subacute thyroiditis

**Your diet-controlled diabetic patient presents for a follow-up. The only medication he currently takes is lisinopril. His vitals are as follows: BP: 125/70; P: 73; RR: 15; Temp: afebrile. You review his most recent laboratory tests with him. His HgA1c is 6.8. His urinalysis shows no protein. The lipid profile demonstrates LDL : 110, HDL: 45, TG: 100. His most recent fundoscopic examination was 4 months ago and was normal. You do a foot examination and that is normal. What medication change do you suggest?**

Add a statin to bring the LDL down below 100.

**A 34-year-old male with hypertension presents to your clinic trying to seek your advice regarding his recent weight gain He has gained 20 lb over the course of the last 3 months but denies any change in his diet. He appears to have quite a bit of abdominal girth as well as noticeable striae on his abdomen. His face is also noticeably round and with significant acne. What do you suspect is this patient's condition?**

Cushing syndrome



# CHAPTER 10

## Infectious Disease

### HIV/AIDS

#### What is HIV (human immunodeficiency virus)?

A retrovirus that destroys CD4 cells

#### How is HIV transmitted?

Sexual contact, blood products, mother to child in HIV positive mothers, needle stick injury

#### How is acquired immunodeficiency syndrome (AIDS) defined?

CD4 count  $<200$  or evidence of an AIDS defining condition or T-helper cell  $<200/\mu\text{L}$  of blood or 14% of all lymphocytes

#### Describe the life cycle of HIV?

gp120 bind CD4 molecule  $\rightarrow$  gp41 molecule helps HIV to fuse with host cell  $\rightarrow$  HIV RNA released into host cell  $\rightarrow$  reverse transcriptase converts viral RNA into DNA  $\rightarrow$  viral DNA translocates into nucleus and viral DNA fuses with host DNA  $\rightarrow$  host cell transcribes the integrated DNA  $\rightarrow$  mRNA is translated into HIV polypeptides which are cleaved by viral proteases  $\rightarrow$  new virus particles assemble to create a new virus cell

#### How is an HIV infection diagnosed?

A positive enzyme-linked immunosorbent assay (ELISA) for HIV is then confirmed with a Western blot assay

#### How is HIV ruled out?

A negative ELISA for HIV

#### What marker is used to follow the *extent* of disease?

CD4 count

#### What can be used as a marker of disease *progression*?

Viral load (it will tell how well the treatment is working)

#### What are the signs and symptoms of acute HIV?

Flu-like symptoms that can later subside

#### Name the complications associated with each of the following CD4 counts:

>500	Multiple episodes of vaginal candidiasis; lymphadenopathy
<400	Pneumonia, pulmonary TB, oral candidiasis, shingles, Kaposi, non-Hodgkin lymphoma
<200	<i>Pneumocystis carinii</i> pneumonia (PCP), wasting, dementia
<100	<i>Cryptococcus</i> or toxoplasmosis infections
<50	<i>Mycobacterium avium</i> complex (MAC), central nervous system (CNS) lymphoma, cytomegalovirus (CMV), cryptosporidiosis

**When should antiretroviral therapy be initiated?**

At CD4 counts <350

**What is the antiretroviral therapy called?**

Highly active antiretroviral therapy (HAART)

**What does HAART therapy usually include?**

Two nucleoside analogues and a protease inhibitor

**Name the medical management that should be initiated for each of the following CD4 counts:**

CD4 <200	Start prophylaxis against PCP pneumonia and toxoplasmosis with bactrim
CD4 <100	Start prophylaxis against MAC with clarithromycin or azithromycin
CD4 <50	Start prophylaxis against fungal infections with fluconazole

**Name the AIDS-related opportunistic infection/complication associated with the following:**

<b>Presents as nonproductive cough</b>	PCP pneumonia
<b>Vascular nodules on the skin</b>	Kaposi sarcoma
<b>Most common cause of AIDS death in the United States</b>	Disseminated MAC
<b>Most common fungal infections in HIV</b>	Candidiasis
<b>Most common cause of meningitis in AIDS</b>	<i>Cryptococcus</i>
<b>Presents as painless progressive vision loss</b>	CMV retinitis
<b>Painful vesicular eruptions</b>	Shingles
<b>Human herpes virus (HHV)-6, 8</b>	Kaposi sarcoma
<b>Bilateral interstitial infiltrates on chest x-ray (CXR)</b>	PCP pneumonia
<b>Ring enhancing lesion on head computed tomography (CT)</b>	Toxoplasmosis, CMV, CNS lymphoma
<b>Perivascular hemorrhages and exudates on fundoscopic examination</b>	CMV
<b>Elevated alkaline phosphatase</b>	MAC

**What is the treatment for each of the following opportunistic infections?**

<b>PCP</b>	Bactrim + glucocorticoids
<b>Toxoplasmosis</b>	Pyrimethamine + sulfadiazine
<b>MAC</b>	Clarithromycin + ethambutol
<b><i>Cryptococcus</i></b>	Amphotericin B + fluconazole
<b>CMV</b>	Ganciclovir, foscarnet
<b>Shingles</b>	Acyclovir
<b>Esophageal candidiasis</b>	Fluconazole, ketoconazole
<b>Herpes simplex virus (HSV)</b>	Acyclovir, foscarnet

**SEXUALLY TRANSMITTED DISEASES**

**Which sexually transmitted disease (STD) is caused by the spirochete *Treponema pallidum*?**

Syphilis

**Name the stage of syphilis associated with the following:**

<b>Painless chancre (ulcer) near the area of contact that often heals spontaneously</b>	Primary syphilis
<b>Fever, malaise, lymphadenopathy, maculopapular rash on soles and palms, condylomata lata</b>	Secondary syphilis (1-2 months after infection)
<b>Positive serology but asymptomatic and &lt;1 year of infection</b>	Early latent
<b>&gt;1 year of infection with possibly positive serology</b>	Late latent
<b>Gummas, tabes dorsalis, Argyll Robertson pupil, aortitis, aortic regurgitation, aortic root aneurysm</b>	Tertiary syphilis

**What are gummas?**

Rubbery granulomatous lesions in CNS, aorta, heart, skin, bone

**What is tabes dorsalis?**

Posterior column degeneration

**How is syphilis diagnosed?**

Four possible tests:

1. Venereal disease research laboratory (VDRL)/rapid plasma reagin (RPR)-rapid test, however nonspecific blood test (eg, can be falsely positive in systemic lupus erythematosus [SLE]).
2. Dark-field microscopy would show motile spirochetes.
3. EIA (enzyme immunoassay): tests for antitreponemal IgG; can be used to screen for syphilis.
4. FTA-ABS/MHA-TP (fluorescent treponemal antibody/microhemagglutination assay—*T pallidum*): sensitive and specific; it remains positive for life.

**What is the treatment for syphilis?**

Penicillin; doxycycline or tetracycline can be given to penicillin-allergic patients (but not for CNS disease)

**Which STD often coexists with gonorrhea?**

*Chlamydia*

**How can *Chlamydia* present?**

Asymptomatic, cervicitis, urethritis, salpingitis or pelvic inflammatory disease (PID)

**What are the signs and symptoms of *Chlamydia* infection with PID?**

Mucopurulent discharge with adnexal pain

**What is Fitz-Hugh-Curtis syndrome?**

Complication of gonorrhea or *Chlamydia* in which there is perihepatic inflammation and fibrosis

**What is lymphogranuloma venereum?**

Systemic disease caused by the *Chlamydia* L serotype causing painful inguinal lymphadenopathy called buboes

**What is the treatment for *Chlamydia* infection?**

Doxycycline or azithromycin

**What sexually transmitted disease is caused by a gram-negative diplococcus?**

Gonorrhea

**What is a major complication of gonorrhea?**

PID

**On what type of medium is gonorrhea diagnosed?**

Thayer-Martin

**How is gonorrhea treated?**

Third-generation cephalosporin with concomitant treatment of *Chlamydia*

**How is PID diagnosed?**

Cervical motion tenderness plus at least one of the following: positive Gram stain; fever; elevated WBCs, tuboovarian abscess; pus on culdocentesis

**What is the most common cause of vaginitis?**

Bacterial vaginosis caused by *Gardnerella*

**What are the signs and symptoms of vaginitis?**

Vaginal itching, burning, bad odor, discharge, and dyspareunia

**What is the classic odor associated with bacterial vaginosis?**

Fishy odor = **positive Whiff test** with KOH prep

**How is bacterial vaginosis diagnosed?**

Clue cells (epithelial cells coated with bacteria) on wet mount

**How is bacterial vaginosis treated?**

Metronidazole

**Which type of vaginitis is caused by a flagellated, motile protozoan?**

*Trichomonas*

**How is *Trichomonas* diagnosed?**

The protozoa are seen on wet mount.

**What are the classic symptoms of *Trichomonas* infection?**

Fishy odor of discharge and **strawberry cervix**

**How is *Trichomonas* treated?**

Patient and partner are treated with metronidazole.

**Which type of vaginitis is associated with a cheesy white discharge?**



*Candida* (also known as yeast infection)

**How is candidiasis diagnosed?**

Pseudohyphae on KOH prep

**How is a *Candida* infection treated?**

Nystatin cream or oral fluconazole (Diflucan)

**Which types of human papillomavirus (HPV) are associated with cervical cancer?**

16, 18, 31, 45, 51, 52, 53

**What are the two vaccines approved to protect against cervical cancer?**

1. Gardasil
2. Cervarix

**Who should get the vaccine?**

Females aged 12-26

**Which of the two vaccines is also protective against genital warts?**

Gardasil

**When should a female start getting Pap smears?**

Age 21 or 3 years after first sexual activity, whichever comes first

**How often should a Pap smear be done?**

If a patient has had three normal consecutive Pap smears, they can get them every 3 years after age 30.

**SEPSIS**

**What is sepsis?**

An infection that causes systemic inflammatory response syndrome (SIRS)

**What is SIRS?**

Includes the following:

1. Tachycardia
2. Tachypnea
3. Fever
4. WBC count >12,000, <4000, or >10% bands

**What is septic shock?**

Sepsis-induced hypotension

**What type of bacteria causes shock secondary to exotoxin-induced fluid loss?**

Gram-positive bacteria

**What type of bacteria causes shock secondary to endotoxin-induced vasodilatation?**

Gram-negative bacteria

**What are some of the signs and symptoms of sepsis?**

Fever, hypotension, tachycardia, tachypnea, disseminated intravascular coagulation (DIC), increased cardiac output

### **What is the treatment of sepsis?**

Intravenous (IV) fluids, antibiotics to treat infection, vasopressors, remove potential sources of infection such as Foley catheter, sometimes steroids

## **OSTEOMYELITIS**

### **What is osteomyelitis?**

Bone infection

### **What are the two main routes of bone infection?**

1. Direct spread from soft tissue infection
2. Hematogenous seeding

### **What types of patients are predisposed to getting osteomyelitis by direct spread?**

Diabetics, people with peripheral vascular disease, deep soft tissue injuries

### **What is the most common organism causing osteomyelitis?**

*Staphylococcus aureus*

### **What is the most common cause of osteomyelitis in a patient with sickle cell anemia?**

*Salmonella*

### **What are the two most common causes of osteomyelitis in a patient who is an IV drug user?**

*Pseudomonas, S aureus*

### **What is the most common cause of osteomyelitis in a patient with a deep foot puncture wound?**

*Pseudomonas*

### **What is the gold standard diagnostic technique to evaluate osteomyelitis?**

Fever, bone pain, warmth, swelling, erythema of overlying skin, with limited range of motion of the area affected

### **What is the classic finding on x-ray?**

Periosteal elevation; lytic lesion

### **What are the signs and symptoms of osteomyelitis?**

Magnetic resonance imaging (MRI)

### **What is the treatment for osteomyelitis?**

Appropriate IV antibiotics for 4-6 weeks

### **What are possible complications of osteomyelitis?**

Chronic osteomyelitis, sepsis, septic arthritis, squamous cell carcinoma secondary to a draining sinus tract

## **CLINICAL VIGNETTES**

**A 32-year-old sexually active female complains of vaginal itching and burning with malodorous discharge. On a wet mount you find epithelial cells coated with bacteria. How do you treat this patient?**

Bacterial vaginosis is treated with metronidazole.

**Your diabetic patient presents with erythema and swelling over the anterior portion of his shin. It is warm and very painful. He is febrile. He states that his blood sugars have been poorly controlled recently. His HgA1c is 9.6. You get an x-ray and find periosteal elevation. What is the diagnosis?**

Osteomyelitis

**A 23-year-old sexually active female presents with vaginal discharge. She has also had a fever. A pelvic examination is not tolerated by the patient due to severe pain. You do a Gram stain and find gram-negative diplococci. How do you treat her?**

Third-generation cephalosporin to treat the gonorrhea and add doxycycline or azithromycin to cover for a possible coinfection with *Chlamydia*



# CHAPTER 11

## Dermatology

### TERMINOLOGY

Name the primary dermatologic skin lesion described below:

Flat, nonpalpable area of discoloration <1 cm in diameter	Macule
Elevated, palpable skin lesion <1 cm in diameter	Papule
Elevated skin lesion >1 cm in diameter	Plaque
Fluid-filled lesion <0.5 cm in diameter	Vesicle
Fluid-filled lesion >0.5 cm in diameter	Bullae
Circumscribed, elevated pus-filled lesion	Pustule
Circumscribed, elevated area of edema that occurs transiently	Wheal
Circumscribed, elevated solid lesion >0.5 cm	Nodule
	Petechiae

**Red-purple, nonblanching, pinpoint lesion due to hemorrhage into the skin**

Purpura

**Red-purple, nonblanching lesion >0.5 cm in diameter**

Telangiectasia

**Blanchable lesion due to dilated blood vessel**

Lichenification

**Flat-topped thickening of skin usually due to prolonged scratching**

Patch

**Flat, nonpalpable, >1 cm in diameter**

Petechiae

**Type of lesion seen in any type of thrombocytopenia**

## **SKIN CANCERS**

**What is the most common type of skin cancer?**

Basal cell carcinoma (BCC)

**What are the three main characteristics of a BCC seen on physical examination?**

1. Pearly papule
2. Telangiectasias
3. Translucent border

**What is the classic description of a BCC?**

“Rodent ulcer”(Fig 11-1)



**Figure 11-1** Rodent ulcer. (Courtesy of Noah Craft, MD, PhD)

**What is the skin cancer most likely to cause death?**

Melanoma

## **What are the risk factors for BCC (Fig 11-2)?**

Sun exposure, fair skin, radiation therapy



**Figure 11-2** BCC-pearly papule. (Courtesy of Noah Craft, MD, PhD)

## **Where are BCCs most commonly found?**

Sun-exposed skin, ie, head, neck, hands

## **How is a BCC diagnosed?**

Biopsy

## **What is the treatment?**

Excision

## **What is the prognosis?**

Prognosis is excellent because this cancer rarely metastasizes.

## **What is second most common skin cancer?**

Squamous cell carcinoma (SCC)

## **What is the precursor lesion to SCC?**

Actinic keratosis (also known as solar keratosis)

## **What are the characteristics of an actinic keratosis on physical examination?**

Red, scaly, rough patches usually found in sun-exposed area of skin

## **How are actinic keratoses treated?**

Cryotherapy for a small number of lesions, topical 5-FU (an antimetabolic agent) for large areas on face and scalp, or imiquimod cream, also photodynamic therapy

## **What are the risk factors for developing a SCC?**

Sun exposure, fair skin, radiation therapy, xeroderma pigmentosa, exposure to arsenic, immunosuppression

## **Where are SCCs most commonly found?**

Sun-exposed areas of skin, ie, head, neck, hand

## **How is SCC diagnosed?**

Biopsy shows “keratin pearls” in the dermis.

## **What is the treatment?**

Excision; radiation in cases where surgery is not an option

## **What is the prognosis?**

Prognosis is very good. They metastasize more often than BCC but not as often as melanoma.

### What is the type of skin cancer most likely to be found in younger age groups?

Melanoma (Fig 11-3)



**Figure 11-3** Melanoma. (Courtesy of Noah Craft, MD, PhD)

### What are the risk factors for melanoma?

Remember the mnemonic **ABCDEE**:

**A**symmetry

**B**orders are irregular

**C**olors vary

**D**iameter is >6 mm (larger than a pencil eraser)

**E**nlarged over time (growing)

**E**levation

### What characteristics are most suggestive of melanoma?

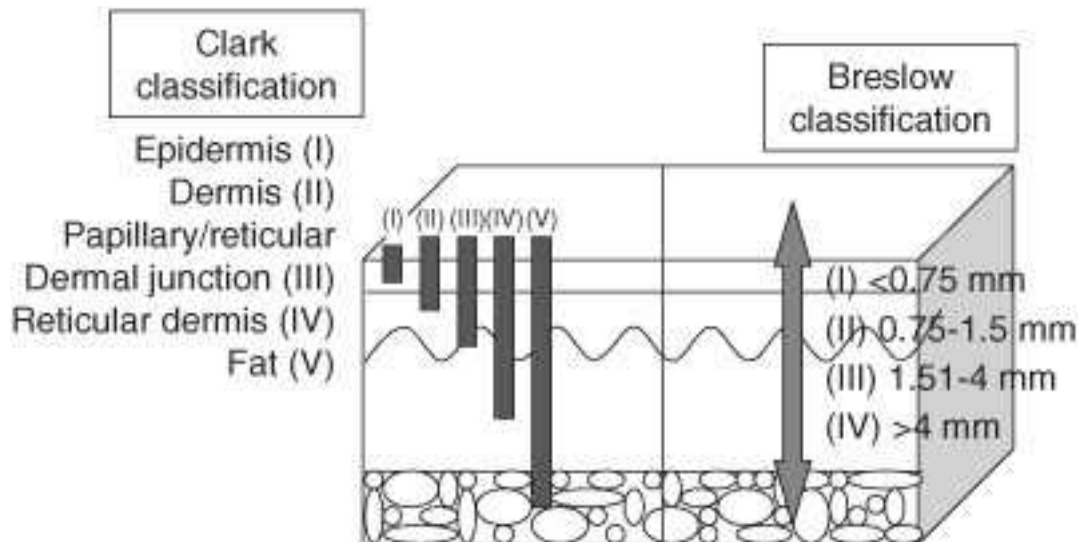
Sun exposure (particularly childhood sunburn), fair skin, family history

### How is melanoma diagnosed?

Excisional or incisional biopsy shows melanocytes with atypia. Do NOT do a shave biopsy.

### What is the most important prognostic factor for melanoma?

**Depth** of invasion or thickness of melanoma; the deeper the lesion the worse the prognosis (Fig 11-4)



**Figure 11-4** Clark and Breslow classification schemes.

### What is Breslow classification?



**Breslow classification:** Staging is done by measuring the depth of the lesion in millimeters.

**What is Clarke classification?**

**Clarke classification:** Staging is done by determining the penetration of the lesion in relation to the layers of the dermis.

**Which classification scheme is most predictive of survival?**

Breslow classification

**Name the different types of melanoma.**

1. Superficial spreading melanoma
2. Nodular melanoma
3. Lentigo maligna
4. Acral lentiginous

**Name the type of melanoma described below:**

<b>Most common type of melanoma</b>	Superficial spreading
<b>Melanoma associated with worst prognosis</b>	Lentigo maligna
<b>Usually found on the head/neck of elderly patient</b>	Lentigo maligna
<b>Melanoma associated with the best prognosis</b>	Acral lentiginous
<b>Type of melanoma common in African Americans</b>	Acral lentiginous
<b>Found on palms, soles, nail beds, mucous membranes</b>	Form of lentigo maligna that is in radial phase of growth; noninvasive
<b>Hutchinson freckle</b>	Lentigo Maligna

**What is the treatment for melanoma?**

Excision; chemotherapy if metastasis is suspected

**What is the type of skin cancer associated with HIV?**

Kaposi sarcoma

**Which herpes virus is associated with Kaposi?**

Human herpes virus (HHV) 8

**What are the clinical findings of Kaposi?**

Red/purple macular or papular nodules on skin, mucous membranes, and viscera (especially lungs, gastrointestinal [GI] so it may present as shortness of breath)

**What is the treatment?**

Treat human immunodeficiency virus (HIV); treat lesions if they cause discomfort; intralesional vinblastine;

radiation; chemotherapy

**What is mycosis fungoides?**

Cutaneous T-cell lymphoma

**What is the leukemic phase of the disease called?**

Sézary syndrome

**What are the clinical findings of mycosis fungoides?**

Chronic progressive eczema unresponsive to treatment

**PSORIASIS**

**What do psoriatic lesions look like?**

Pink plaques with silvery-white scale (Fig 11-5)



**Figure 11-5** Psoriasis. (Courtesy of Noah Craft, MD, PhD)

**Where are psoriatic plaques classically found?**

On the elbows and knees (extensor surfaces)

**What other clinical findings can psoriasis be associated with?**

1. Fingernail pitting
2. Onycholysis (separation of distal nail plate from nail bed)
3. Psoriatic arthritis (rheumatologic factor negative)

**Which joints do psoriatic arthritis most commonly affect?**

Distal interphalangeal (DIP) joints

**What is Köbner phenomenon?**

Psoriatic lesions that occur at the site of injury

**What is Auspitz sign?**

Pinpoint bleeding at sites where overlying scale is removed

**How is psoriasis affected by season?**

Psoriasis is worse in winter and better in summer because sunlight improves lesions.

**How is psoriasis treated?**

See [Table 11-1](#).

**Table 11-1** Management of Psoriasis

<b>Topical (Mild Dose)</b>	<b>Systemic (Severe Dose)</b>
Emollients	Systemic steroids
Steroids	Narrow band UV-B
Coal tar	Retinoids
Vitamin D analogs (calcipotriene)	Methotrexate
	Cyclosporine
	Biologics

**What blood tests should be done on patients taking methotrexate?**

Complete blood count (CBC) to monitor for bone marrow suppression; liver function test to check for hepatotoxicity; renal function tests

**What blood test should be done on patients taking cyclosporine?**

Renal function tests due to the risk of nephrotoxicity

**BLISTERING DISEASES**

**Name the blistering diseases described below:**

<b>Flaccid bullae that rupture easily</b>	Pemphigus vulgaris (PV)
<b>Tense bullae that do not rupture easily</b>	Bullous pemphigoid
<b>Autoimmune blistering disorder</b>	Both PV and bullous pemphigoid are autoimmune.
<b>Blistering disorder more likely to affect 40-60 year olds</b>	PV
<b>Blistering disorder most likely to affect the elderly</b>	Bullous pemphigoid
<b>Immunofluorescence shows a "tombstone" pattern surrounding epidermal cells</b>	PV
<b>Immunofluorescence shows a linear band along the basement membrane</b>	Bullous pemphigoid
<b>Blistering disease that is more likely to be fatal</b>	PV (PV is vulgar because it is fatal; that is why we see tombstones on biopsy)
<b>Nikolsky sign</b>	Pemphigus vulgaris

**What is the Nikolsky sign?**

Sloughing of epidermis with gentle traction

**What is the treatment for blistering diseases?**

Oral steroids and antibiotics if infection occurs

## **VECTOR-BORNE DISEASES**

**Which vector-borne illness is caused by *Rickettsia rickettsii*?**

**Rocky Mountain spotted fever (RMSF)**

**What are the symptoms?**

Fever, headache, rash, myalgias, nausea, photophobia  
(Note: **R**ash **M**yalgias **S**evere headache **F**ever)

**What kind of rash is it?**

Maculopapular

**How does the rash spread?**

The rash spreads centrally. It starts at the wrists and ankles and spreads to the palms, soles, and trunk.  
(Note: The rash **WRAPS**: **W**rists **A**nkles **P**alms **S**oles)

**In what months is it likely to be seen?**

April through September

**In what regions is this illness found?**

It is an illness of the Western hemisphere; mainly southeastern states (North/South Carolina, Tennessee, Oklahoma); rare in the Rocky Mountains

**How is RMSF diagnosed?**

Usually a clinical diagnosis with a history of being outdoors or tick bite; clinical test results are slow and it is important to start treatment immediately

**What is the most specific and sensitive clinical test for RMSF?**

Indirect fluorescent antibody assay

**What are some clinical tests to diagnose RMSF?**

Serologies for *Rickettsia*; Weil-Felix test, biopsy showing necrotizing vasculitis

**What is considered the best treatment for RMSF?**

Doxycycline

**What is the treatment of RMSF in children?**

Doxycycline, even though tetracyclines are typically not given to children because of the risk of staining teeth, this is one exception.

**How would you treat patients that are pregnant but not in the third trimester?**

Chloramphenicol—This is avoided in the third trimester due to the risk of gray baby syndrome.

**What is the major side effect of chloramphenicol to watch for?**

Aplastic anemia

**What vector-borne illness is caused by *Borrelia burgdorferi*?**

Lyme disease

**What is this transmitted by?**

Ixodes deer tick

**What are the symptoms?**

Fever, headache, myalgias, photophobia, rash, myocarditis

**What is the classic rash called and how does it spread?**

**Erythema chronicum migrans**—erythematous annular plaques at the sites of tick bites expand with central clearing

(Note: Looks like a target)

**How is this rash different from that seen in RMSF?**

It does not involve the palm and soles; usually rash is on trunk, extremities, axilla, inguinal regions

**In what months is Lyme disease usually seen?**

May through September

**In what region of the United States is it mostly found?**

Northeast

### **How is Lyme disease diagnosed?**

Clinically and confirmed by polymerase chain reaction (PCR) or skin biopsy for *B burgdorferi* (spirochete)

### **What is the treatment?**

Doxycycline, penicillin

### **What are the potential complications if treatment is delayed?**

Cardiac: carditis, atrioventricular (AV) block

Neurologic: meningitis, encephalitis, Bell palsy

## **FUNGAL INFECTIONS**

### **Name the fungal infection described below:**

**Scaly, erythematous, pruritic, ring-shaped plaque with elevated borders and central clearing on the body**

*Tinea corporis*

**Previous symptoms found on the scalp**

*Tinea capitis*

**Thickened, yellow fingernails or toenails**

*Onychomycosis*

**Erythematous, scaly plaques with satellite pustules in intertriginous areas**

*Candida*

**Cottagecheese-like plaques on oral mucosa**

Oral thrush

**Sharply demarcated hypopigmented macules on face and trunk; more prominent in summer months**

*Tinea versicolor* (also known as *pityriasis versicolor*)

### **What is the causative agent of *t versicolor*?**

*Pityrosporum ovale* also known as *Malassezia furfur*

### **How are these infections diagnosed?**

KOH (potassium hydroxide) preparation

### **What is the “classic finding” on KOH preparation for *t versicolor*?**

Termed “spaghetti and meatballs”

(Note: The spaghetti is the hyphae and the meatballs are the yeast.)

### **What is seen in the KOH preparation of *Candida*?**

Satellite scrapings show budding yeast and **pseudohyphae**.

### **What is seen in KOH preparation of *t corporis*?**

## Hyphae

What is the treatment for each of the following?

*T corporis*

Topical antifungals (imidazoles)  
Systemic antifungals (griseofulvin, azoles, terbinafine) if unresponsive to topicals

*T versicolor*

Topical antifungals; selenium sulfide shampoo; oral antifungals are rarely needed

*Candida*

Reduce moisture and friction in affected areas usually via weight loss and body powders; topical antifungals (nystatin) or oral antifungals

*Onychomycosis*

**Very difficult to treat!** Oral antifungal needed

*T capitis*

Oral antifungal

## BACTERIAL AND VIRAL INFECTIONS

What is the causative agent of acne vulgaris?

*Propionibacterium acnes* cause inflammation of the pilosebaceous unit.

What is the term used for a “blackhead?”

Open comedone

What is the term used for a “whitehead?”

Closed comedone

What are the topical treatments for acne?

Mild acne: Use topicals alone.

Benzoyl peroxide, retinoic acid, erythromycin, or clindamycin, and antiseptics.

What are the oral treatments for acne?

Use in moderate to severe cases (cystic acne).

Oral tetracyclines (doxycycline), erythromycin, clindamycin.

Isotretinoin in very severe cases.

What is the warning that female patients should receive *before* being placed on an isotretinoin (Accutane)?

Female patients should be put through the “I Pledge” system and be told that they should **not** become pregnant while taking this drug because it will cause severe fetal abnormalities.

**What is cellulitis?**

Subcutaneous, soft tissue infection with classic signs of inflammation. Area of skin is shiny and poorly demarcated and borders are not elevated.

**What are the classic signs of inflammation?**

**Red** (rubor)

**Hot** (calor)

**Painful** (dolor)

**Swollen** (tumor)

**What are the most common causative agents of cellulitis?**

*Staphylococcus* and *Streptococcus*

**What is the term used to describe a superficial spreading cellulitis?**

Erysipelas

**What is the most common causative agent?**

*Streptococcus pyogenes*

**What patients are at high risk for cellulitis?**

Immunocompromised patients

(Note: If diabetic with tender, erythematous rash on lower extremity unilaterally, **think** cellulitis)

**How is the diagnosis confirmed?**

Gram stain with gram-positive cocci

**How is it treated?**

Penicillin or cephalosporin (cephalexin) If penicillin- or methicillin-resistant *Staphylococcus aureus* (MRSA)-allergic, use vancomycin or clindamycin

**What are the signs and symptoms of *folliculitis*?**

Erythematous pustules in areas of hair growth especially in beard region

**What is the most common causative agent?**

*S aureus*

**What is the most common causative agent of “hot tub” folliculitis?**

*Pseudomonas*

**What is the treatment?**

Keep area clean, if severe can use fluoroquinolone

**What is a furuncle?**

A collection of puss in one hair follicle

**What is a carbuncle?**

A collection of puss in multiple hair follicles

**What is an abscess?**

Localized collection of pus “walled off” by a cavity formed by the surrounding tissue

**What is the most common causative agent?**

*S aureus*



**What is the abnormal lab value seen?**

High white blood cell (WBC) count

**What is the treatment for an abscess, carbuncle, and furuncle?**

Incision and drainage; antibiotics may be added if needed (cephalexin is typical but it does not cover MRSA which has become more prevalent and may need an antibiotic such as clindamycin or Bactrim)

**What is impetigo?**

Superficial skin infection

**What is the characteristic description of impetigo?**

Honey-crusted lesion

**What is the treatment?**

Cephalexin, clindamycin (if MRSA)

**What are the most common causative agents?**

*S aureus* (children) or *S pyogenes* (adults)

**What is erythrasma?**

An erythematous rash along major skin folds (eg, axilla, groin)

**In what patient population is it most commonly found?**

Diabetics

**What is the causative agent?**

*Corynebacterium*

**How is it diagnosed?**

Under Wood lamp there is coral red fluorescence; KOH preparation is negative.

**What is the treatment?**

Erythrasma is treated with erythromycin.

**What is the term used to describe a plugged apocrine sweat gland that has become infected?**

Hidradenitis suppurativa

**In what regions of the body is it usually found?**

Axilla and groin

**What is the treatment?**

Surgical debridement and antibiotics

**What is the term used to describe an infection of the skin surrounding the nail plate?**

Paronychia

**What are the most common infective agents?**

*Staphylococcus* or *Streptococcus*

**What is the treatment?**

Warm compress, incision and drainage (ID) if purulent, keflex if severe

**What is herpes simplex?**

Recurrent, painful vesicular eruptions in groups due to the herpes simplex virus (HSV) infection

**Where are the lesions most commonly found?**

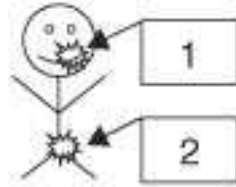
Oral-labial region or genitals

**What form of the virus is most commonly found at each of the regions above?**

HSV 1: oral-labial

HSV 2: genital

(Note: **Think from top to bottom—type 1 then type 2**) (Fig 11-6)



**Figure 11-6** Typical locations of HSV 1 and HSV 2 eruptions.

**How is it diagnosed?**

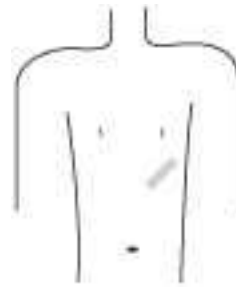
**Tzanck smear**—positive for HSV when multinucleated giant cells are seen

**What is the treatment?**

Acyclovir ointment reduces duration but does not prevent recurrence. Oral acyclovir reduces frequency and recurrence.

**What is herpes zoster?**

Also known as shingles; an acute, dermatomal vesicular eruption caused by the reactivation of latent varicella zoster that has been dormant in the sensory root ganglion (Fig 11-7)



**Figure 11-7** Dermatomal distribution of herpes zoster.

**What is the typical history of symptoms?**

Day 1: dermatomal pain (no lesions), can also present with fever, malaise

Day 3-5: **unilateral** grouped vesicles along a dermatome

Day 5-10: crust formation

**Which nerves are most commonly involved?**

Thoracic nerves

**What test is used to confirm the diagnosis?**

Tzanck smear—multinucleated giant cells revealed (same as with herpes simplex)

**What is the term used to describe herpes infection of the geniculate ganglion which leads to vesicles**

**forming on the external auditory meatus?**

Ramsay Hunt syndrome (RHS)

**What can happen if RHS is not treated rapidly?**

It could extend to meningitis. It can also lead to facial paralysis and hearing loss.

**What is the treatment for herpes zoster?**

Oral acyclovir within 3 days of infection; immunocompromised patient: IV acyclovir  
Analgesia to all patients (**it hurts**)

**What are potential complications of herpes zoster?**

1. Superficial infection of affected area.
2. **Postherpetic neuralgia** (may last for years).
3. V1 (primary visual area) involvement can lead to corneal scarring.

**PIGMENTARY DISORDERS**

**Name the pigmentary disorders described below:**

<b>Discrete areas of hypopigmentation due to melanocyte loss</b>	Vitiligo
<b>Hypopigmentation due to tyrosinase deficiency—melanocytes present</b>	Albinism
<b>Dark hyperpigmented plaques on flexor surfaces and intertriginous areas</b>	Acanthosis nigricans

**What autoimmune disorder is associated with vitiligo?**

Thyroid disease

**What are the potential treatments for vitiligo?**

Vitiligo cannot be cured because it is autoimmune in nature, but skin grafting or total depigmentation are options, also psoralen–UV-A (PUVA) and narrow band UV-B

**What are the characteristics seen in albinism?**

White skin and hair, red eyes, translucent iris, impaired vision with nystagmus

**What are albinos predisposed to?**

Skin cancer

**In what patient population is acanthosis nigricans seen?**

Obese patients and patients with diabetes

**What can acanthosis nigricans be a sign of?**

It may indicate the presence of a malignancy.

# HYPERSENSITIVITY REACTIONS

## What is Henoch-Schönlein purpura?

An IgA small vessel hypersensitivity vasculitis in which immune complexes lodge in small vessels resulting in inflammation, fibrinoid necrosis, and **palpable purpura**. Patients have a hypersensitivity reaction to antigens in immune complex.

## What is seen on physical examination?

**Palpable purpura**, usually of the lower extremities and buttocks.

Lesions may be crusted because of tissue necrosis.

Patients also present with abdominal pain, pruritis, fever, and malaise.

## What is palpable purpura?

Nonblanchable, red papules

## What patient population is Henoch-Schönlein purpura usually seen in?

Children

## What are the criteria for diagnosis of a hypersensitivity vasculitis according to the American College of Rheumatology?

Three of the following must be present:

**Meds** taken at onset of disease

**Age** >16 at onset of disease

**Palpable purpura**

**Maculopapular rash**

**Eosinophils** seen on biopsy

## What can it potentially progress to and why?

Rarely it progresses to glomerulonephritis because IgA deposits in glomeruli.

## What is the treatment?

Treat the underlying cause; systemic corticosteroids; immunosuppressives in serious cases but often self-limiting

## What is erythema multiforme?

Immune complex hypersensitivity reaction to various causative agents

## What are the various causes of erythema multiforme?

Half of all cases are idiopathic but other causes are:

Infections

Bacterial (*Streptococcus*, *Mycoplasma*)

Viral (herpes simplex, hepatitis A or B) Fungal

Drugs: nonsteroidal anti-inflammatory drugs (NSAIDs), penicillin, sulfonamides, thiazide diuretics, barbiturates, phenytoin

Malignancy

Collagen vascular disease

## What is the pathognomonic lesion?

Erythematous **target lesions** with red center and dark outer ring in many different shapes (that is why it is called multiforme) (Fig 11-8)



**Figure 11-8** Target lesions. (Courtesy of Noah Craft, MD, PhD)

**Where are lesions mostly found?**

On the palms, soles, and extremities

**What forms can the lesions take?**

Many forms—vesicles, papules, bullae

**What is the treatment?**

Treat the underlying cause. Stop any drugs causing the reaction or treat any underlying infection.

**What is Stevens-Johnson syndrome?**

A severe form of erythema multiforme with systemic symptoms as well as **mucous membrane** involvement (oral mucosa and conjunctiva); <10% of body; potentially fatal (Fig 11-9)



**Figure 11-9** Stevens-Johnson syndrome. (Courtesy of Noah Craft, MD, PhD)

**What is the treatment?**

Remove/treat causative agent; systemic corticosteroid therapy; treat skin lesions as burns; immune globulin intravenous (IGIV) potentially helpful

**What can Stevens-Johnson syndrome progress to?**

Toxic epidermal necrolysis (TEN)

**How is TEN different from Stevens-Johnson?**

>30% of body surface area with full-thickness skin necrosis; higher risk of being fatal

**What happens to the target lesions in TEN?**

Lesions become confluent, tender, erythematous, and become bullae. There is eventual loss of the epidermis.

**What is “positive” sign for TEN?**

Nikolsky sign—Gentle manual traction leads to sloughing off of epidermis.

### What is the treatment?

Remove/treat causative agent (acyclovir to prevent herpes recurrence); fluid and electrolyte replacement; systemic corticosteroids; IGIV may be helpful

### What is erythema nodosum?

A painful inflammation of subcutaneous fat

### What is the etiology?

Most cases are idiopathic.

Other causes:

**Drugs:** oral contraceptives, sulfonamides

**Infections:** *Streptococcus*, TB, leprosy, *Chlamydia*

**Autoimmune:** inflammatory bowel disease, Behçet, sarcoidosis, rheumatic fever, pregnancy

### In what patient population is it most commonly seen?

Young women between the ages of 15 and 30

### What is seen on physical examination?

**Erythematous nodules on lower legs that are extremely tender to touch**

(Note: Nodules are bilateral but not symmetric. Occasionally found on forearms or other areas with fat.) (Fig 11-10)



**Figure 11-10** Erythema nodosum. (Courtesy of Noah Craft, MD, PhD)

### How is the diagnosis confirmed?

CBC, CXR, throat culture, antistreptolysin-O

### What is the treatment?

Treat the underlying cause as well as anti-inflammatories for pain and leg elevation.

### What is pityriasis rosea? And what is the sequence of eruption?

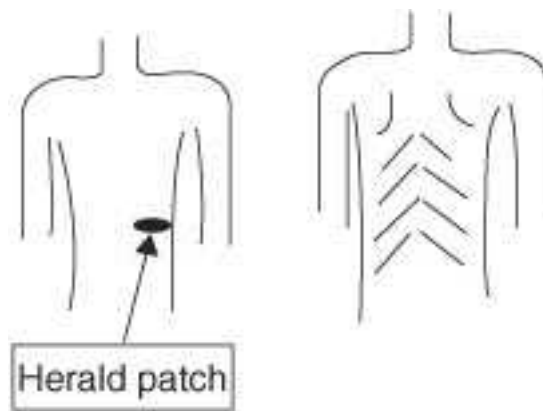
A self-limiting maculopapular pruritic rash with central scale that begins as a **single herald patch** on the trunk, then followed by a generalized rash of pink scaly patches within 2 weeks of the initial eruption. Caused by HHV-7. (Fig 11-11)



**Figure 11-11** Herald patch in pityriasis rosea. (Courtesy of Noah Craft, MD, PhD)

**What is the pattern of distribution of the generalized rash?**

**Christmas tree pattern** on the back (Fig 11-12)



**Figure 11-12** Herald patch and Christmas tree pattern.

**In what season is this most commonly seen?**

Spring

**In what patient population does it most commonly present?**

Children and young adults

**What is the treatment?**

Treatment is symptomatic only; it usually self-resolves in 6-8 weeks; however, sunlight helps. Symptomatic treatment includes antihistamines, topical corticosteroids, and calamine lotion.

**What is scabies?**

An infection by the *Sarcoptes scabiei* mite which causes an extremely pruritic papular rash. Lesions are contagious.

**What should you look for on physical examination if you suspect scabies?**

Burrows in webs of finger, toes, and other intertriginous areas

**How is it diagnosed?**

Microscopic identification of the *S scabiei* mite in skin scraping

**What is the treatment?**

Permethrin 5% cream to entire body for 8 hours, then repeat 1 week later. Wash all linens. Antihistamines

can help with pruritis.

**How long can postscabies pruritis last after treatment?**

6-8 weeks after treatment

**Who should be treated?**

Patient with scabies and all close contacts

## **CLINICAL VIGNETTES**

**An obese 37-year-old diabetic, hyperlipidemic male presents to your clinic for a follow-up. His HgA1c is 8. His LDL is 100 and HDL is 40. He complains of a dark “rash” that has slowly appeared in the posterior fold of his neck. It is nonpruritic, and not painful. On examination there is an area of hyperpigmented skin that has a “velvety” texture to it. What is the most likely diagnosis?**

Acanthosis nigricans

**In the month of March, a healthy 23-year-old female presents to your office complaining of a very pruritic rash. She states that the rash started as a single larger lesion; then about 5 days later she broke out in a rash on her entire back that is extremely pruritic. She has not started any new medications or used any new products either. This has never happened to her in the past. On examination you find a single larger scaly lesion on her upper back and a generalized rash consisting of pink scaly patches. Her vitals are within normal limits. What is the most likely diagnosis?**

Pityriasis rosea

**A 17-year-old male presents complaining of some lesions on his back. He states that they do not cause him any discomfort. There is no itching or pain. On examination you find small, hypopigmented patches on his upper back. With scratching there is fine overlying scale. A KOH preparation shows pseudohyphae and yeast. What is the organism causing his rash?**

*Malassezia furfur* is the organism in tinea versicolor.

**An 87-year-old female who lives in a convalescent home is brought in for evaluation of a rash. The rash is extremely pruritic, especially in the evening. The caretaker mentions that her roommate has similar symptoms. The patient has a generalized rash with a lot of excoriation marks on her body. When you look in the webs of her fingers you find superficial burrows. What is the most likely diagnosis?**

Scabies

**A fair-skinned 57-year-old construction worker presents for a skin check. On the helix of his ear you find red, scaly rough patches. They are then treated with liquid nitrogen. What are these lesions precursors of?**

SCC





# CHAPTER 12

## Clinical Vignettes Review

**A 45-year-old female who recently had surgery for a thyroid cancer develops perioral paresthesias, confusion, and muscle weakness. An EKG was performed and it demonstrated a prolonged QT interval. What is the most likely reason for this woman's symptoms?**

Hypocalcemia

**A 30-year-old African-American female presents to your office complaining of a photosensitive skin rash over her nose and cheeks as well as fever and polyarthritis. She reports no pain. You listen to her heart and hear a murmur. Based on the previous findings, what do you think is the most likely cause of the murmur?**

Libman-Sacks endocarditis (Mnemonic: SLE causes LSE)

**A 60-year-old alcoholic female presents with severe back pain with nausea and vomiting. Abdominal x-ray shows a sentinel loop. What is the most likely diagnosis?**

Pancreatitis

**A patient diagnosed with leukemia has Auer rods on blood smear. What type of leukemia does he have?**

Acute myelogenous leukemia (AML)

**A young boy presents to the dentist and is found to have excessive bleeding. Laboratory tests are performed and he is found to have a prolonged bleeding time with normal prothrombin time (PT)/partial prothrombin time (PTT). What is the diagnosis of choice?**

von Willebrand disease

**A 58-year-old female presents with acute renal failure of unknown etiology. Urinalysis shows Bence Jones proteinuria and she is found to have a monoclonal gammopathy. What is the diagnosis?**

Multiple myeloma

**A 70-year-old male in the intensive care unit (ICU) on total parenteral nutrition (TPN) for 10 days develops jaundice. Liver function test demonstrates a total bilirubin of 12. What is the most likely cause of his hyperbilirubinemia?**

Cholestasis caused by parenteral nutrition

**A 60-year-old female is found to be hypotensive on pressors with minimal improvement. Her chest x-ray (CXR) demonstrates an enlarged heart that resembles a water bottle. What would be the test you would order to make the diagnosis?**

Echocardiogram. This patient most likely has a pericardial effusion.

**A 50-year-old male who had a myocardial infarction (MI) approximately 3 weeks prior presents with fever and elevated erythrocyte sedimentation rate (ESR). What is the most likely diagnosis?**

Dressler syndrome

**You are called by the nurse about a hospitalized patient with a blood pressure of 100/60. You go to evaluate the patient and on examination she has distant heart sounds and jugular venous distention (JVD). You order an EKG and you notice that the height of the QRS complex varies from beat to beat. What is your diagnosis?**

Cardiac tamponade

**An otherwise healthy medical student gets his annual purified protein derivative (PPD) (tuberculin) as required by medical school; 48 hours later he goes to have it read and it measures 10 mm. What would you tell this student about the results?**

He has a positive PPD and needs to be treated with 6-9 months of isoniazid (INH).

**A 30-year-old female presents with fatigue for several months. She has also had multiple urinary tract infections (UTIs) over the past year. You order a complete blood count (CBC) with a peripheral smear. The smear shows Auer rods and 52% myeloblasts. What is the diagnosis?**

Acute myelocytic leukemia

**A 60-year-old male presents to your office for a physical examination. He has no past medical history, does not drink or smoke, and currently takes no medications. His physical examination is benign except that he appears somewhat pale. His CBC shows a hemoglobin of 11 and the mean corpuscular volume (MCV) is 70. He has a low ferritin, low serum iron, and elevated total iron-binding capacity (TIBC). What is your next step?**

Screen for colon cancer—Iron deficiency anemia is colon cancer until proven otherwise.

**Your 16-year-old patient comes to your office because his friends told him that he looks “yellow.” He has no past medical history and is not taking any medications. He denies any recent antibiotic use. He does mention that he has felt fatigued over the past 2 days. He also says that he tried Indian food for the first time a few days ago. He had a really tasty bean dish. You order a CBC and his hemoglobin is 8. What is the diagnosis?**

Glucose-6-phosphate dehydrogenase (G6PD) deficiency

**An HIV patient with a CD4 count of 198 comes to see you for follow-up on his HIV. What new antibiotic would you initiate?**

Bactrim as prophylaxis against *Pneumocystis carinii* pneumonia (PCP)

**A 55-year-old alcoholic male is brought in to the emergency room (ER) for altered mental status. He is found to have a pulse oxygen of 85%. A stat CXR is done and the patient is found to have a large right upper lobe consolidation. He is reported to have a “currant jelly” sputum. What is the most likely organism?**

*Klebsiella* secondary to an aspiration pneumonia

**A 25-year-old female presents to your office complaining of diarrhea, weight loss, and heart palpitations. What initial test would you order?**

Thyroid-stimulating hormone (TSH) and T4 (Think: hyperthyroidism)

**A 70-year-old male presents with renal failure. During your history and physical on your review of systems you discover that he has been having bone pain and weight loss over the past several months. On your initial laboratory assessment you find that your patient is hypercalcemic, has rouleaux formation, and has Bence Jones proteins in his urine. A serum protein electrophoresis demonstrates an “M” spike. You order an x-ray and find he has “punched out lesions.” What is the most likely diagnosis?**

Multiple myeloma

**A patient presents to the ER with symptoms of nausea, vomiting, and fatigue. He tells you that over the past few months he has had a significant amount of weight loss. His sister, who has come to the hospital with him, says that she has noticed that recently his skin has become very tanned as well. You question the patient about recent sun exposure and he tells you that he has had very little since he is an accountant and is indoors most of the day. His laboratory tests reveal that he is hyponatremic and hyperkalemic. What diagnostic test would you order for this patient?**

Plasma adrenocorticotropic hormone (ACTH) level to evaluate for Addison disease

**A patient with a history of IV drug abuse presents to the hospital with high fever and chills. On physical examination you hear a new murmur. Blood cultures are drawn and are positive × 2 with *Streptococcus viridans*. What is the most likely diagnosis?**

Endocarditis. The tricuspid valve is most likely involved.

**Unfortunately, your patient has been diagnosed with lung cancer. He has been feeling very weak and fatigued for the past few days and develops an altered level of consciousness. A CT scan was done and fortunately there were no metastases to the brain. Electrolytes show that he has a sodium of 125. His glucose is within normal limits. What test would you order next to confirm your suspected diagnosis?**

Urine electrolytes to confirm the most likely diagnosis of SIADH (syndrome of inappropriate antidiuretic hormone)

**A nursing home patient who is alert and oriented presents with severe hyponatremia. Your colleague treats the patient with hypertonic saline and is able to correct his sodium within 7 hours. Subsequently, the patient becomes unresponsive and unarousable. Your colleague does not know what happened. What would you tell her was the cause of her patient's rapid alteration in mental status?**

The patient has central pontine myelinolysis. Hyponatremia should never be corrected too quickly for this reason.

**A patient in renal failure complains of chest pain. Her potassium is 6.5. A stat EKG shows peaked T waves. What would be the initial treatment that should be given?**

Calcium gluconate to protect the heart

**Your next patient in clinic is a 75-year-old white male visiting for a routine physical. He mentions that he has noticed a lesion on the ridge of his ear. You take a look at it and find it is pearly in appearance and has some telangiectasias. What is the most likely diagnosis?**

Basal cell carcinoma

**A sexually active 18-year-old male presents with a hot, swollen, severely painful right knee for the past 2 days. He denies any history of trauma to the joint that he can recall. What is the next step in diagnosis?**

Arthrocentesis. Most likely organism is *Neisseria gonorrhoeae*.

**A 77-year-old female complains of severe joint pain over the past several years. On her hands you notice some nodules on her proximal interphalangeal joints (PIP). What are these nodules called?**

Bouchard nodes

**A 45-year-old woman presents to the ER complaining of dyspnea and chest pain. She just came back from a cross-country road trip. She also tells you that she had one episode of hemoptysis. The nurse takes her vitals. They are: Tmax: 37.8°C; BP: 130/90; pulse: 110; respiratory rate: 28; and oxygen saturation of 88%. You examine the patient and find that her left calf is swollen and tender. What is the most likely diagnosis for this patient's shortness of breath?**

Pulmonary embolism from a deep venous thrombosis (DVT) in her left lower extremity

**A 20-year-old patient presents with altered level of consciousness. His parents report that he has been very thirsty recently. A serum glucose is 849. What test could you order to differentiate between type 1 and type 2 diabetes?**

C-peptide. It would be missing in type 1 diabetics.

**A 45-year-old obese female presents with a 2-day history of nausea, vomiting, and abdominal pain. On examination the patient has right upper quadrant pain. You suspect cholecystitis so you order a right upper quadrant ultrasound. The test is equivocal. What is your next step in management?**

This patient needs a hydroxy iminodiacetic acid (HIDA) scan.

**A 70-year-old male with a 35-pack-year history of smoking presents with dyspnea on exertion. The patient has a chronic dry cough and his voice sounds very hoarse. Physical examination demonstrates decreased breath sounds, a hyper-resonant chest, and distant heart sounds. A CXR reveals flattened diaphragms. What is the diagnosis?**

Chronic obstructive pulmonary disease (COPD)

**A 25-year-old male presents with acute right knee pain. The patient denies any history of trauma but does report fever and chills. He also tells you that over the last week he has had pain in multiple joints as well. He admits to you that he is sexually active with multiple partners and does not like to use any protection. On physical examination, the knee is swollen, erythematous, and painful. He has a rash on his palms. You tap the joint and the fluid demonstrates gram-negative diplococci. What is the diagnosis?**

Gonococcal arthritis

**An 84-year-old male with a past medical history significant for hypertension, hyperlipidemia, and diabetes presents with left-sided paralysis. He is admitted to the hospital for further workup. In the next 15 hours, his symptoms resolve. What is the most likely diagnosis?**

Transient ischemic attack (TIA)

**A 19-year-old male presents to your clinic complaining of a “rash” on his knees and elbows. He says that he has used moisturizer on it with no improvement. On physical examination, you find silvery white scaly patches on his elbows and knees. You also notice that he has pitting of some of his fingernails. What is the most likely diagnosis?**

Psoriasis

**A young male presents with a 3-month history of night sweats, fatigue, and 15-lb weight loss. He has noticed that he has a single, nontender cervical lymph node that does not seem to be resolving. He did mention that his symptoms seem worse with alcohol consumption. A CBC demonstrates leukocytosis. A lymph node biopsy demonstrates binucleated giant cells (Reed-Sternberg cells). What is the diagnosis?**

Hodgkin lymphoma

**A patient presents with altered mental status with petechiae on the lower extremities. The patient has a temperature of 38.3°C, blood pressure of 110/80. The following are the patient’s labs: CBC: WBC 10, hemoglobin 10, hematocrit 26, and platelets 50. Electrolytes demonstrates hyperkalemia and blood urea nitrogen/creatinine (BUN/CR) of 40/2.5. The patient has an elevated lactate dehydrogenase (LDH) and unconjugated bilirubin. What is the diagnosis?**

Thrombotic thrombocytopenic purpura (TTP)

**An 18-year-old athlete presents with an erythematous, pruritic skin eruption in the intertriginous region. A potassium hydroxide (KOH) scraping demonstrates hyphae. What is the diagnosis?**

Tinea cruris

**An HIV patient presents with purple-colored macules and nodules on his skin. It is caused by human herpesvirus 8 (HHV 8). What is the diagnosis?**

Kaposi sarcoma



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Endarterectomy, carotid, indications for

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- defined

- diagnosis of

- Libman-Sacks, vignette

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- valves affected by

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False diverticulum

False negative, defined  
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Family history, described  
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    kilocalories in  
    in PTN  
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    extracellular, separation of  
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    preventative screening related to  
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Focal segmental glomerulosclerosis  
Focal seizures  
Folate deficiency  
Folic acid deficiency  
Follicle-stimulating hormone (FSH), action of  
Follicular cancer  
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Formula(s), common  
*Francisella tularensis*, in pneumonia  
FRC. *See* Functional residual capacity (FRC)  
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    signs and symptoms of  
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GFR. *See* Glomerular filtration rate (GFR)  
GH. *See* Growth hormone (GH)  
“Ghon complex”  
GI. *See* Gastrointestinal (GI) Bleed  
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    with pneumonitis  
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    vignette  
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Gonococcal arthritis, vignette  
Gonorrhea  
*Gonorrhea* spp., preventative screening for  
Goodpasture disease  
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Gram-negative bacteria  
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    action of  
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HAART (highly active antiretroviral therapy)  
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    *H influenzae*  
        in pneumonia  
    *H pylori*, peptic ulcers due to  
Hairy cell leukemia  
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    S2 sound in  
Heart block, types of

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Heart failure, right

Heart murmurs

Heart valves, mechanical prosthetic, therapeutic INR level for patient on warfarin with

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Hematocrit, to hemoglobin, formula for conversion of

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Hematoma(s), epidural

Hemodialysis, vascular access for

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  splinterf  
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Hepatic encephalopathy

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  A  
  B  
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  C  
    blood transfusions and

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HHNK coma. *See* Hyperosmolar hyperglycemic nonketotic (HHNK) coma

HIDA scan, vignette

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Highly active antiretroviral therapy (HAART)

*Histoplasma* spp., in pneumonia

History of present illness (HPI), described

HIV infection  
  blood transfusions and  
  preventative screening for

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Horner syndrome  
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Hypersensitivity reactions  
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- Hyponatremia
- Hypoparathyroidism
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- Hypothesis(es), null, defined
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- Hypovolemia, signs of
- Hypoxia
  - causes of
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  - mechanisms of, mnemonic for
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- Idiopathic myelofibrosis
- IgA nephropathy
- Immune thrombocytopenic purpura (ITP)
- Immunization(s). *See also* Vaccine(s)
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- Incidence, defined
- Infarct(s)
  - lacunar
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- Infection(s). *See specific types*
- Infectious diseases
  - vignettes
- Inflammation, signs of
- Inflammatory bowel
- Influenza vaccine
- INR. *See* International normalized ratio (INR)
- Inspiratory capacity (IC), defined
- Inspiratory reserve volume (IRV), defined
- Insulin
  - complications of
  - types of
- Intercranial bleeding, platelet count and
- International normalized ratio (INR)
  - laboratory tests related to
  - for patient on warfarin
- Intracellular water, percentage of
- Intracranial bleeding
- Intravenous fluids, composition of
- Intrinsic factor
- Iron, absorption of



Iron deficiency anemia  
Isotretinoin  
ITP. *See* Immune thrombocytopenic purpura (ITP)

## **J**

Janeway lesions

## **K**

Kaposi sarcoma  
    vignette  
Keratosis(es), actinic  
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Ketoacidosis, diabetic  
Kidney stone  
    evaluation of, radiography in  
Kilocalories  
    in carbohydrates  
    in fat  
    in protein  
*Klebsiella* spp.  
    in pneumonia  
    vignette  
Knee(s), ACL of, evaluation of, radiography in  
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Laboratory studies, in patient history  
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Lacunar infarct  
Lambert-Eaton syndrome  
LDL. *See* Low-density lipoprotein (LDL)  
Lead time bias, defined  
*Legionella* spp., in pneumonia  
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    skin, terminology related to  
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    myelocytic, acute, vignette  
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- LH. *See* Luteinizing hormone (LH)
- Lhermitte sign
- Libman-Sacks endocarditis, vignette
- Lichenification
- Likelihood ratio, defined
- Lipoid nephrosis
- Lipoprotein(s), low-density, goal for
- Listeria* spp., meningitis due to
- Liver disorders
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- Lou Gehrig disease
- Low-density lipoprotein (LDL), goal for
- Lung(s), alpha-1-antitrypsin in, function of
- Lung cancer
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  - diagnosis of
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- Lung disease, restrictive
- Lung volumes
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- Lyme disease
- Lymphoblastic lymphoma
- Lymphogranuloma venereum
- Lymphoma(s)
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  - Hodgkin
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- Macrocytic anemias
- Macule
- Magnesium, normal range for
- Magnetic resonance imaging (MRI), structures visualized on
- Maintenance fluids
- Malabsorption disorders
- Malassezia furfur*

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Malignant hypertension  
  signs and symptoms of  
  treatment of  
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MAT. *See* Multifocal atrial tachycardia (MAT)  
Mean arterial pressure (MAP), calculation of  
Measles, mumps, rubella (MMR) vaccine  
Mechanical prosthetic heart valve, therapeutic INR level for patient on warfarin with  
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MEN syndromes  
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  CSF findings in  
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  in neonates  
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Metabolic alkalosis  
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Methotrexate, blood tests in patients taking  
MGUS. *See* Monoclonal gammopathy of undetermined significance (MGUS)  
MI. *See* Myocardial infarction (MI)  
Microalbuminuria, in diabetics, treatment of  
Microcytic anemias  
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Mitral stenosis  
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MMR (measles, mumps, rubella) vaccine  
Monoclonal gammopathy of undetermined significance (MGUS)  
MS. *See* Multiple sclerosis (MS)  
Mucor  
Multifocal atrial tachycardia (MAT)  
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Multiple endocrine neoplasia type I (MEN I)  
Multiple myeloma  
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*Mycobacterium avium*, in pneumonia  
*Mycoplasma* spp., in pneumonia  
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Myelofibrosis, idiopathic  
Myeloma(s), multiple  
    vignette  
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    complications of  
    defined  
    defining factors for  
    EKG changes with  
    emergent treatment of, mnemonic for  
    symptoms of  
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Negative predictive value (NPV), defined  
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    *N gonorrhoeae*, vignette  
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Nephritic syndrome  
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Nephropathy, IgA  
Nephrosis, lipoid  
Nephrotic syndrome  
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Nil disease  
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Normocytic anemia  
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O<sub>2</sub> saturation, laboratory values for  
OA. *See* Osteoarthritis (OA)  
Obstructive pulmonary diseases. *See also specific diseases*  
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Oliguria  
Onychomycosis  
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Oral thrush  
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Osteomalacia  
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Oxygen, increased requirement for, example of

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*p* value, defined  
Packed red blood cells (PRBCs)  
PaCO<sub>2</sub>, laboratory values for  
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Pain, chest, cardiac enzymes tested in  
Palpable purpura  
PAN. *See* Polyarteritis nodosa (PAN)  
Panacinar emphysema  
Pancoast syndrome  
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Pancreatitis  
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PaO<sub>2</sub>, laboratory values for  
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Papillary cancer  
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Partial parenteral nutrition (PPN)  
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Pelvic inflammatory disease (PID)  
Pemphigoid, bullous  
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    complications of  
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    spontaneous  
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pH, laboratory values for  
Phenytoin, side effects of  
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Phosphate, normal range for  
Physical examination, components of  
PID. *See* Pelvic inflammatory disease (PID)  
Pigment stone  
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Pituitary disorders  
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- anterior
- hormones secreted from
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- Pituitary tumors
- Pityriasis rosea
- Pityrosporum ovale*
- Plaque
- Plasma cell dyscrasia
- Platelet(s), transfusion of, thrombocytopenia and
- Platelet count, intracranial bleeding and
- Platelet disorders
- Platelet levels
- Pleural effusion
  - evaluation of, radiography in
  - radiographic findings in
- Plummer disease
- Plummer-Vinson syndrome
- PMH. *See* Past medical history (PMH)
- Pneumococcal vaccine
- Pneumocystis* spp.
  - P. carinii*, in pneumonia
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- Pneumonia(s)
  - aspiration, vignette
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  - community-acquired, treatment of
  - CXR of
  - diagnosis of, laboratory tests in
  - nosocomial, treatment of
  - physical examination findings in
  - Pneumocystis carinii*
    - vignette
  - radiographic findings in
  - signs and symptoms of
  - treatment of
  - types of
- Pneumonitis, glomerulonephritis with
- Pneumothorax
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  - tension
- Poisoning, carbon monoxide
  - clinical sign of
  - hypoxia due to
- Polyarteritis nodosa (PAN)
- Polycythemia vera
- Polymyositis
- Portal hypertension
- Positive predictive value (PPV), defined
- Posterior cerebral artery (PCA)

Posterior inferior cerebellar artery (PICA)  
Posterior-anterior (PA) film  
Postmyocardial infarction, hypertension with, treatment of  
Postnasal drip, causes of  
Poststreptococcal glomerulonephritis (PSGN)  
Posturing, decorticate  
Potassium  
    for hypertension, contraindications to  
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Pott disease  
Power, defined  
PPD (purified protein derivative), positive  
    treatment of  
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    daily requirement for  
    kilocalories in  
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*Providencia* spp.  
Pseudogout  
Pseudohyperkalemia  
Pseudohypocalcemia  
Pseudohyponatremia  
Pseudomembranous colitis  
*Pseudomonas* spp.  
    in pneumonia  
PSGN. *See* Poststreptococcal glomerulonephritis (PSGN)



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PT. *See* Prothrombin time (PT)  
PTH. *See* Parathyroid hormone (PTH)  
PTT. *See* Partial thromboplastin time (PTT)  
PTU. *See* Propylthiouracil (PTU)  
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Pulmonary edema, acute, treatment of  
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CXR findings in  
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Pulmonology  
Pulsus paradoxus  
Pupil(s), “blown”  
Purified protein derivative (PPD), positive  
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Purpura  
Henoch-Schönlein  
palpable  
thrombocytopenic, thrombotic  
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Pustule  
PVC. *See* Premature ventricular contraction (PVC)  
Pyelonephritis

## **R**

RA. *See* Rheumatoid arthritis (RA)  
Radioactive iodine ablation  
Radiologic studies. *See also specific types, e.g.,* Chest x-ray (CXR)  
CT  
CXR  
KUB film  
MRI  
Ramsay Hunt syndrome  
Ransom criteria  
Rapidly progressive glomerulonephritis  
RBCs. *See* Red blood cells (RBCs)  
Red blood cells (RBCs), life span of  
Reed-Sternberg cells  
Refeeding syndrome  
Reiter syndrome  
Relative risk, defined  
Reliability, defined

- Renal artery stenosis
- Renal failure
  - acute
  - anemia in
  - chronic
  - diet for patients with
- Residual volume (RV), defined
- Respiratory acidosis
- Respiratory alkalosis
- Respiratory rate
  - decreased, causes of
  - increased, causes of
- Restrictive lung disease
- Reversible ischemic neurologic deficit (RIND)
- Review of systems (ROS)
- Rheumatic fever
- Rheumatic heart disease
- Rheumatoid arthritis (RA)
- Rheumatology
  - vignettes
- Rickets
- Rickettsia rickettsii*
- Right heart failure
- Right-to-left shunt
- Rigidity, decerebrate
- RIND. *See* Reversible ischemic neurologic deficit (RIND)
- RMSF. *See* Rocky Mountain spotted fever (RMSF)
- Rocky Mountain spotted fever (RMSF)
- “Rodent ulcer”
- ROS. *See* Review of systems (ROS)
- Roth spots
- Rupture(s), papillary muscle

## S

- S1 sound
- S2 sound
- SAAG (serum-ascites albumin gradient)
- SAH. *See* Subarachnoid hemorrhage (SAH)
- Salmonella* spp.
- Sarcoidosis
- Sarcoma(s), Kaposi
  - vignette
- SBP. *See* Spontaneous bacterial peritonitis (SBP)
- Scabies
- Schatzki ring
- Schwannoma(s)
- Scleroderma
- Sclerosis(es)
  - amyotrophic lateral

multiple  
Scrofula  
Secondary adrenal insufficiency  
Secondary hyperaldosteronism  
Secondary hyperparathyroidism  
Seizure(s). *See also* Status epilepticus; *specific types, e.g.*, Generalized seizures  
    absence  
    defined  
    evaluation of  
    focal  
    generalized, types of  
    risk factors for  
    treatment of  
        discontinuation criteria  
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Sepsis  
Septic shock  
Serum-ascites albumin gradient (SAAG)  
Sexually transmitted diseases (STDs)  
Sézary syndrome  
Shock, septic  
Shunt(s), right-to-left  
SIADH. *See* Syndrome of inappropriate antidiuretic hormone (SIADH)  
Sickle cell anemia  
Sideroblastic anemia  
Simple partial seizures  
Sinemet, mechanism of  
Sinusitis  
Sipple syndrome  
SIRS. *See* Systemic inflammatory response syndrome (SIRS)  
Sjögren syndrome  
Skin cancer  
Skin lesions, terminology related to  
SLE. *See* Systemic lupus erythematosus (SLE)  
Small bowel obstruction, radiographic findings in  
Social history, described  
Sodium, normal range for  
Sodium loading test  
Somogyi effect  
“Spaghetti and meatballs”  
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Spine, bamboo  
Splinter hemorrhage  
Spondylitis, ankylosing  
Spontaneous bacterial peritonitis (SBP)

Spontaneous pneumothorax, primary  
Squamous cell carcinoma  
Stable angina. *See also* Angina  
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*Staphylococcus* spp.  
*S aureus*  
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Statin(s)  
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Statistics, types of  
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STDs. *See* Sexually transmitted diseases (STDs)  
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*Streptococcus* spp.  
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*S pneumoniae*  
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Streptokinase, contraindications to  
Stroke  
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evaluation of, radiography in  
hypertension and  
risk factors for  
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Struvite stones  
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Subacute thyroiditis  
Subarachnoid hemorrhage (SAH)  
Subdural hemorrhage  
Sulfonylurea(s), side effects of  
Superior vena cava syndrome  
Surgical history, described  
Swallowing difficulty, diet for patients with  
Swan neck deformity  
Syndrome of inappropriate antidiuretic hormone (SIADH)  
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Syphilis  
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Systemic disorders  
Systemic inflammatory response syndrome (SIRS)  
Systemic lupus erythematosus (SLE)  
endocarditis in  
Systolic ejection murmur

# T

Tabes dorsalis

Tachycardia(s)

multifocal atrial

ventricular

Takayasu arteritis

Tdap vaccine

Teeth, lack of, diet for patients with

Telangiectasia

Temporal arteritis

TEN. *See* Toxic epidermal necrolysis (TEN)

Tension headache

Tension pneumothorax

Thalassemia(s)

alpha-

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Thiazide diuretics, for hypertension, contraindications to

Thiazolidinedione(s), side effects of

Thrombocytopenia

platelet transfusion and

Thrombocytosis, essential

Thrombolysis, indications for

Thrombolytics, contraindications to

Thrombotic thrombocytopenic purpura (TTP)

vignette

Thrush, oral

Thyroid disease/disorders

Thyroid gland, function of, evaluation of

Thyroid mass

Thyroid storm

Thyroiditis

de Quervain

Hashimoto

subacute

Thyroid-stimulating hormone (TSH)

action of

vignette

TIA. *See* Transient ischemic attack (TIA)

Tidal volume (TV), defined

Tinea capitis

Tinea corporis

Tinea cruris, vignette

Tinea versicolor

Tissue plasminogen activator (tPA)

after embolic stroke

contraindications to

Todd paralysis

Tonic-clonic seizures

Torsades de pointes

Total lung capacity, defined  
Total parenteral nutrition (TPN)  
    complications of  
    components of  
    fat in  
    indications for  
Toxic epidermal necrolysis (TEN)  
tPA. *See* Tissue plasminogen activator (tPA)  
TPN. *See* Total parenteral nutrition (TPN)  
Tram track lung markings  
Transfusion(s), blood  
Transient ischemic attack (TIA)  
    vignette  
Trichomonas  
*Trichomonas* spp.  
Tropical sprue  
Trousseau sign  
True diverticulum  
True negative, defined  
True positive, defined  
TSH. *See* Thyroid-stimulating hormone (TSH)  
TTP. *See* Thrombotic thrombocytopenic purpura (TTP)  
Tuberculosis  
    diagnosis of  
    extrapulmonary  
    healed primary  
    latent, detection of  
    lung affected by  
    risk factors for  
    secondary  
    signs and symptoms of  
    transmission of  
    treatment of  
Tumor(s). *See also specific types*  
    brain  
    pituitary  
Type and cross  
Type and screen  
Type I error, defined  
Type II error, defined  
Tzanck smear

## U

UC. *See* Ulcerative colitis (UC)  
Ulcer(s). *See also specific types, e.g.,* Peptic ulcers  
    Curling  
    Cushing  
    duodenal  
    gastric

peptic  
perforated, treatment of  
“rodent”

Ulcerative colitis (UC)

vs. Crohn disease

Ulcerative proctitis

Universal donor blood type

Universal recipient blood type

Unstable angina, evaluation of

Uremia

Uremic syndrome

Uric acid stones

Urinary tract infections (UTIs)

delirium in elderly due to

Urine output, normal

UTIs. *See* Urinary tract infections (UTIs)

## V

Vaccine(s), for adults

HBV

influenza

MMR

pneumococcal

Tdap

varicella

Vaginitis

Vaginosis, bacterial

Validity, defined

Valproic acid, side effects of

Valvular heart disease

Variceal bleed

Varicella vaccine

Vasculitis

Vector-borne diseases

Ventricular fibrillation

Ventricular tachycardia (VT)

Vertical nystagmus

Vertigo

Vesicle

Vital capacity, defined

Vitamin(s)

B12, absorption of

fat-soluble

K, in foods

Vitamin deficiencies

A

B<sub>1</sub>

B<sub>2</sub>

B<sub>3</sub>

B<sub>6</sub>

B<sub>12</sub>

C

folic acid

K

zinc

Vitamin K–dependent clotting factors

Vitiligo

Volume(s), lung

Volume status, assessment of

Volvulus

von Willebrand disease, vignette

von Willebrand factor (vWF) deficiency

V/Q mismatch, causes of

VT. *See* Ventricular tachycardia (VT)

vWF deficiency. *See* von Willebrand factor (vWF) deficiency

## W

Warfarin

anticoagulation in patient with, reversal of  
coagulation and

contraindications to

for pulmonary embolism

therapeutic INR levels for patient on

Wart(s), genital

Water, in body mass

Waterhouse-Friderichsen syndrome

Watershed infarct

Wegener granulomatosis

Wermer syndrome

Wernicke aphasia

Westmark signs

Wheal

Whipple disease

“Whitehead”

Wilson disease

Winter’s formula

Wolff-Parkinson-White (WPW) syndrome

WPW syndrome. *See* Wolff-Parkinson-White (WPW) syndrome

Writing notes

## X

X-ray(s), chest. *See* Chest x-ray (CXR)

## Z



Zenker diverticulum  
Zinc, deficiency of  
Zollinger-Ellison syndrome