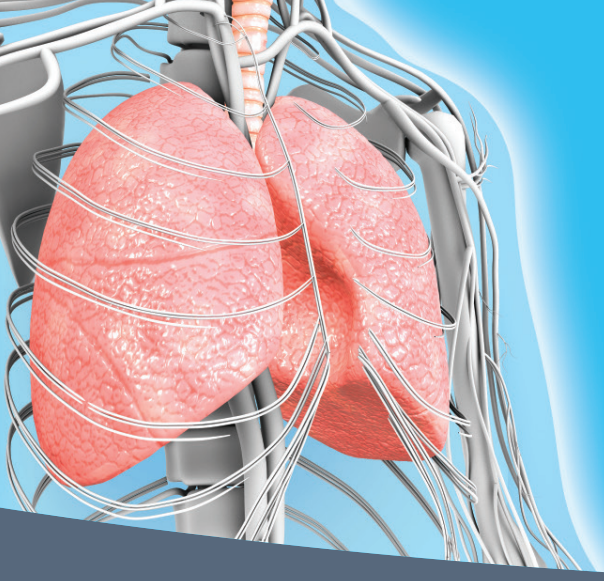
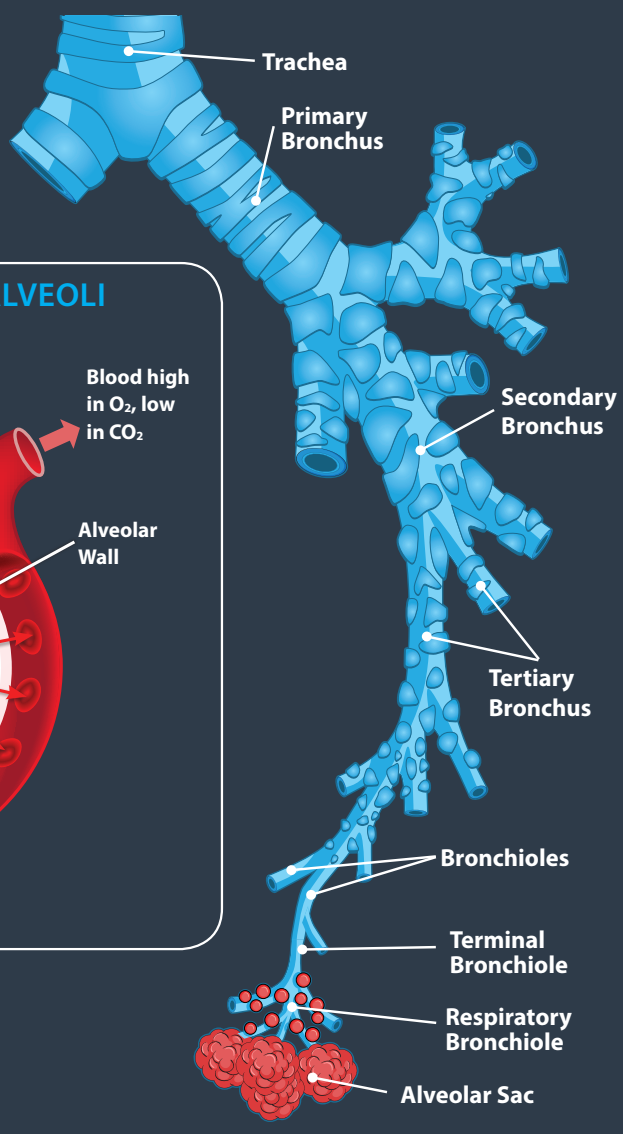
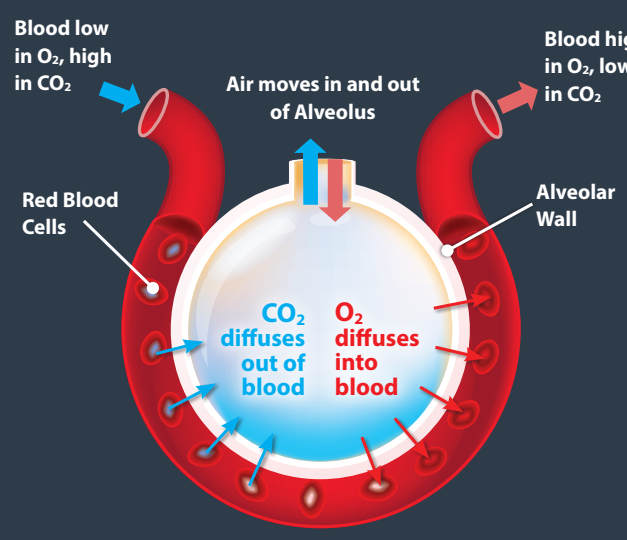


THE RESPIRATORY ASSESSMENT COMPANION

ANATOMY OF THE LUNGS



GAS EXCHANGE IN THE ALVEOLI



In the red blood cells, hemoglobin molecules bond with the oxygen for delivery to the cells.

RESPIRATORY SOUNDS

RHONCHI

Secretions in larger airways

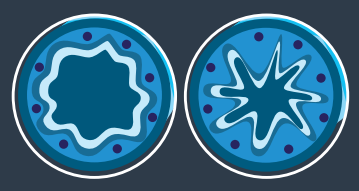
Rumbling, course sounds

May clear with cough or suction

COPD, Pneumonia

WHEEZING

Airway narrowing in Bronchioles



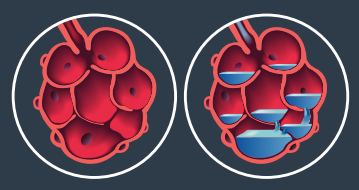
Musical noise during inspiration/expiration

Usually louder during expiration

Asthma, Bronchitis

RALES

Secretions in Terminal Bronchi & Alveoli



Crackles, fluid in Alveoli

CHF, Pneumonia

A STEP-BY-STEP METHOD FOR ANALYZING ABGS

1. Is the pH out of range?
2. Is the pCO_2 normal?
3. Is the HCO_2 out of range?
4. Match the abnormal result with the pH?
5. Does the $PaCO_2$ or HCO_3 go in the opposite direction of the pH?
6. Is the pO_2 and SO_2 out of range?

Reference Ranges

pH	7.35–7.45
pCO_2	35–45 mmHg
HCO_3	22–26 mEq/L
pO_2	80–100 mmHg
SO_2	95–100%

RESPIRATORY ALPHABET SOUP

ABG	Arterial blood gas
CO_2	Carbon dioxide
FiO_2	Fraction of inspired oxygen
HCO_3	Bicarbonate
H_2CO_3	Carbonic Acid
HR	Heart rate
O_2	Oxygen
PO_2	Partial pressure of oxygen
PaO_2	Partial pressure of oxygen in arterial blood
PvO_2	Partial pressure of oxygen in venous blood
PCO_2	Partial pressure of carbon dioxide
$PaCO_2$	Partial pressure of carbon dioxide in arterial blood
pH	Potential of hydrogen
$PvCO_2$	Partial pressure of carbon dioxide in venous blood
SO_2	Oxygen saturation
SaO_2	Oxygen saturation in arterial blood
SvO_2	Oxygen saturation in venous blood
TCO_2	Total carbon dioxide content

TIPS

TO ENSURE ACCURACY OF PULSE OXIMETER

- ✓ Does the capillary refill in less than 3 seconds?
- ✓ Does pulse reading match the heart rate (HR)?
- ✓ Validate with arterial blood gas (ABG).

$pO_2 : FiO_2$ RATIONALE

- ✓ Take the pO_2 from the ABG
- ✓ Divide by the FiO_2
- ✓ Change % to a decimal

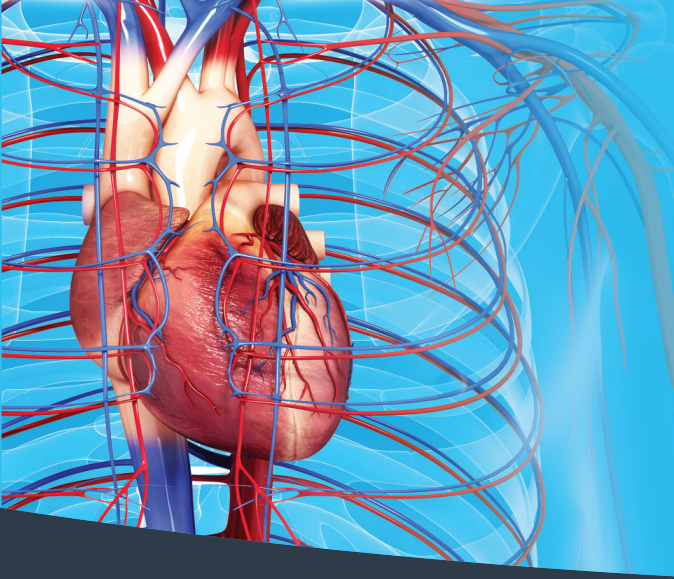
The results should be greater than 300. 200 or less indicates respiratory failure.

FOR BEST OXYGEN SATURATION

Normalize pH and body temperature.

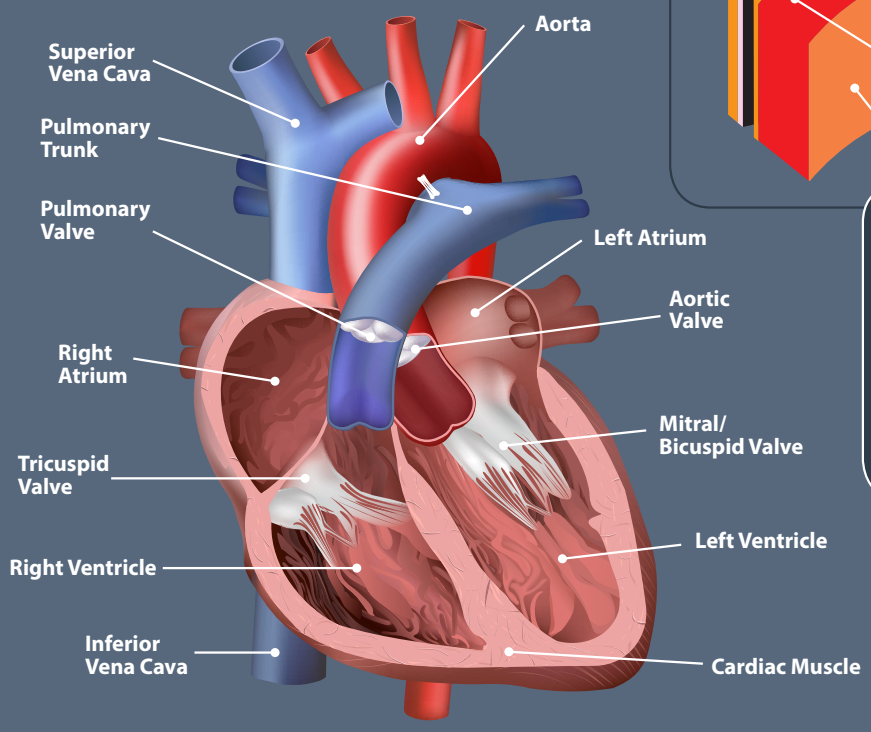
RESPIRATORY QUICK CHECK

Perfusion is best in the bases and in the back. Assess and treat there first.

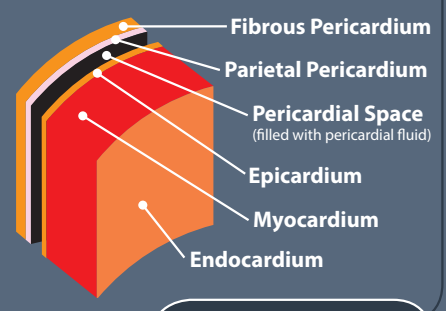


THE CARDIOVASCULAR ASSESSMENT COMPANION

ANATOMY OF THE HEART



THE HEART WALL



The pericardial space (filled with pericardial fluid):

- Limits the movement of the heart
- Protects it from infections coming from other organs
- Prevents excessive dilation of the heart
- Lubricates the heart

ABNORMAL PULSES

WEAK, THREADY PULSE

Cause: Shock

BOUNDING PULSE

Causes: Hyperdynamic phase of sepsis
Hypertension

PULSUS ALTERNANS (STRONG, WEAK)

Cause: Severe cardiac dysfunction

PULSUS PARADOXUS

Causes: Mechanical ventilation
Air trapping (asthma, COPD)
Cardiac tamponade

SHOCK

Shock Type	Fluid Volume	Pulse Pressure
Hypovolemic	↓	Narrow
Cardiogenic	↑	Narrow
Septic	↓	Wide

PERIPHERAL PULSES

0	Absent
1	Diminished, weak
+2	Brisk, expected
+3	Increased
+4	Bounding

FLUID VOLUME: (PRELOAD)

- CVP (0-8 mmHg)
- PAOP (5-12 mmHg)
- JVD
- Dependent edema
- I & O
- Daily weights

RESISTANCE: (AFTERLOAD)

- SVR (800-1400 dynes)
- Diastolic blood pressure
- Skin color and temp
- Capillary refill
- Organ dysfunction

PUMP PERFORMANCE (CARDIAC OUTPUT)

- CO (4-8 L/min)
- Systolic blood pressure
- Skin color and temp
- Organ function

CARDIOVASCULAR QUICK CHECK

Use changes in vital signs to signal changes in hemodynamics. Compare every new measurement to the previous ones, and talk about the change in hemodynamic terms.

HEART ELECTRICAL DISORDERS

SICK SINUS SYNDROME (SSS)

- Heart rate can alternate between slow and fast
- Indicates that the heart's natural electrical pacemaker, the Sinus Node, is not working properly

SINUS TACHYCARDIA

- A harmless, faster rhythm that happens with fever, excitement, and exercise

ATRIAL FIBRILLATION (AF OR AFIB)

- Heart rate is irregular and rapid
- Is caused by disorganized signals from the heart's electrical system

ATRIAL FLUTTER (AFL)

- Heart rate is regular and rapid
- Is caused by a single electrical wave that circulates very rapidly in the atrium

JUNCTIONAL RHYTHM

- Occurs when the AV Node takes over as the primary pacemaker site in the heart either because the SA node has failed or the AV Node is going faster and over takes the SA Node
- Juntional rhythm: 40-60 beats per minute
- Accelerated junctional rhythm: 60-100 beats per minute
- Junctional tachycardia: greater than 100 beats per minute

VENTRICULAR TACHYCARDIA (VT)

- Heart rate that is regular and rapid
- Heart beat starts in the lower part of the heart (Ventricles)

VENTRICULAR FIBRILLATION (VF)

- Heart rate that is regular and rapid which cause the Ventricles of the heart to quiver uselessly, instead of pumping blood
- Causes blood pressure to plummet, cutting off blood supply to the vital organs

PREMATURE CONTRACTIONS

- Extra, early, or "skipped" beats are the most common cause of irregular heart rhythms

LONG QT SYNDROME (LQTS)

- Disorder of the electrical system

HEART BLOCK

- Heart rate is too slow
- Caused when the electrical signals from the upper chambers of the heart (Atria) cannot travel to the lower chambers (Ventricles)

SYNCOPE (FAINTING)

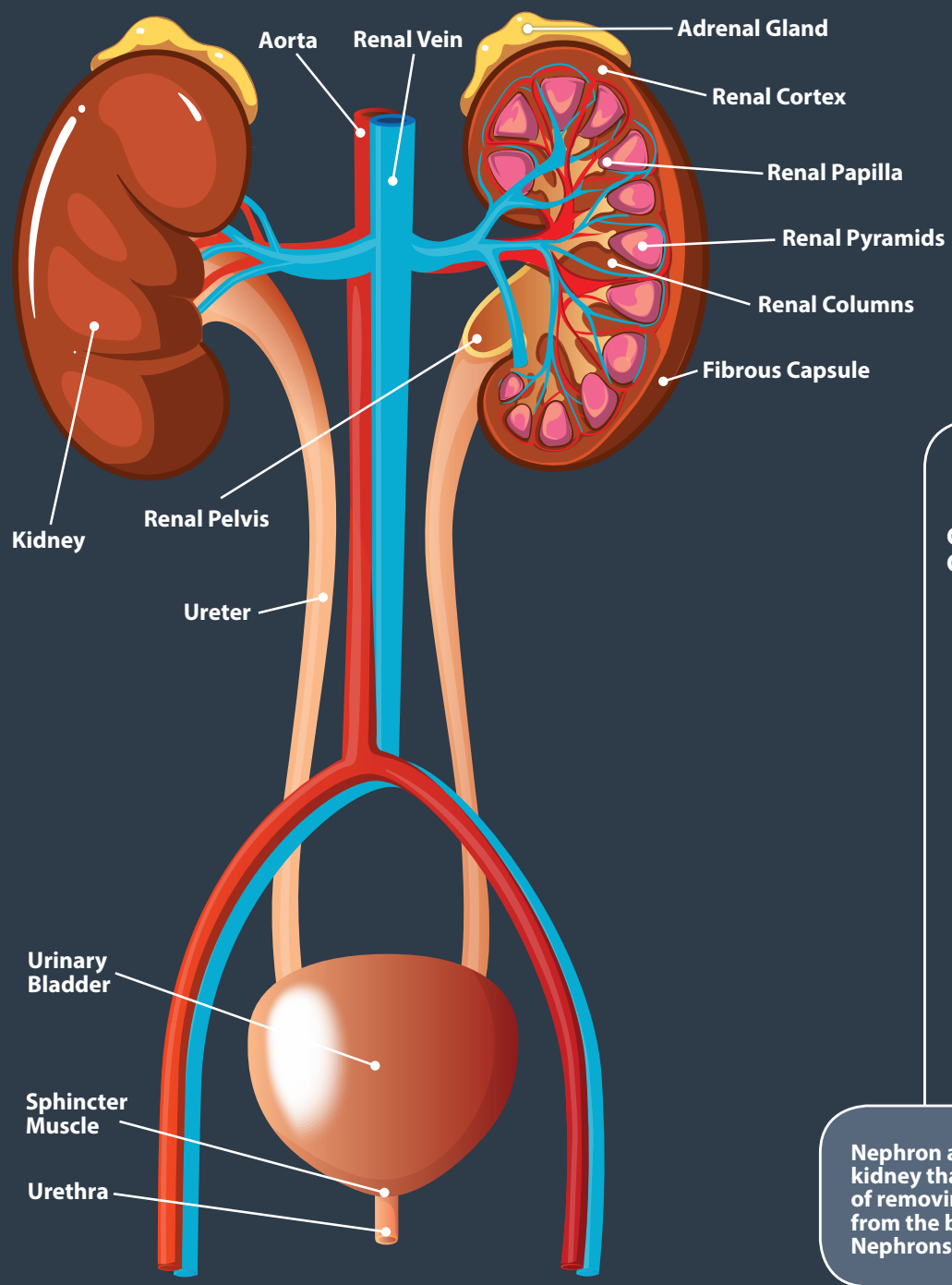
- A heart rhythm disorder that causes fainting or feeling as if one might pass out

S4:
Indicates MI (myocardial infarction) & hypertension
Low pitched and soft
Best heard with the bell

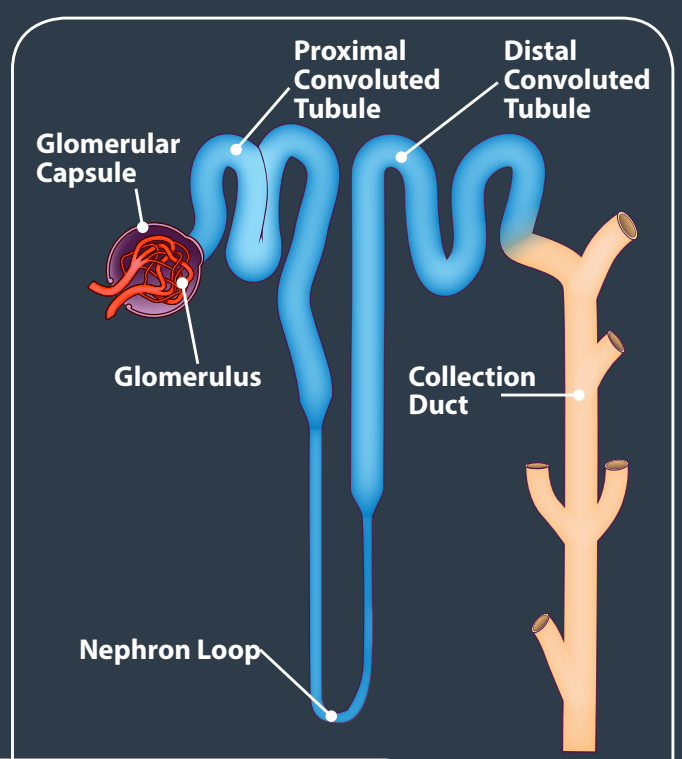
S3:
Indicates CHF (congestive heart failure)
Low pitched and soft
Best heard with the bell

THE GENITOURINARY ASSESSMENT COMPANION

ANATOMY OF THE URINARY SYSTEM



NEPHRON



Nephron are the functional unit of the kidney that produce urine in the process of removing waste and excess substances from the blood. There are about 1,000,000 Nephrons in each human kidney.

GU QUICK CHECK

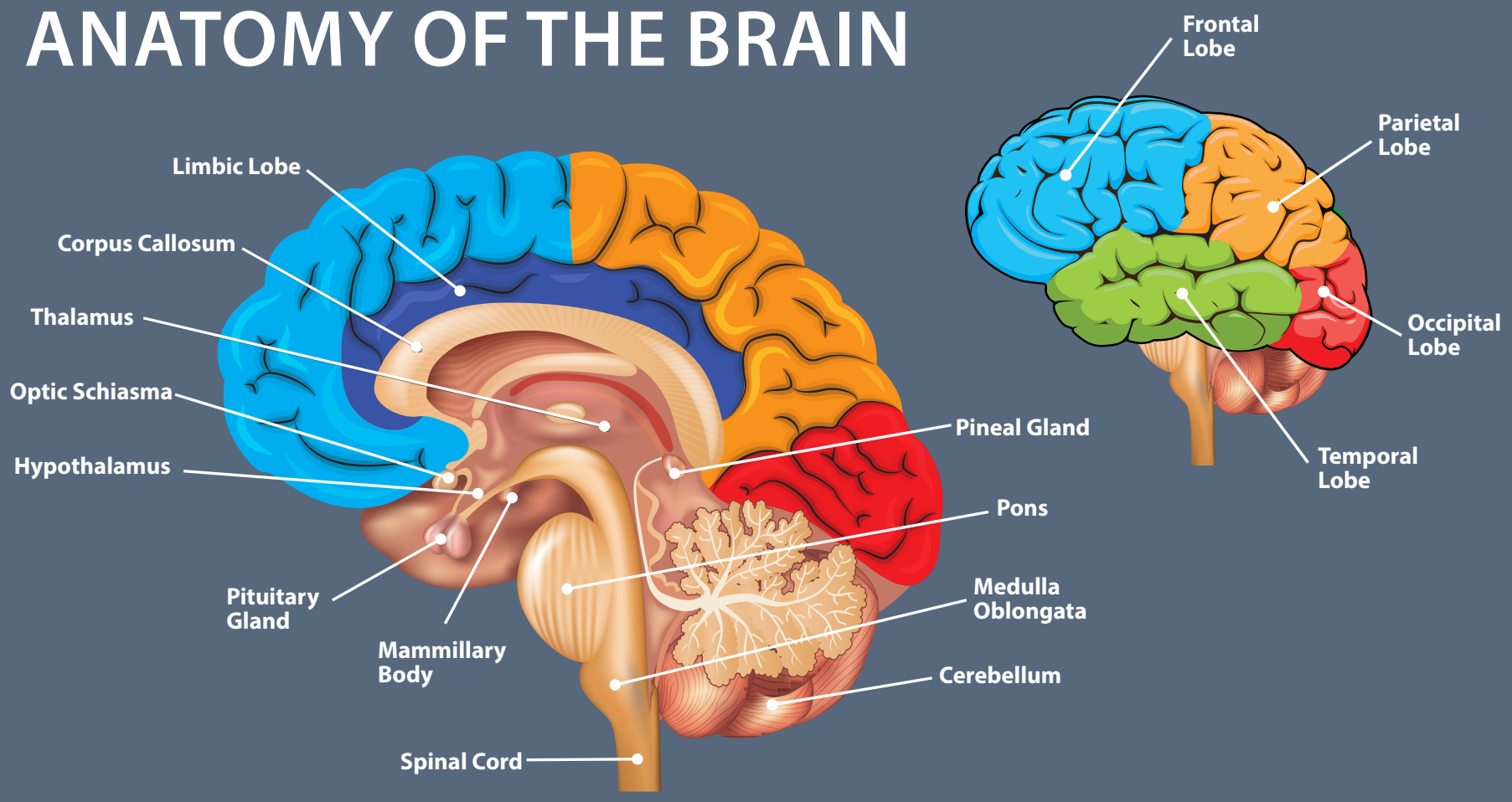
Decreased urine output could be from dehydration or acute renal dysfunction—check the creatinine clearance.

URINE COLOR INTERPRETATION

- **WHITE** — Over hydration
- **PALE YELLOW** — Normal
- **DARK YELLOW** — Dehydration, vitamins
- **AMBER OR HONEY** — Dehydration, vitamins
- **ORANGE** — Dehydration, food, vitamins, liver dysfunction
- **SYRUP** — Severe dehydration, liver dysfunction
- **DARK BROWN** — Severe dehydration, liver dysfunction
- **SMOKEY BROWN** — Drugs
- **PINK OR RED** — Blood, drugs, food
- **BLUE OR GREEN** — Food, bacterial infection, medications

THE NEUROLOGIC ASSESSMENT COMPANION

ANATOMY OF THE BRAIN



5-POINT NEURO CHECK

BEST

1. Behavior
2. Speech
3. Content
4. Arousability
5. Systolic BP

WORST

NEURO QUICK CHECK

CONSCIOUS PATIENT
Watch his/her behavior

UNCONSCIOUS PATIENT
Watch his/her systolic blood pressure

GLASGOW COMA SCALE

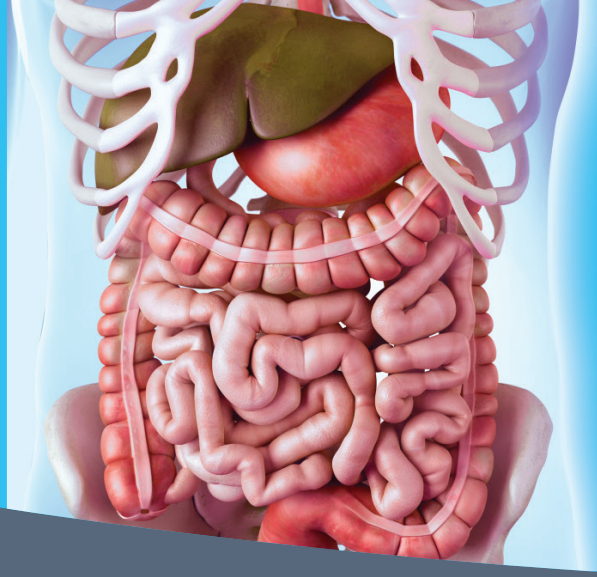
EYE OPENING	E
Spontaneous	4
To speech	3
To pain	2
No response	1

BEST MOTOR RESPONSE	M
Obeys command	6
Localizes pain	5
Flexion-withdrawal	4
Flexion-abnormal	3
Extension	2
No response	1

BEST VERBAL RESPONSE	V
Oriented and converses	5
Disoriented and converses	4
Inappropriate words	3
Incomprehensible sounds	2
No response	1

8 OR LESS:	9 TO 12:	13 TO 15:
Severe head injury	Moderate head injury	Mild head injury

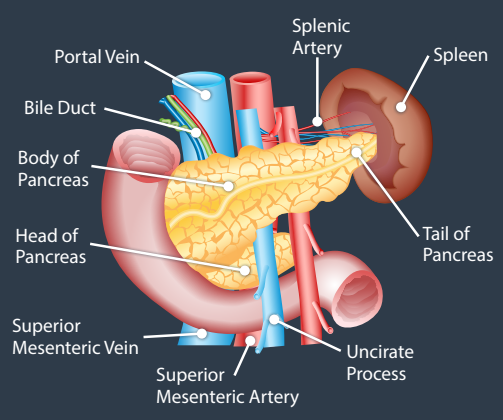
Mortality and functional capacity is inversely related to GCS.



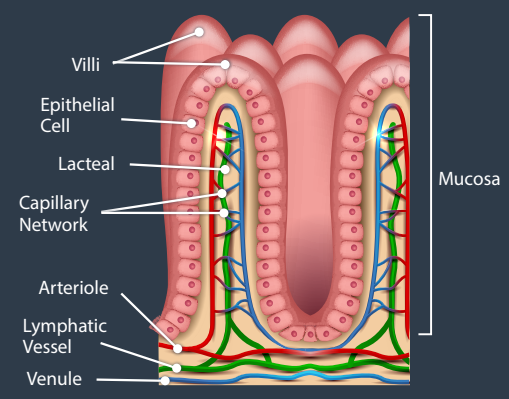
THE GASTROINTESTINAL ASSESSMENT COMPANION

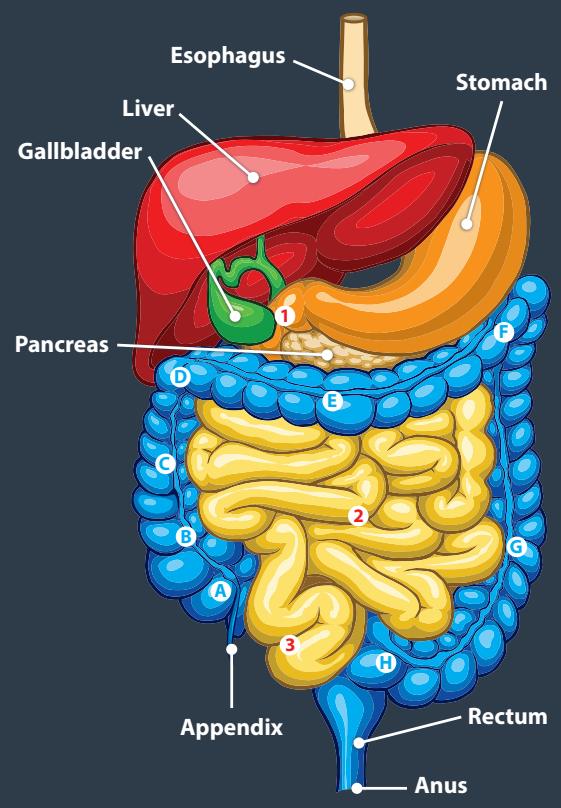
ANATOMY OF THE GI TRACT

PANCREAS



INTESTINAL VILLI





SMALL INTESTINE
1. Duodenum
2. Jejunum
3. Ileum

LARGE INTESTINE
- A Cecum
- B Teniae coil
- C Ascending colon
- D Right colic flexure
- E Transverse colon
- F Left colic flexure
- G Descending colon
- H Sigmoid colon

BACTERIAL FLORA

GOOD FLORA

BIFIDOBACTERIA
Bifidobacteria helps to regulate other bacteria, modulate immune responses to invading pathogens, prevent tumor formation, and produce vitamins.

ESCHERICHIA COLI
Some strains of Escherichia Coli help to produce vitamin K2 and help to keep bad bacteria in check. Bad strains can cause illness.

LACTOBACILLI
Beneficial strains produce vitamins and nutrients, boost immunity, and protect against carcinogens.

BAD FLORA

CAMPYLOBACTER
Some strains of Campylobacter are most commonly associated with human disease. Infection usually occurs through ingestion of contaminated food.

ENTEROCOCCUS FAECALIS
Can cause endocarditis and septicemia, urinary tract infections, meningitis, and other infections in humans. Common cause of post-surgical infections.

CLOSTRIDIUM DIFFICILE
Causes colitis by producing toxins that damage the lining of the colon. Most harmful following a course of antibiotics when it is able to proliferate.

HOW DIGESTION WORKS

MOUTH
Chewing breaks food into smaller pieces, mixing it with enzymes in your saliva. Starches begin to digest.

ESOPHAGUS
The esophagus moves the food from the mouth to the stomach.

STOMACH
The food mixes and grinds with gastric juices, which help digest proteins and other foods while minimizing harmful bacteria.

LIVER
The liver produces bile which is released into the small intestine. It helps to break down fats and fatty acids so they are more easily absorbed.

GALLBLADDER
A storage tank for the extra bile produced by the liver. The gallbladder releases the bile into the small intestine when it is needed.

PANCREAS
Connected to the top of the small intestine, the pancreas manufactures three important enzymes to digest lipids, carbohydrates, proteins, and nucleic acids. It also produces Insulin which controls the amount of sugar in the blood.

SMALL INTESTINE
Most of the nutrients from the food is absorbed through the intestine lining known as the mucosa.

LARGE INTESTINE
What is left over from the small intestine travels into the large intestine. Here, water, fat-soluble vitamins, and minerals are absorbed. Living bacteria called flora break down and extract what small amount of nutrients are left. The waste left over will then exit the body.

GI QUICK CHECK

Absent bowel sounds and abdominal pain signal bowel infarction.

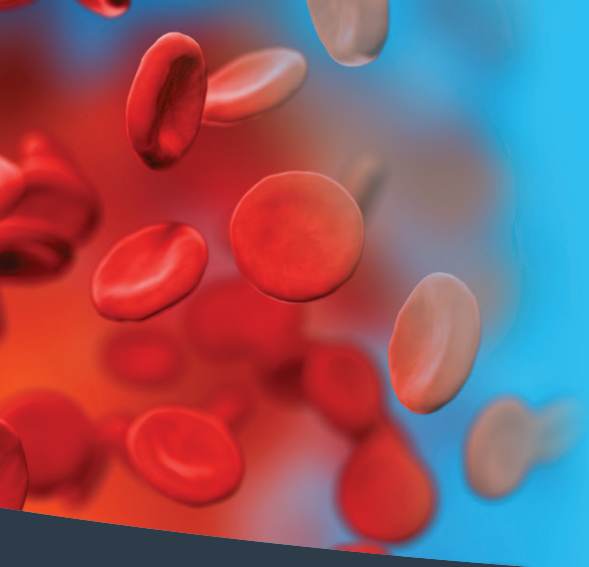
BOWEL SOUNDS

HYPERACTIVE	HYPOACTIVE
Diarrhea GI bleeding Colitis Enteritis	Infarction Perforation Ileus Narcotics Surgery

SIGNS OF PERITONITIS

- Pain
- Rebound tenderness
- Diminished bowel sounds
- Taut abdominal muscles
- Nausea / vomiting
- Fever
- Shock
- Respiratory failure

Condition	HCT	BUN
Dehydration	↑	↑
GI Bleed	↓	Norm
Overhydration	↓	↓



THE PATHOLOGY ASSESSMENT COMPANION

LABS TO WATCH

Basic Metabolic Panel

	Normal Values
Glucose	70-100 mg/dL
Calcium	9.0-10.5 mg/dL
Sodium	135-145 mmol/L
Potassium	3.5-5.0 mEq/L
CO2	23-29 mmol/L
Chloride	95-103 mEq/L
BUN	8-20 mg/dL
Creatinine	0.7-1.2 mg/dL

Complete Blood Count

	Normal Values
White blood cells (WBC)	4500-10000
Red blood cells (RBC)	4.2-6.1
Hemoglobin (Hb)	12.1-17.2
Hematocrit (HCT)	36-50%
Platelets	150,000-450,000
Mean corpuscular volume (MCV)	80-95
Mean corpuscular hemoglobin (MCH)	27-31

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