

# Diagnostic and Assessment Procedures

Diagnostics, Infection Control and Sterilization



# Lesson Objectives:

1. Patient vital signs
2. Review collecting patient vital signs
3. List and define commonly used imaging studies
4. Discuss basic blood and urine chemistry tests
5. Describe different methods of tissue biopsy
6. Discuss cancer screening

# Introduction

- **Assessment** – First step in medical and surgical decision-making.
- **Assessment data** may include:
  - Vital Signs
  - Head to Toe Assessment of Body Systems
  - Laboratory Testing
  - Imaging Studies
- Tests and procedures done to rule out or confirm diagnosis
- Testing may provide guidance on what type of procedure (from below) is ideal for the patient
  - Invasive procedures
  - Noninvasive procedures
  - Minimally-Invasive and Endoscopic procedures

# Sources of Patient Data

## History and Physical Examination includes:

- History and Physical
- Diagnostic Imaging
- Laboratory findings
- Electrical studies
- Endoscopic studies
- Pulmonary diagnosis

**HISTORY and PHYSICAL**

Name \_\_\_\_\_  
DOB \_\_\_\_\_  
Date \_\_\_\_\_ Age

C C: \_\_\_\_\_  
H P I: location, quality, severity, duration, timing, context, modifying factors, associated symptoms  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PAST MEDICATIONS		ALLERGY
_____ _____ _____		_____ _____ _____

medications • environmental • reaction

Tobacco ☐ present ☐ past ☐ never  
Alcohol ☐ present ☐ past ☐ never  
Drugs ☐ present ☐ past ☐ never

Exercise yes no sometimes  
Seat belts yes no sometimes

**PREVENTION**

Prevention	Yes	No	Explain
PAP			
Mammogram			
Glaucoma			
Serum Lipids			
PPD			

Health Good  
Prostate  
Glucose  
Tetanus Vac  
Influenza Vac

Risk Factors  
Toxic Exposure  
Travel  
Transfusion  
Healthy diet  
Pills  
Loaded guns  
Pneumonia Vac  
DNR

Discussed Given

Past Medical/Six History	Family History	Social History
Diabetes	Cardiac problem	Thyroid
Hypertension	Cancer	Glaucoma
Pneumonia	TB	Stroke
Gallbladder	Hysterectomy	Appendix
R L Hip	R L Knee	R L Foot
Colon	Heart	Stomach
Prostate	Breast	Tonils

DM  
CAD  
HTN  
CA  
TB  
Stroke  
Cataracts

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# Concepts Related to Pathology

(Slide 1 of 2)

## **Pathology Overview:**

- Study of disease and specific illnesses.
- Etiology: cause of disease; "etiology unknown" if cause is unclear.
- Morbidity: illness rate; mortality: death rate in a population.

## **Disease Assessment Terms:**

- Course: progression of disease; pathogenesis: origin and development.
- Signs: measurable evidence (e.g., rash, fever); symptoms: patient-reported experiences.

## **Disease Events:**

- Complication: separate from primary problem but occurs simultaneously or as a consequence.
- Exacerbation: worsening of condition; syndrome: unique group of signs.

# Concepts Related to Pathology

(Slide 2 of 2)

- **Course of Disease:**
  - Prognosis: prediction of outcome; expressed as excellent, good, poor, etc.
  - Relapse: recurrence after remission; terminal: illness leading to death.
  - Acute: sudden onset; chronic: long-term condition.
- **Treatment Vocabulary:**
  - Curative: resolves medical problem.
  - Palliative: makes condition more tolerable without curing it.



# Assessment Data: Vital Signs

- Crucial for overall assessment.
- Surgical technologists may be responsible for measurement, documentation, and reporting.

## **Vital Signs Include:**

- Temperature
- Pulse
- Respirations
- Blood pressure
- Oxygen saturation



# Vital Signs - Temperature

- **Methods of Measuring Temperature**

- Oral (Measures under the tongue)
- Temporal (Forehead)
- Tympanic (Ear)
- Rectal (will be +1 Degree)
- Axillary (Armpit, will be –1 Degree)

- **Documenting temperature**

- Record in Celsius.
- Tympanic artery thermometer (TAT) preferred in clinics.

- **Normal Range**

- 96.8° F (36°C) - 100.4°F (38°C)

## Oral

- Range: 96.4° to 99.1°F

## Temporal Artery

- Range: Approximately 0.8°F

## Rectal

- Range: 0.7° to 1°F

## Axillary

- Range: 0.5° to 1°F



# Vital Signs - Pulse / Heart Rate

- Reflection of stroke volume.
- Felt in artery as it expands with each heartbeat.
- **Normal Heart Rate:**
  - Varies by age, condition, and metabolic level.
  - Adult: 60 to 100 beats per minute.
- **Strength of Pulse:**
  - Elastic and moderate strength is normal.
  - Bounding: exceptionally strong.
  - Weak or thready: barely palpable.

# Vital Signs - Pulse / Heart Rate

- **Measurement Technique:**

- Palpate artery, typically radial.
- Use pads of first three fingers.
- Count beats for 30 seconds and multiply by 2.
- For irregular pulse, count for a full minute.

## How to Check Your Heart Rate:

- 1 Place your index and middle finger on your wrist, right below the base of your thumb.
- 2 When you feel your pulse, use a clock or timer and count the number of times your heart beats in 30 seconds.
- 3 Once 30 seconds is up, multiply the number of beats you counted by two. (A typical resting heart rate is between 60–100 beats.)



# Vital Signs - Respirations

- Objective assessment of the number of breaths per minute
- **Measured when patient is unaware**
  - Do not tell patient you are measuring their respirations!
  - Tip: Count respirations right after checking Pulse
- **Documenting respiration**
  - Breaths per minute
  - Count number of breaths in 30 seconds, and multiply by 2
- **Normal Range**
  - 12-20 breaths per minute

# Vital Signs - Blood Pressure

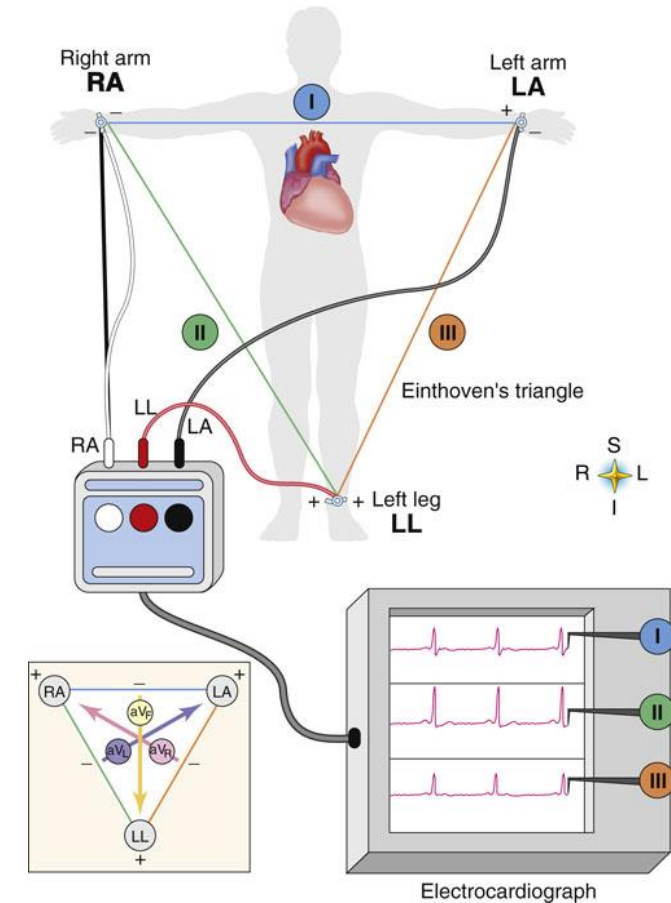
- **Systolic pressure** (when heart is ejecting blood)
  - Greater pressure
- **Diastolic pressure** (when heart is refilling)
  - Lower pressure
- **Documenting blood pressure**
  - Write the systolic pressure over the diastolic pressure
- **Normal Range**
  - Systolic  $\leq 120\text{mmHg}$
  - Diastolic  $\leq 80\text{mmHg}$

- **Mean arterial pressure (MAP)**
  - Average overall pressure.
  - $(\text{Systolic BP} + 2 \times \text{Diastolic BP}) / 3$



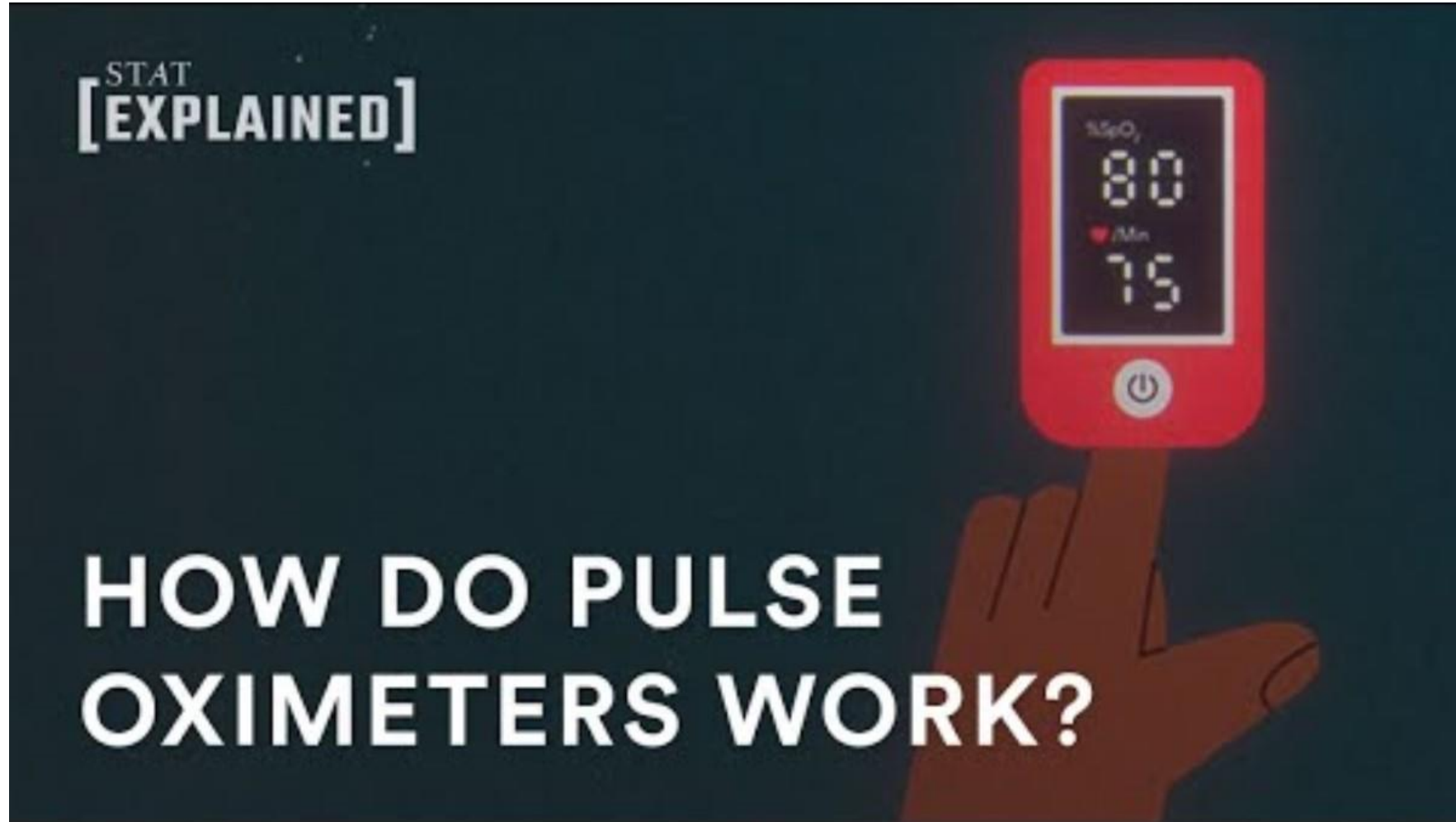
# Vital Signs - Oxygen Saturation

- Measured with pulse oximeter that attaches to the finger
- Determines level of oxygen in the blood using spectrometry
- Normal Range
  - $\geq 95\%$



**Watch the "Pulse Oximeter" Video to get  
an understanding of how this device works**

# Pulse Oximeter Video



# Pulse Oximeter Video

## Summary of the Video:

- Pulse Oximetry works by detecting light that goes through the patient's finger
- 95% or Higher is the Normal Range
- These factors can give incorrect readings:
  - Darker Skin
  - Cold Fingers
  - Nail Polish



## **Watch the "Vital Signs" Video for an overview of:**

- Vital Signs
- Normal Values
- Demo of how to collect Vital Signs from a Patient

# Vital Signs with Skills Demo Video



# Vital Signs with Skills Demo Video

## Summary of Video:

- Temperature: 36-38°C
- Heart Rate: 60-100bpm
- Respiration: 12-20 breaths per minute
- BP  $\leq$  120/80mmHg
- O2 Sat:  $\geq$  95%

# Electrocardiogram (ECG)

(Slide 1 of 2)

- **Introduction to Electrocardiography (ECG):**

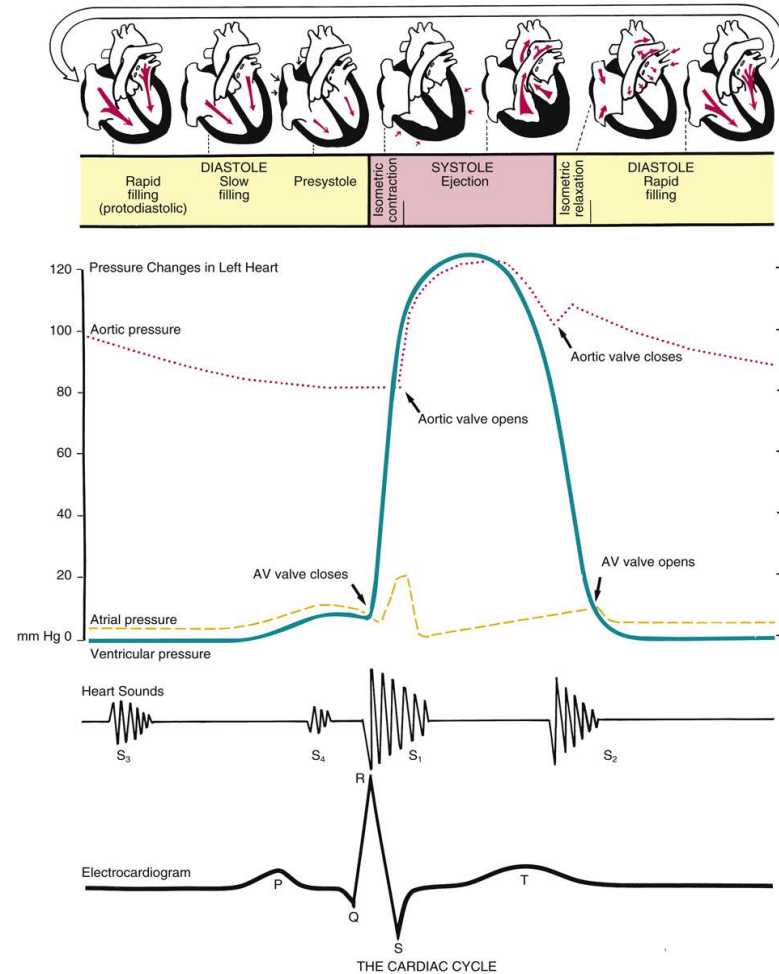
- Measures heart's electrical activity.
- Displayed on electrocardiogram (ECG) graph.

- **Procedure:**

- Electrodes placed on chest wall and extremities.
- 12-lead ECG for comprehensive assessment, 3-lead for basic evaluation.

- **Monitoring:**

- Routine during general anesthesia, sedation, and postoperative period.
- Essential for high-risk patients.



# Electrocardiogram (ECG)

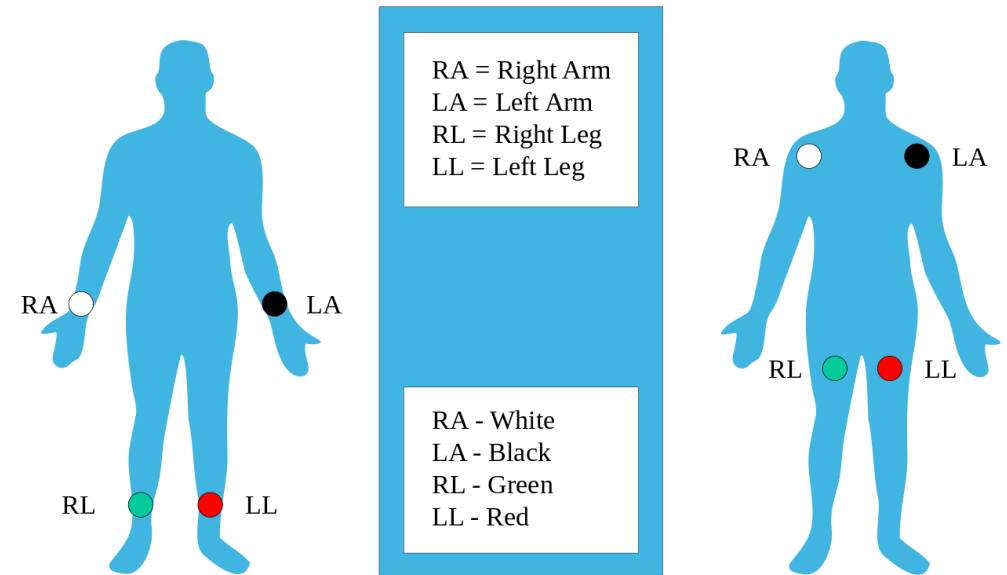
(Slide 2 of 2)

- **Operation of ECG Machine:**

- Console with paper roll for graphing.
- Automatic feed when activated.
- Graphs electrical activity by time and impulse strength.

- **Diagnostic Importance:**

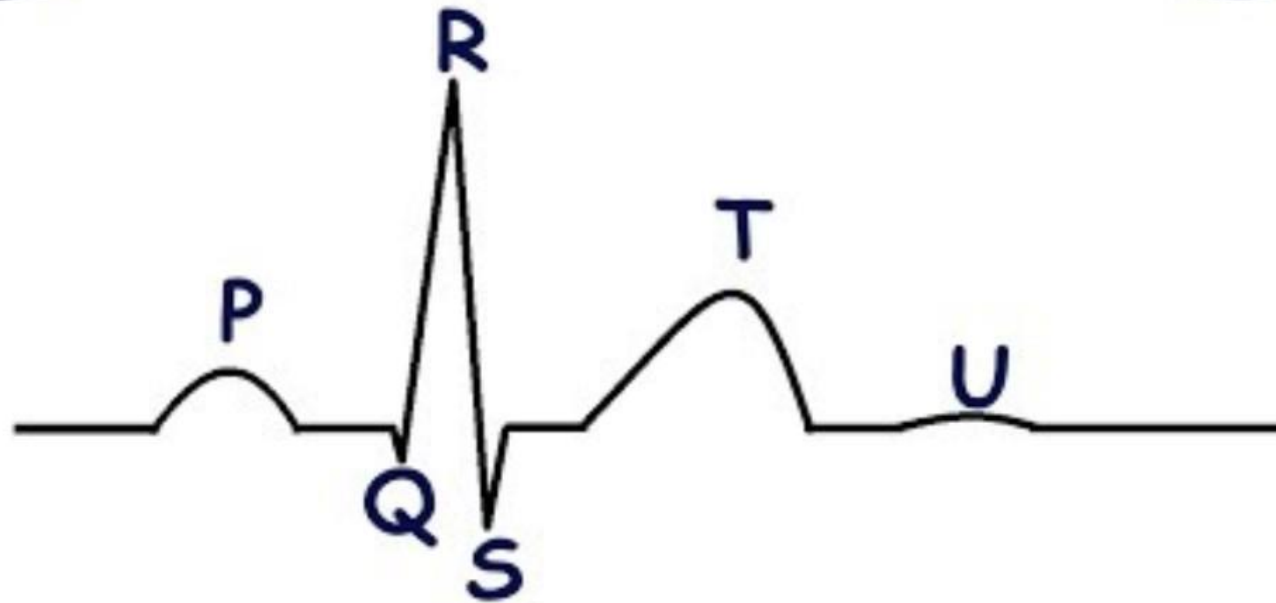
- Provides detailed information on heart conduction.
- Graphs phases of cardiac conduction system.
- Identifies abnormalities indicative of disease, disorders, or drugs.



**Watch the "ECG Waves" Video for a  
more detailed explanation of the ECG**

# ECG Waves Video

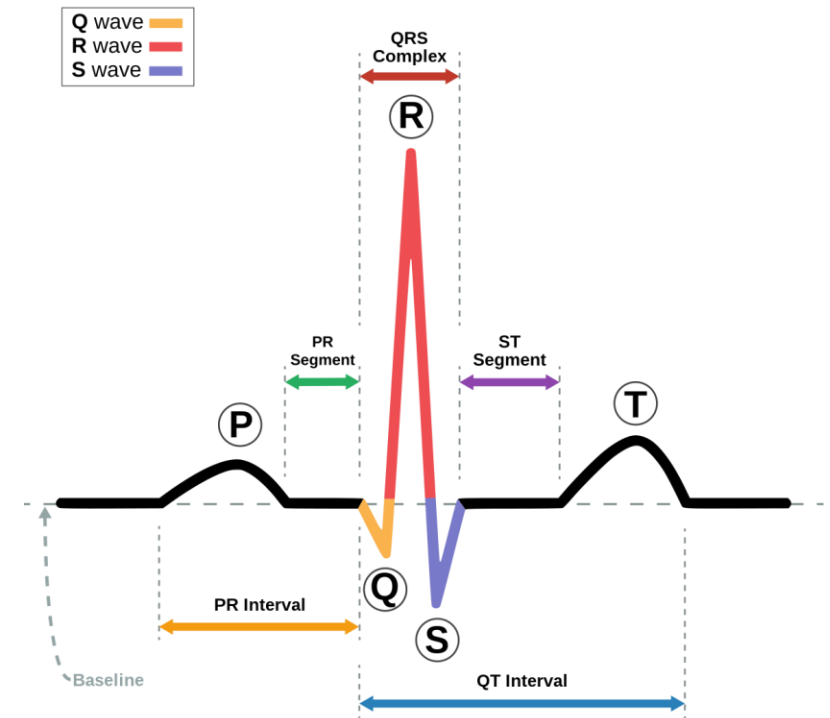
## ECG waves



# ECG Waves Video

## Summary of Video:

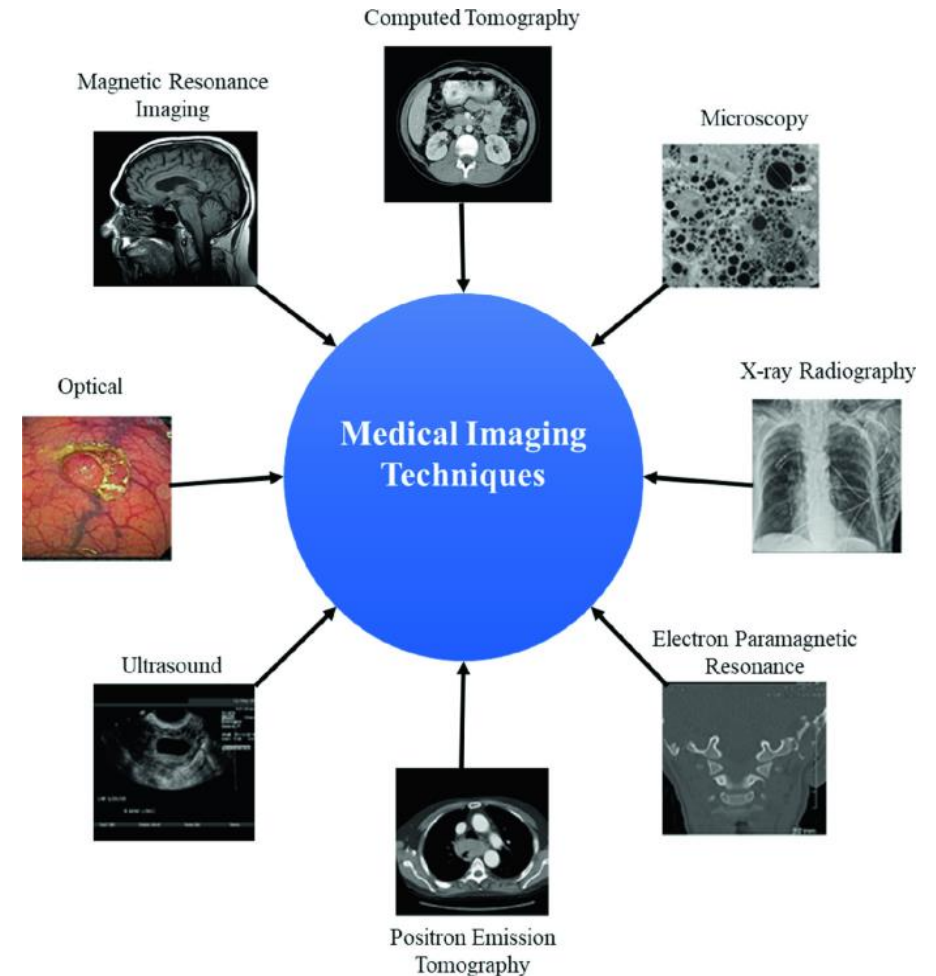
- P Wave = Atrial Depolarization (Contraction)
  - Atrium (Upper chambers of the heart) fill the Ventricles (lower chambers)
  - This is Diastole, when the heart is filling
- QRS Complex = Ventricular Depolarization (Contraction)
  - Ventricles Eject blood to the body
  - This is Systole, when the heart is ejecting





# Imaging Studies

- **Introduction to Imaging Procedures**
  - Provide anatomical "picture" of patient.
  - Reveal function and shape of regional anatomy.
- **Types of Imaging Studies**
  - Radiology
  - Radiography
  - Fluoroscopy
  - Computed tomography (CT)
  - Magnetic resonance imaging (MRI)
  - Positron emission tomography (PET)
  - Ultrasound
  - Doppler



# Imaging Procedures – Radiology

- **Radiology:**
  - X-rays penetrate body tissue at different rates.
  - Historically recorded on film, now digitally via digital radiography (DR).
  - Displays contrasts in density, aiding diagnosis.

# Imaging Procedures – Radiography

- **Standard Radiography:**
  - Obtained with fixed or portable machines.
  - Commonly used during orthopedic, biliary, and vascular surgery.
  - Intraoperative use with Bucky platform or portable film stand.
- **Contrast Radiography:**
  - Uses contrast medium to highlight organs or vessels.
  - Commonly used in cholangiography, angiography, retrograde pyelography, and gastrointestinal studies.
- **Digital and Computed Radiography:**
  - DR captures X-rays with flat panel detectors.
  - Computed radiography uses photo-stimulated luminescent screen.
  - Both methods produce digital images with lower radiation doses.

**Watch the "Diagnostic Imaging Explained" Video for differences between the most common imaging studies and why they are used**

# Diagnostic Imaging Explained Video



# Diagnostic Imaging Explained Video

## Summary of Video:

- X-Ray
  - Bones, Fractures, Dislocations
  - Quick and Cost Effective
  - 2D Only
- CT Scan
  - Many X-Rays to give overall 3D image
  - Can give better imaging for complex body parts
- Ultrasound (Doppler)
  - Sound waves give imaging
  - Easy, Real-time and non-invasive
- MRI
  - Discs and Joints
  - No Radiation
  - Expensive, longer to perform

# Imaging Procedures

- **Fluoroscopy:**
  - Real-time X-ray imaging with digital technology.
  - Used diagnostically and intraoperatively during procedures with contrast media.
- **Mobile C-Arm:**
  - Real-time imaging in surgery.
  - Offers multiple imaging angles with movement along the axis of the operating table.
- **O-Arm:**
  - Image-guided system for spinal surgery.
  - Produces real-time 3-D images with superior accuracy and reduced radiation exposure

# Imaging Procedures – Uses of Fluoroscopy

- Angiography
- Cholangiography
- Urography
- Bone
- Catheter
- Aim instrumentation





# Imaging Procedures

- **Computed Tomography (CT):**

- Produces high-contrast cross-sectional images.
- Precise tissue differentiation and dimension determination.
- used for abdominal viscera, pregnancy assessment, vascular flow, and echocardiography.

- **Ultrasound:**

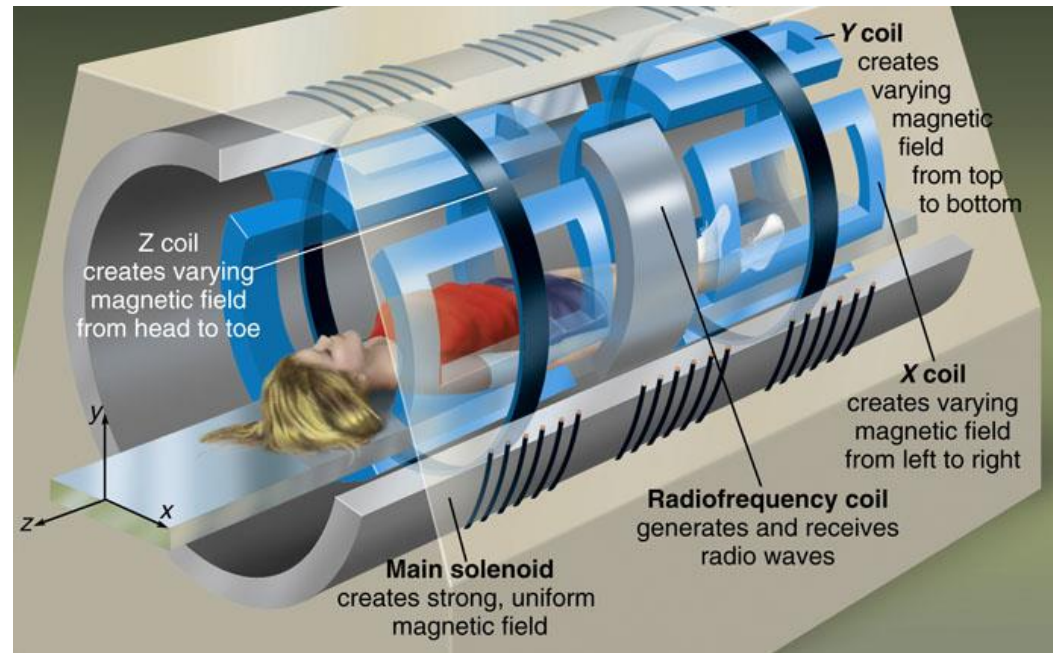
- Uses high-frequency sound waves for real-time imaging.
- Commonly used for abdominal viscera, pregnancy assessment, vascular flow, and echocardiography.

- **Positron Emission Tomography (PET):**

- Combines CT and radioactive scanning.
- Images metabolic processes rather than structures.

# Imaging Procedures

- **Magnetic Resonance Imaging (MRI):**
  - Produces high-definition images using radiofrequency signals and magnetic fields.
  - Detects structural abnormalities but poses risks with metal presence.



# Electrodiagnostic Studies Electrical activity measured and analyzed

## Electrocardiography ECG (EKG)

- Heart disorders

## Electroencephalography (EEG)

- Electrical Activity of Brain

## Electromyography

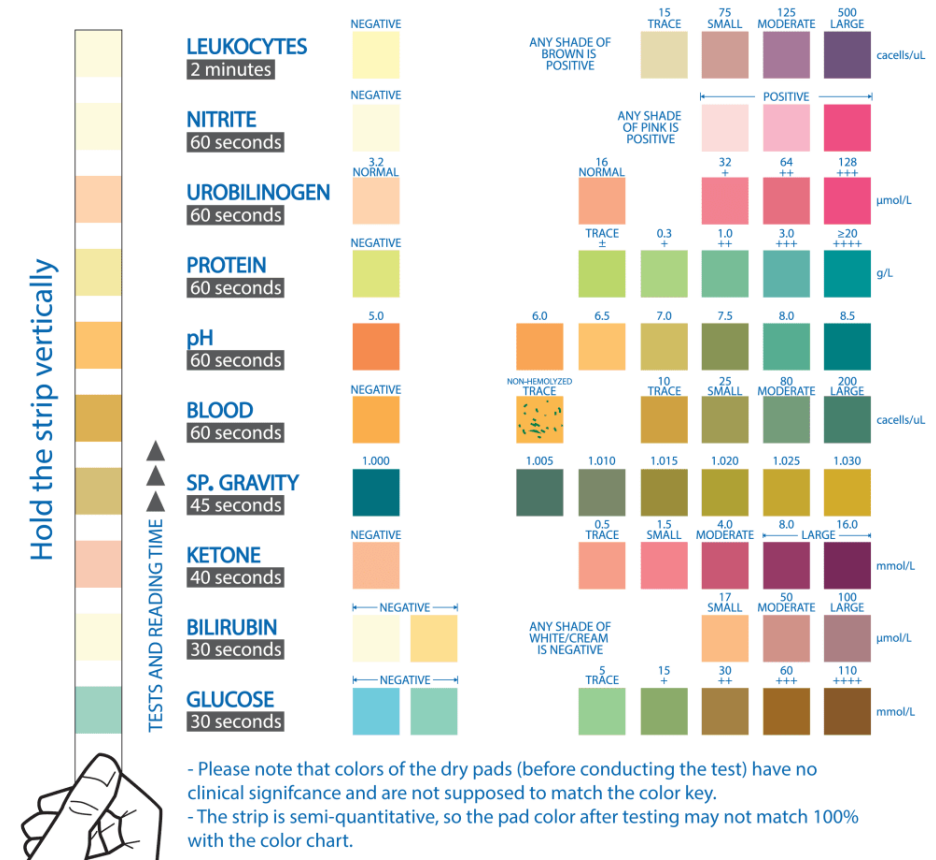
- Electrical Activity of Skeletal Muscle

# Blood Tests

- **Complete blood count (CBC)**
  - Looks at Red and White Blood Cells
  - Can Help Identify Anemia and Infection
- **Metabolic panel**
  - Looks at how the body uses energy (Metabolism)
  - Blood sugar, Liver/Kidney Health, Acid/Base Balance, Fluid/Electrolyte Balance
- **Coagulation tests**
  - Looks at how a patient will clot. Can identify risk for bleeding
  - Important for surgery, as risk for bleeding is high
- **Arterial blood gases**
  - Looks at Oxygen and CO<sub>2</sub> and Acid/Base (pH).
- **ABO groups**
  - Blood typing. Important for Surgical procedures where a blood transfusion may be needed
- **Electrolytes**
  - Electrolyte imbalance can result in severe physiological disturbances

# Urinalysis

- Can help identify Liver Disease, Kidney Disease, Diabetes, and Urinary Tract Infections
- **Urinalysis will look at:**
  - Albumin
  - Bilirubin
  - Glucose
  - Ketones
  - Leukocytes
  - Blood nitrite
  - Urobilinogen
- **Assessment Parameters:**
  - pH
  - Specific gravity
  - Color, clarity, and odor of urine.



# Microbiological Studies

- Microbiology or "Culture" is done to detect infective microbes. This is a surgical specimen that may be sent to the lab during a procedure
- Helps the Surgeon identify what infective microbe is present, so correct treatment can be done – such as Antibiotic Therapy treating the specific organism
- Culture and sensitivity
  - Culture: Sample of the organism is allowed to incubate on a medium
  - Sensitivity: Exposes culture to a variety of antibiotics
- Common Microbiology Tests: Gram Stain, Aerobic, Anerobic, Fungal, AFB
- It is important to not have Microbiology Specimens come into contact with Antibiotics, as this could potentially destroy the organism being cultured

# Correct Handling of Specimen



## Calculi

- NO formalin

## Amputated limbs

- Morgue
- Return?

## Bullets

- Do not scratch
- Police

## Removed prostheses

- NO formalin

# Pathological Examination of Tissue

- **Introduction to Pathology:**

- Study of diseases.
- Tissue pathology: examination of tissue for disease presence.

- **Tissue Biopsy:**

- Removal of tissue for analysis and diagnosis.
- Protocols vary based on tissue type and analysis method.

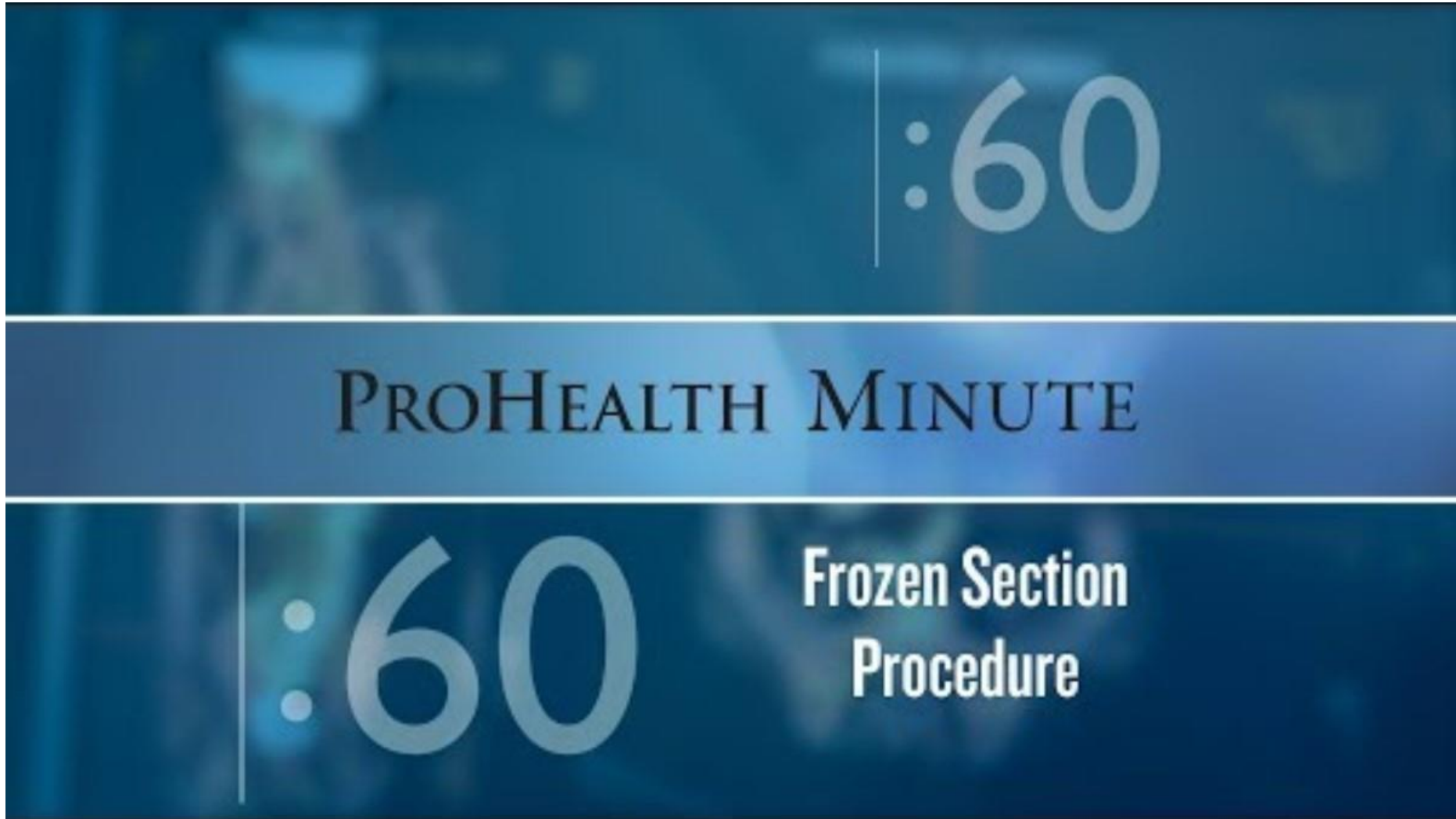
- **Types of Biopsy:**

- Excision: surgical removal for disease check.
- Needle or trocar biopsy: removal with hollow needle.
- Brush biopsy: sweeping cavity for cells.
- Aspiration biopsy: spraying specimen on microscope slide.
- Frozen section: immediate microscopic examination after freezing (looks for cancerous tissue)



**Watch the Frozen Section Video for a brief overview of the process**

# Frozen Section Procedure Video



# Frozen Section Video

## Summary of Video:

- Frozen Section gives nearly immediate results
  - Infective Tissue
  - Malignant or Benign Mass
- Used when unexpected mass is found during surgery

# Cancer Terms and Concepts

(Slide 1 of 2)

- **Definitions:**
  - Neoplasm or tumor: abnormal growth.
  - Malignant vs. benign tumors.
  - Terminology with "-oma" refers to tumor.
- **Comparison of Tumors:**
  - Benign: resembles origin tissue, encapsulated.
  - Malignant: disorganized, invasive, metastatic.
- **Effects of Malignancy:**
  - Thrombosis, pain, cachexia, anemia.
  - Changes in target tissue function.

# Cancer Terms and Concepts

(Slide 2 of 2)

- **Diagnostic Methods:**
  - Tumor markers.
  - Biopsy: tissue, cells, or fluid.
  - Tumor staging: TNM classification system.
- **Cancer Prevention and Screening:**
  - Early treatment possibility.
  - Public health promotion and screening.
- **Nuclear Medicine:**
  - Use of radioactive particles for diagnosis and treatment.
- **Radiation Therapy:**
  - Tissue destruction by ionizing radiation.
  - Delivery systems: needles, seeds, implants.

# READ CHAPTER 6 FROM THE E-BOOK

Read **Chapter 6** from your E-Book to pass the upcoming quiz from **Surgical Technology - Elsevier eBook on VitalSource, 8th Edition**.

[Click Here](#) to read chapter 6!

# Thank you!

Get ready for your quiz and rest of the activities now. Best of luck!



# Congratulations!

Lesson 6 is complete.