Fanshawe College CHIMA Clinical Knowledge Study Guide

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BHELA, TARANJIT; BISSOONDIAL, RADICA; CORRÊA REIS, RICARDO; QUAISIE, ALEXANDER; SHARMA, MARYADA; SINGH, AASTHA; AND WIEBE, TIA

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Foreward

Fanshawe College School of Information Technology's Health System Management post-graduate program earned its accreditation by the Canadian College of Health Information Management (CCHIM) as of Fall 2022. The accreditation enabled graduates of Health Systems Management to be eligible to sit and write the Certified in Health Information Management (CHIM) National Certification Exam (NCE). Since acquiring accreditation, Health Systems Management alumni who have proceeded to write their CHIM NCE have maintained an above-average pass rate when compared to other academic institutions in Canada, accredited by CCHIM.



Dr. Radica Bissoondial, BSc, MHA, MEd, DHA, CHIM

Yet, feedback from alumni has been that resources on the practice area of 'clinical knowledge' are either overwhelming or limited for preparation to sit and write the national certification examination. This does not negate the resources of the program nor those shared by CCHIM or other publicly available resources.

This then led me, Dr. Radica Bissoondial, Health Systems Management Professor and Program Coordinator, to reach out to alumni of the program who have earned their CHIM credential to collaborate and create a study guide that has two (2) key purposes:

1. Provide a resource that can be shared with those studying to earn their CHIM, and
2. Use the study experience in alignment with the practice area competencies.

The outcome is this study guide. It was created as a guide to supplement and enhance those preparing for their CHIM NCE in the practice area of 'clinical knowledge'. It is developed with an expansion of the practice area competencies, followed by elaborating on the 12 body systems in areas of medical terminology, physiology and pathophysiology. Each body system chapter is followed by a micro assessment to test knowledge.

Health Systems Management alumni and CHIM who contributed to this study guide are:

- Taranjit Bhela, CHIM
- Ricardo Corrêa Reis, CHIM
- Alexander Quaisie, CHIM
- Maryada Sharma, CHIM
- Aastha Singh, CHIM
- Tia Wiebe, CHIM

This study guide was supported and endorsed by:

- Ms. Tina Lewis, CHIM, Health Information Project Coordinator, CHIMA

We would like to acknowledge Fanshawe College's OER Studio Team Members:
Ms. Catherine Steeves, Ms. Shauna Roch, and Ms. Rosalyn Bourne

Authorship

This book was authored in collaboration with the following Fanshawe alumni.

- Taranjit Bhela, CHIM
- Ricardo Corrêa Reis, CHIM
- Alexander Quaisie, CHIM
- Maryada Sharma, CHIM
- Aastha Singh, CHIM
- Tia Wiebe, CHIM



Taranjit Bhela

BDS, CHIM

My Goals in Creating this Guide

The Clinical Knowledge section is the most extensive section of CHIM NCE that requires abundant studying and medical knowledge. The goal of this study guide is to provide a reference point for the students to revisit before the CHIM NCE so that they can use this guide to focus on the important topics often tested in the exam.

Taranjit is currently employed as a Health Information Coder at London Health Sciences Centre

Experience

- Internationally Trained Dentist – BDS from Govt. College in India (2012-2017)
- Nursing and Allied Health Coordinator – Paramed Home Health Care (2019-2021)
- Contact Tracer/Program Assistant – Middlesex-London Health Unit (2021-2022)
- Health Records Clerk – LHSC University Hospital (2021-2025)
- Health Information Coder – LHSC Victoria Hospital (2025-Present)



Ricardo Corrêa Reis

B.Sc., CHIM

My Goals in Creating this Guide

One of my life values is to be able to help others achieve their dreams and goals. Having helped many other health information students with their preparation for the NCE, participating in the guide composition is another step for this learning cycle. I wish that all HIM students who have studied through the guide have the same opportunities (or even more!) and that their exam and future CHIM life is/will be fruitful, challenging and gratifying.

Ricardo is currently employed as a Health Information Coder at London Health Sciences Centre

Experience

- Certified Health Information Management professional.
- Being a coder, my focus is on accurate health data acquisition, compliance with rules and regulations from diverse institutions, while also fighting for a more integrated HIM-hospital structure.
- Having instructed fellow co-workers in their duties and responsibilities, I feel comfortable instructing a wide variety of topics within the HIM realm.
- More than 7 years of helping others achieve their career goals.
- Experience with mental health advocacy and management of people.
- Future Master of Health Information Sciences student at Western University.



Alexander Quaisie

MPH, CHIM

My Goals in Creating this Guide

While studying for my CHIMA exam, I created a quick and easy reference guide that I frequently used during my final week of preparation. When helping compile this document, I had the same goal in mind: to provide a concise and focused reference tool that can be used alongside your own notes to help you stay confident and prepared for the exam. The volume of content covered for this exam can feel overwhelming, and having a streamlined guide in the final days before the test can help reinforce key concepts and ease exam-related stress.

Alexander is currently employed as a Health Information Coder at London Health Sciences Centre

Experience

- Health Information Coder
- Health Information Management Technician (Release of Information)
- Assistant Professor (Health Systems Environment)
- Sexual and Reproductive Health and Rights Consultant
- Healthcare Professional



Maryada Sharma

BDS, CHIM

My Goals in Creating this Guide

One of the main motivations behind contributing to the clinical knowledge study guide was recognizing how overwhelming the breadth of clinical content can feel for students and National Certification Examination (NCE) candidates preparing for the CHIM credential. During my own HIM journey, I found that learners often benefit most from study resources that simplify complex clinical concepts.

Coming from both an international clinical background and Canadian HIM education, I understand the challenge of bridging anatomy, physiology, pathophysiology, medical terminology, diagnostics, and coding concepts into practical application. I wanted to help create a resource that presents clinical knowledge in a structured, approachable, and learner-focused way that supports understanding rather than memorization alone.

Another important driving force was the desire to contribute back to the HIM community. Many students and internationally educated professionals preparing for the NCE may not always have access to consolidated or simplified study supports. By collaborating with credentialed CHIM alumni (under the guidance of Dr. Radica Bissoondial) and incorporating practical perspectives from healthcare environments, the goal is to create an accessible educational resource that promotes confidence, reduces barriers to learning, and supports future HIM professionals across Canada.

Maryada is currently employed as a Health Information Management Professional at Health Shared Services Alberta

Experience

- Health Information Management professional with experience in clinical documentation review, health data analysis, privacy compliance, and healthcare reporting within healthcare environments in Calgary, Alberta and Toronto, Ontario.
- Experienced in using electronic health records and health information systems, including Connect Care (Epic), Accuro EMR, Paradigm, Procura, PC-Blut, and 3M HDM, while supporting data integrity and operational workflows in organizations across Alberta and Ontario.
- Applied knowledge of ICD-10-CA/CCI coding principles, CIHI DAD/NACRS abstracting concepts, medical terminology, anatomy, and pathophysiology through Health Information Management education and applied projects completed at Fanshawe College, London, Ontario.
- Internationally trained dental professional with a Bachelor of Dental Surgery from Panjab University, Chandigarh, India, with foundational clinical training and knowledge in patient care, anatomy, physiology, pathology, pharmacology, and healthcare ethics, providing a strong clinical base relevant to Health Information Management practice.

- Collaborated with multidisciplinary healthcare and administrative teams in Calgary, Alberta, Toronto and London, Ontario to support documentation quality, privacy compliance, workflow improvement, and patient-centred healthcare operations.



Aastha Singh

BDS, MPH, CHIM

My Goals in Creating this Guide

I contributed to this guide with the intention of making clinical concepts easier to understand for someone preparing for the CHIM National Certification Examination (NCE). While preparing myself, I realized that professionals from non-clinical backgrounds find it difficult to connect medical terminology, anatomy and physiology, pathophysiology, and clinical conditions into one complete picture. A lot of resources provide information separately, but not always in a way that feels simple, organized, and easy to apply during studying or an exam. Coming from a background in healthcare, public health, research, and now Health Information Management, I have been able to see healthcare from different perspectives. My international education and work experience, along with my Canadian HIM education and professional experience, helped me understand the challenges many learners face while preparing for the exam. Because of this, I wanted to create a resource that feels practical, relatable, and less overwhelming. This guide focuses on high-yield concepts and presents them in a structured and learner-friendly way while still keeping the clinical relevance important for Health Information Management practice. My goal is not only to help students prepare for the examination, but also to help them build confidence, strengthen their understanding, and feel more comfortable applying clinical knowledge in their future professional roles. It may not be everything, but it may be something for someone who is preparing for the exam.

Aastha is currently employed as a Health Information Management Practitioner at Saskatchewan Health Authority, Kindersley Hospital

Experience

My journey in healthcare started when I completed my Bachelor of Dental Surgery (BDS) from Maulana Azad Medical College, India. During my medical training, I developed a deep interest in clinical sciences and patient care. After graduation, I worked as a Dental Surgeon in India for about two years, where I gained valuable clinical experience and also volunteered in several community health and dental camps. Those experiences helped me understand the importance of accessible healthcare and patient education at the community level. As my interest in healthcare grew beyond clinical practice, I decided to pursue a Master of Public Health (MPH) from the Indian Institute of Public Health. Through my studies and internship experience, I was introduced to healthcare systems, research, public health programs, and population health concepts. I later worked for nearly two years as a Research Analyst with a UK-based research company, where I was involved in healthcare research, data analysis, and evidence-based projects for various pharmaceutical organizations globally. This experience strengthened my analytical thinking and

helped me appreciate the growing role of health information in improving healthcare outcomes. In 2023, I moved to Canada to continue building my career in healthcare and completed Health Systems Management studies at Fanshawe College, followed by obtaining my CHIM Certification. Since 2025, I have been working with the Saskatchewan Health Authority as a Health Information Practitioner.



Tia Wiebe

CHIM

My Goals in Creating this Guide

The opportunity to contribute to this guide aligns with my commitment to the Health Information Management profession. Throughout my career, I have often been approached for guidance on exam preparation, with particular focus on the clinical knowledge component. In response, I have supported students and colleagues in strengthening their understanding in this area. My goal in contributing was to help develop a practical, profession-specific resource that supports both exam preparedness and professional growth within the Health Information Management community.

Tia is currently employed as a HIM Support Specialist at London Health Sciences Centre

Experience

- Certified Health Information Management professional with more than 22 years of healthcare experience.
- Over 20 years of progressive leadership and practice experience at London Health Sciences Centre.
- Specializes in health information governance and digital health transformation, providing operational and organizational support through consultation, policy and procedure development, process improvement, and change management.
- Post-secondary educator with experience preparing future Health Information Management professionals for practice.
- Recipient of the Excellence in Health Information Management Award (LHSC) and the Women Rock IT Award (Fanshawe College Foundation).

About this Book

This open textbook has been compiled and adapted by Dr. Radica Bissonodial in partnership with the OER Design Studio and the Library Learning Commons at Fanshawe College in London, Ontario

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Collaborators

This project was a collaboration between the authors and the team in the OER Design Studio at Fanshawe. The following faculty and support staff were involved in the creation of this project:

- Rosalyn Bourne, *Instructional Design*
- Catherine Steeves, *Project Lead & Quality Assurance*

Accessibility Statement

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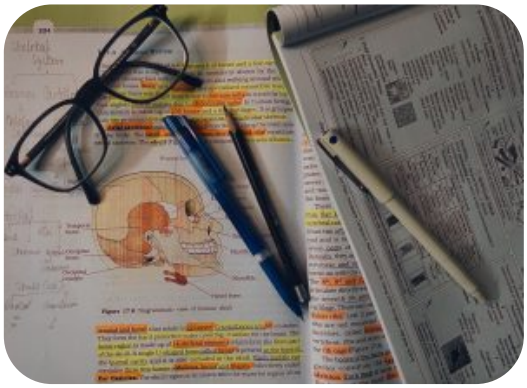
CHAPTER 1 - FOUNDATIONAL CLINICAL KNOWLEDGE

Chapter Outline

1.1 Clinical Knowledge Introduction
1.2 Anatomy and Physiology
1.3 Pathophysiology
1.4 Medical Terminology
1.5 Study Tips for Non-Clinical Learners

1.1 Clinical Knowledge Introduction

The clinical knowledge practice area focuses on understanding the human body in both health and disease. It includes foundational knowledge of anatomy and physiology, the development and progression of disease processes, and the standardized language used to describe clinical conditions and interventions. This knowledge supports accurate interpretation of health information, effective communication within the healthcare team, and appropriate management of health records across the continuum of care.



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1.2 Anatomy & Physiology

WIEBE, TIA

> **Focus –** The structure and function of the human body.

Anatomy and physiology explore how the body is organized and how its systems function under normal conditions. For the NCE, the focus is on a high-level, systems-based understanding rather than detailed scientific mechanisms.

Core Concepts

The human body is organized in a hierarchy:

1. Cells

Basic units of structure and function.

2. Tissues

Groups of similar cells performing a shared function.

3. Organs

Composed of multiple tissue types.

4. Body Systems

Groups of organs that work together to maintain essential functions.

Understanding this hierarchy helps explain how **structure supports function** across the body.

Body Systems and Functions

Candidates should recognize major body systems, the organs within them, and their primary roles, including key physiological processes such as:

- Circulation
- Respiration
- Digestion
- Regulation and control

The emphasis is on **general function and system relationships**, rather than memorizing detailed mechanisms.

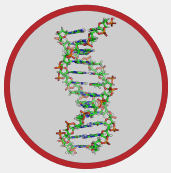
Anatomical Location and Orientation

Candidates should be familiar with the **general locations of major organs and body regions**, and understand how placement relates to function and clinical documentation.

Genetics and the Human Genome

At a high level, candidates should understand how genetics relates to structure and function:

DNA



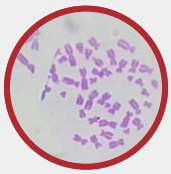
The blueprint directing development and function.

Genes



Units of inheritance that influence traits and biological processes.

Human Genome



The complete set of an individual's genetic material.

Image Attributions

"DNA Orbit" by Richard Wheeler, CC BY-SA 3.0; "Chromosome DNA Gene Unannotated" by Thomas Shafee, CC BY.4.0; "Human Chromosomes" by SANCHITA20, CC BY 4.0. Modifications: Cropped and Recoloured.

This knowledge helps explain **predisposition** to certain conditions and its relevance in clinical documentation, such as family history or genetic testing results.

Exam Emphasis

- Recognize and understand body structures, functions, and locations.
- Connect structure, function, and clinical context.
- Apply anatomy and physiology knowledge to health records and clinical documentation review.

Example Exam Questions

A patient's record notes a family history of inherited heart conditions. Which aspect of clinical knowledge helps you interpret this information?

A. Knowledge of body systems
B. Understanding of physiological processes
C. Understanding of genetic composition and the human genome
D. Awareness of tissue structure
E. Awareness of organ function

Answer = C

Which sequence correctly represents the body's structural hierarchy?

A. Organs, tissues, cells, body systems
B. Cells, tissues, organs, body systems
C. Tissues, organs, cells, body systems
D. Body systems, organs, tissues, cells
E. Tissues, cells, organs, body systems

Answer = B

Body Systems Quick Reference

Table 1.2.1: Systems of the Human Body

Body System	Major Organs / Structures	Primary Functions (High-Level)
Integumentary	Skin, hair, nails, sweat glands	Protection, temperature regulation, sensation
Skeletal	Bones, cartilage, ligaments	Support, protection, structure, blood cell production
Muscular	Skeletal muscles, tendons	Movement, posture, heat production
Nervous	Brain, spinal cord, and peripheral nerves	Control and coordination of body functions
Endocrine	Pituitary, thyroid, adrenal glands, pancreas	Hormone production and regulation
Cardiovascular (Circulatory)	Heart, blood vessels	Transport oxygen, nutrients, waste
Respiratory	Lungs, trachea, bronchi, diaphragm	Gas exchange (O_2/CO_2), maintain pH balance
Digestive	Mouth, esophagus, stomach, intestines, liver, pancreas	Breakdown of food, nutrient absorption, waste elimination
Urinary	Kidneys, ureters, bladder, urethra	Filter blood, remove waste, regulate fluid and electrolyte balance
Lymphatic	Lymph nodes, spleen, thymus, lymph vessels	Maintain fluid balance, transport fats, immunity support
Immune	White blood cells, lymphoid tissues	Defence against infection, identify and destroy pathogens
Reproductive	Ovaries, testes, uterus, and penis	Gamete production, hormone regulation, and reproduction
Excretory	Skin (sweat), lungs, liver (bile)	Elimination of metabolic wastes, detoxification

---

"1.2 Structural Organization of the Human Body " from Anatomy and Physiology 2e by OpenStax – Rice University is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License, except where otherwise noted. Modifications: Used body systems images; Added more details.

1.3 Patho-physiology

CORRÊA REIS, RICARDO

> **Focus –** How disease alters normal body function.

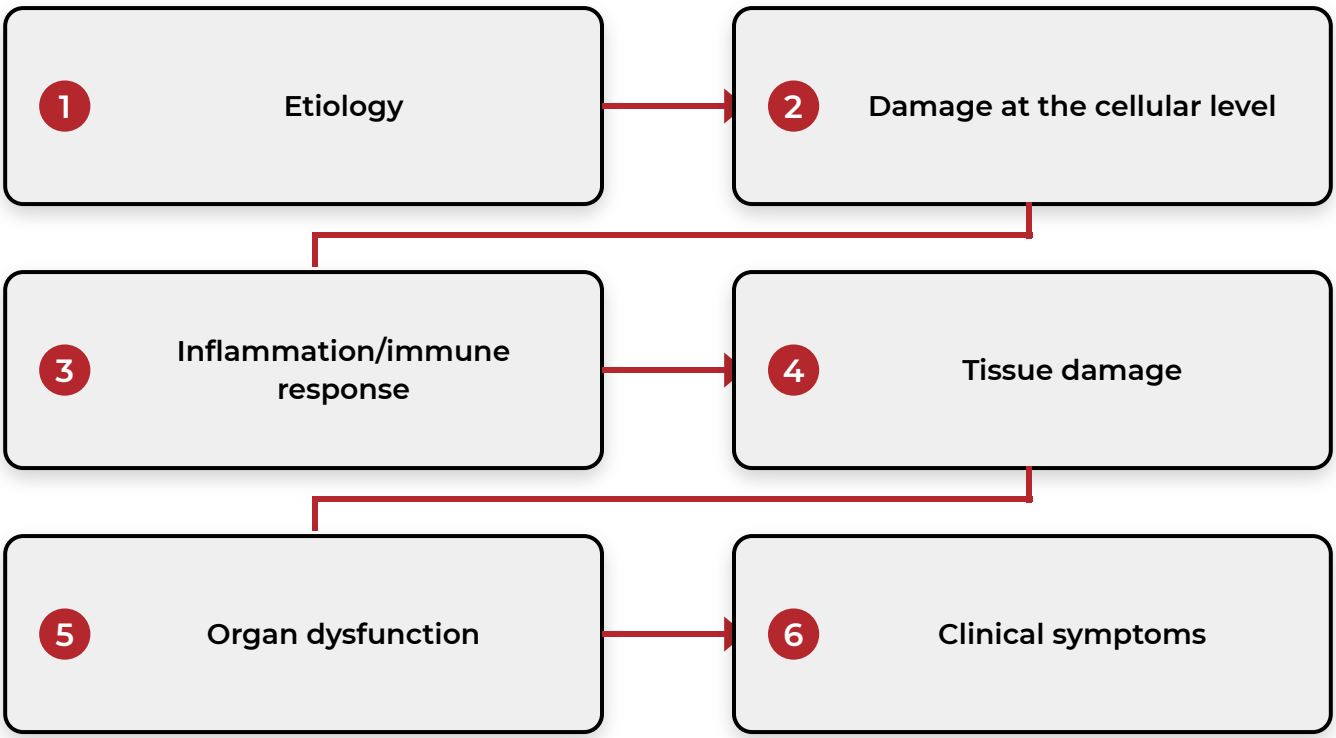
Pathophysiology builds on anatomy and physiology by examining how illness, injury, or disorders disrupt normal body processes. This competency supports the interpretation of diagnoses and clinical conditions documented in health records.

Core Concepts

Pathophysiology links the origin of the disease (etiology), the paths through which diseases develop (pathogenesis), and the alterations the body undertakes to try to combat the disease (clinical, observed manifestations, lab reports).

It is an amalgamation of anatomy, physiology, and pathology, resulting in an abnormal functioning of the body.

A usual route of pathophysiology is:



Risk Factors and Clinical Context

There are several factors related to disease risk, prevention, and clinical presentation that may be reflected in the NCE:

1 Understanding Baseline Health

Understanding usual baseline levels and patterns can provide important context when reviewing clinical documentation. These may include resting heart rate, blood pressure, weight, sleep, overall energy, bowel habits, menstrual patterns (if applicable), and exercise tolerance.

2 Understanding Early Clinical Signs in Documentation

Many diseases may initially be reflected in documentation through vague or nonspecific symptoms, such as:

Table 1.3.1: Early Symptoms

Early Symptom	Possible Underlying Process
Persistent fatigue	Anaemia, thyroid disorder, chronic inflammation
Unexplained weight loss	Neoplasm, hyperthyroidism
Mild shortness of breath	Early heart or lung disease
Swelling in the legs	Early heart failure, kidney disease
Increased thirst/urination	Diabetes
Chronic low-grade pain	Inflammatory disorders

3 Screening and Diagnostic Testing

Screening and diagnostic testing can help identify certain conditions or risk factors. Common examples include: blood reports which are used to assess levels of components of blood, tissue tests for assessing changes at the cellular level, urinalysis for assessing kidney and urinary system function, fecal tests to assess gastrointestinal health and identify parasites or infections, genetic testing for assessment of inherited conditions, and imaging exams (ultrasound, CT scans, MRI, PET scans, etc.) for assessing anatomical structures for abnormalities and disease processes. Examples include:

Cardiovascular

- **Lipid Panel** – used to assess lipid levels associated with cardiovascular risk
- **Blood Pressure Monitoring** – used to assess blood pressure and identify abnormal patterns

Metabolic

- **Fasting glucose / A1C** – Assesses risk for Diabetes
- **Thyroid function tests** – Detects Hypothyroidism or Hyperthyroidism

Cancer Screening

- **Mammogram** – Detects Breast Cancer
- **Colonoscopy** – Detects Colorectal Cancer
- **Pap smear** – Detects Cervical Cancer

4 Inflammation and Biomarkers

Inflammation is involved in many disease processes and may be reflected in clinical documentation through symptoms, diagnoses, and laboratory findings. Common laboratory findings associated with inflammation include:

- C-reactive protein (CRP)
- Erythrocyte Sedimentation Rate (ESR)

Chronic inflammation is associated with a number of disease processes, including:

- Cardiovascular disease
- Alzheimer's disease
- Rheumatoid arthritis

5 Functional Changes and Clinical Presentation

Changes in function may be documented before more significant symptoms develop. Examples include:

- Getting winded more easily
- Taking longer to recover from exercise
- Brain fog
- Slower wound healing
- Increased susceptibility to infections

6 Family History and Genetic Risk

Family history can provide important context for understanding disease risk and the relevance of screening information in clinical documentation. Common conditions that may be relevant when reviewing family history include:

- Type 2 diabetes
- Coronary artery disease
- Breast cancer

Table 1.3.2: Pathophysiology of Common Problems of the Human Body

System	Common Problems	Key Pathophysiology Concept
Cardiovascular	Hypertension	Increased systemic vascular resistance → endothelial damage
	Atherosclerosis	Lipid deposition → Inflammation → Plaque Formation
	Heart Failure	Impaired Cardiac Output → Fluid Retention
	Myocardial Infarction	Coronary Artery Occlusion → Ischemic Necrosis
	Arrhythmias	Abnormal Electrical Conduction
Respiratory	Asthma	Bronchoconstriction + Airway Inflammation
	Chronic Obstructive Pulmonary Disease	Air trapping + Alveolar Destruction
	Pneumonia	Infection → Alveolar Inflammation & Consolidation
	Pulmonary Embolism	Blocked pulmonary Artery → Impaired gas Exchange
Neurologic	Stroke	Ischemia or Hemorrhage → Neuronal Death
	Epilepsy	Abnormal Neuronal Firing
	Parkinson's Disease	Dopamine Deficiency (Substantia Nigra Degeneration)
	Alzheimer's Disease	Beta-amyloid Plaques + Neurofibrillary Tangles
Endocrine	Type 1 Diabetes	Autoimmune Beta-cell Destruction
	Type 2 Diabetes	Insulin Resistance + Relative Deficiency
	Hypothyroidism	Reduced Metabolic Rate
	Hyperthyroidism	Increased Metabolic Activity
Renal / Urinary	Acute Kidney Injury	Rapid Decline in Filtration
	Chronic Kidney Disease	Nephron loss → Uremia
	Urinary Tract Infection	Ascending Bacterial Infection
	Nephrotic Syndrome	Glomerular Damage → Proteinuria
Gastrointestinal	Gastro-esophageal Reflux Disease	Lower Esophageal Sphincter Dysfunction
	Peptic Ulcer Disease	Mucosal Erosion from Acid
	Inflammatory Bowel Disease	Autoimmune Intestinal Injury
	Cirrhosis	Fibrosis → Portal Hypertension
Haematologic	Anaemia	Reduced Oxygen-carrying Capacity
	Leukaemia	Bone Marrow Overproduction of WBCs
	Thrombocytopenia	Increased Bleeding Risk
	Sickle Cell Disease	Abnormal Hemoglobin → Vaso-occlusion

Immune / Autoimmune	Systemic Lupus Erythematosus	Autoantibody-mediated Tissue Injury
	Rheumatoid Arthritis	Synovial Inflammation → Joint Destruction
	HIV/AIDS	CD4 T-cell Depletion
	Allergic Disorders	IgE-mediated Hypersensitivity
Musculoskeletal	Osteoarthritis	Cartilage Breakdown
	Osteoporosis	Decreased Bone Mineral Density
	Gout	Uric Acid Crystal Deposition
Reproductive	Polycystic Ovary Syndrome	Insulin Resistance + Androgen Excess
	Endometriosis	Endometrial Tissue Outside Uterus
	Benign Prostatic Hyperplasia	Prostate Tissue Overgrowth
Integumentary (Skin)	Psoriasis	Rapid Keratinocyte Proliferation
	Eczema	Skin Barrier Dysfunction + Inflammation
	Melanoma	Malignant Melanocyte Proliferation

Exam Emphasis

- Recognize common disease processes and their underlying mechanisms.
- Connect pathophysiology with clinical signs, symptoms, tests, and treatments.
- Apply pathophysiology knowledge to health records and clinical documentation review.

1.4 Medical Terminology

QUAISIE, ALEXANDER

> **Focus –** The language of healthcare.

Medical terminology provides the structured language used to describe the anatomy, physiology, pathophysiology, diseases, and clinical findings introduced in the previous sections. For CHIM professionals, understanding this language is essential to interpreting and accurately representing clinical information in health records.

Most medical terms are constructed from:

> **Prefixes** – Appear at the beginning of a word and modify its meaning

> **Root Words** – Identify the body part, organ, or system represented in the term

> **Suffixes** – Appear at the end of a word and indicate a condition, disease, procedure, or other meaning

Understanding how these components combine allows you to interpret unfamiliar terms systematically, which is a critical skill for working with clinical documentation, ICD-CA/ICD (Canadian) version coding, release of information, and other health information management activities

A complete clinical term could be constructed thus:

Prefix	+	Root	+	Suffix

Although some terms may omit some of these components. Understanding how these components combine will help you when interpreting clinical terminology.

The following tables provide examples of medical terminology commonly associated with each body system. Each chapter will provide additional terminology respective to its discussed system.

Table 1.4.1: Prefixes and Suffixes of the Cardiovascular System

Type	Term	Meaning
Prefix	Cardio-	Heart
	Angio-	Vessel
	Tachy-	Fast
	Brady-	Slow
	Hyper-	Excessive
	Hypo-	Deficient
Suffix	-cardia	Heart Rate/Heartbeat
	-emia	Condition of the blood or presence of a substance in the blood
	-itis	Inflammation
	-megaly	Enlargement
	-pathy	Disease
	-plasty	Surgical Repair

Table 1.4.2: Key Terms of the Cardiovascular System

Term	Meaning
Tachycardia	Fast Heart Rate
Bradycardia	Slow Heart Rate
Cardiomegaly	Enlarged Heart
Myocarditis	Heart Muscle Inflammation
Endocarditis	Inner Heart Inflammation
Pericarditis	Pericardial Inflammation
Hypertension	High Blood Pressure
Hypotension	Low Blood Pressure
Atherosclerosis	Plaque Buildup in Arteries
Angioplasty	Vessel Repair
Vasoconstriction	Narrowing of Vessels
Vasodilation	Widening of Vessels
Cardiomyopathy	Heart Muscle Disease
Ischaemia	Reduced Blood Supply
Thrombosis	Clot Formation
Embolism	A travelling blockage in a blood vessel
Arrhythmia	Irregular Rhythm
Haemorrhage	Excessive Bleeding
Hyperlipidemia	High Blood Lipids
Cyanosis	Bluish discoloration associated with increased deoxygenated hemoglobin

Table 1.4.3 Key Terms of the Respiratory System

Term	Meaning
Dyspnea	Difficulty Breathing
Tachypnea	Rapid Breathing
Bradypnea	Slow Breathing
Apnea	No Breathing
Hypoxia	Low Oxygen
Hypercapnia	High CO_2
Pneumonia	Lung Infection
Bronchitis	Bronchial Inflammation
Emphysema	Alveolar Damage
Asthma	Airway inflammation and variable/reversible airflow obstruction
Atelectasis	Lung Collapse
Hemoptysis	Coughing Blood
Pleural Effusion	Fluid Around Lungs
Pneumothorax	Air in Pleural Space
Laryngitis	Larynx Inflammation
Pharyngitis	Throat Inflammation
Tonsillectomy	Removal of Tonsils
Bronchoscopy	Airway Examination
Pulmonary Oedema	Fluid in Lungs
COPD	Chronic Obstructive Pulmonary Disease

Table 1.4.4: Key Terms of the Gastrointestinal System

Term	Meaning
Gastritis	Stomach Inflammation
Gastroenteritis	Stomach and Intestine Inflammation
Hepatitis	Liver Inflammation
Cirrhosis	Liver Scarring
Cholecystitis	Gallbladder Inflammation
Cholelithiasis	Gallstones
Pancreatitis	Pancreas Inflammation
Dysphagia	Difficulty Swallowing
Dyspepsia	Indigestion
Diarrhoea	Frequent Loose Stools
Constipation	Difficult Bowel Movement
Hematemesis	Vomiting Blood
Melena	Black Stool
Appendectomy	Removal of the Appendix
Colostomy	Colon Opening
Endoscopy	GI Examination
Polypectomy	Polyp Removal
Steatorrhea	Fatty Stool
Hernia	Organ Protrusion
Ascites	Abdominal Fluid

Table 1.4.5: Key Terms of the Nervous System

Term	Meaning
Neuropathy	Nerve Disease
Neuralgia	Nerve Pain
Encephalitis	Brain Inflammation
Meningitis	Meningeal Inflammation
Hemiplegia	One-sided Paralysis
Paraplegia	Lower Body Paralysis
Quadriplegia	Four-limb Paralysis
Aphasia	An acquired language disorder affecting comprehension, expression, reading, and writing
Dysarthria	Speech Difficulty
Seizure	Abnormal Brain Activity
Epilepsy	Recurrent Seizures
Concussion	Mild traumatic brain injury
Coma	Unconscious State
Parkinsonism	Movement Disorder
Alzheimer Disease	Neurodegeneration
Multiple Sclerosis	Demyelinating Disease
Myelopathy	Spinal Cord Disease
Radiculopathy	Nerve Root Disorder
Ataxia	Loss of Coordination
Syncope	Fainting

Table 1.4.6: Key Terms of the Musculoskeletal System

Term	Meaning
Arthritis	Joint Inflammation
Osteoarthritis	Degenerative Joint Disease
Rheumatoid Arthritis	Autoimmune Joint Disease
Osteoporosis	Bone Density Loss
Osteomyelitis	Bone Infection
Myalgia	Muscle Pain
Myositis	Muscle Inflammation
Tendinitis	Tendon Inflammation
Bursitis	Bursa Inflammation
Fracture	Broken Bone
Dislocation	Joint Displacement
Arthroplasty	Surgical reconstruction or replacement of a joint
Laminectomy	Removal of a part or all of the lamina of a vertebra
Kyphosis	Forward Curvature
Scoliosis	Lateral Curvature
Contracture	Permanent Tightening
Sprain	Ligament Injury
Strain	Muscle Injury
Ankylosis	Joint Fusion
Osteonecrosis	Bone Death

Table 1.4.7: Key Terms of the Urinary System

Term	Meaning
Nephritis	Kidney Inflammation
Pyelonephritis	Kidney Infection
Cystitis	Bladder Inflammation
Urethritis	Urethra Inflammation
Hematuria	Blood in Urine
Proteinuria	Protein in Urine
Polyuria	Excess Urine
Oliguria	Low Urine Output
Anuria	No Urine
Nephrolithiasis	Kidney Stones
Urolithiasis	Urinary Stones
Hydronephrosis	Kidney Swelling
Renal Failure	Kidney Dysfunction
Dialysis	The replacement of some kidney functions, including the removal of waste and excess fluid
Nephrectomy	Kidney Removal
Cystoscopy	Bladder Exam
Incontinence	Loss of Control
Retention	Unable to Void
Azotemia	Nitrogen Waste in Blood
Uremia	The clinical syndrome resulting from the accumulation of uremic toxins in advanced kidney failure

Table 1.4.8: Key Terms of the Endocrine System

Term	Meaning
Hyperthyroidism	Excess Thyroid Hormone
Hypothyroidism	Low Thyroid Function
Goiter	Thyroid Enlargement
Thyroiditis	Thyroid Inflammation
Diabetes Mellitus	Chronic High Blood Sugar
Hyperglycemia	High Blood Sugar
Hypoglycemia	Low Blood Sugar
Ketoacidosis	Acid Buildup
Cushing Syndrome	Excess Cortisol
Addison Disease	Adrenal Insufficiency
Acromegaly	Excess Growth Hormone
Gigantism	GH Excess in Children
Dwarfism	GH Deficiency
Hyperparathyroidism	Excess Parathyroid Hormone
Hypoparathyroidism	Low Parathyroid Hormone
Pheochromocytoma	Adrenal Tumour
Insulinoma	Insulin Tumour
Endocrinopathy	Hormone Disorder
Metabolic Syndrome	Metabolic Risk Cluster
Hormonal Imbalance	Abnormal Hormone Levels

Exam Emphasis

- Break down medical terms into prefixes, root words, and suffixes.
- Interpret commonly used terms across body systems.
- Understand common abbreviations and acronyms.
- Apply terminology knowledge to health records and clinical documentation review.

1.5 Study Tips for Non-Clinical Learners

Many CCHIM NCE candidates do not come from a clinical background. The following tips are designed to help non-clinical learners study efficiently and confidently.

1. **Focus on Recognition, Not Expertise.** You are not expected to diagnose or treat patients. Focus on recognizing systems, conditions, and terms as they appear in health records.
2. **Study by Body System.** Organizing content by body system helps connect anatomy, pathophysiology, and terminology. *Ask yourself:* What system is involved? What is normal? What changes with disease?
3. **Learn Medical Word Parts.** Understanding prefixes, suffixes, and root words reduces the need for memorization and helps interpret unfamiliar terms.
4. **Translate Terms into Plain Language.** Before memorizing definitions, restate clinical terms in everyday language to reinforce understanding.
5. **Think in Health Records, Not Textbooks.** Relate your studying to how information appears in discharge summaries, operative reports, diagnostic results, and progress notes.
6. **Look for Patterns and Clues in Questions.** Exam questions often include keywords that point to a body system, condition, or process.
7. **Prioritize Common Conditions.** The NCE emphasizes commonly encountered conditions and terminology rather than rare or highly specialized diagnoses.
8. **Use Simple Visual Aids.** Basic diagrams of body systems can help reinforce understanding without requiring detailed anatomical study.
9. **Review Practice Questions Strategically.** After each question, identify the system, concept, or terminology being tested and why the correct answer applies.
10. **Trust the HIM Perspective.** Non-clinical learners bring strengths in documentation, data interpretation, and information management. Apply that lens when answering exam questions.

CHAPTER 2 - NERVOUS SYSTEM

Chapter Outline

2.1 Medical Terminology
2.2 Anatomy & Physiology
2.3 Patho-Physiology
2.4 Self Assessment
2.5 References

2.1 Medical Terminology

BHELA, TARANJIT

Table 2.1.1: Prefixes of the Nervous System

Prefix	Meaning
Cerebr/o	Cerebrum
Encephal/o	Brain
Myel/o	Spinal Cord
Neur/o	Nerve
Mening/o	Meninges
Hemi	Half
Hyper	Excessive
Intra	Within
Psych/o	Mind

Table 2.1.2: Suffixes of the Nervous System

Suffix	Meaning
-algia	Pain
-ictal	Seizure
-oma	Tumour
-pathy	Disease
-plegia	Paralysis
-sclerosis	Hardening
-itis	Inflammation

Examples

Encephalitis – Inflammation of Brain
Neuralgia – Nerve pain

2.2 Anatomy & Physiology

BHELA, TARANJIT

Anatomy

The nervous system is a complex system of nerves and nerve cells that helps the brain and spinal cord communicate with different parts of the body. Different nerves carry signals from various parts of the brain and spinal cord and transmit them to specific body parts for a certain response via sensory and motor pathways (Canadian Cancer Society, 2020; Cleveland Clinic, 2023b; SEER Training Modules, 2026). The nervous system is divided into two parts:

1. **Central Nervous System (CNS)** – Includes the brain and the spinal cord
2. **Peripheral Nervous System (PNS)** – Includes Somatic and Autonomic Nervous System (ANS). ANS further divides into sympathetic and parasympathetic systems.

> **Brain:** consists of Cerebrum, Diencephalon, Midbrain, Cerebellum, Pons and Medulla Oblongata. The cerebrum is further divided into 4 lobes, namely – Frontal, Parietal, Temporal and Occipital lobes (Margetis et al., 2026; SEER Training Modules, 2026).

> **Spinal Cord:** Divided into 5 regions with 31 pairs of spinal nerves. The regions include cervical (8), thoracic (12), lumbar (5), sacral (5) and coccygeal (1). Also contains 12 pairs of cranial nerves that supply the head, neck and various other organs (Margetis et al., 2026; SEER Training Modules, 2026).

The brain and spinal cord are protected by 3 layers of membranes called **meninges**, namely dura mater, arachnoid mater and pia mater, that surround and protect from any type of injury. The space between arachnoid and pia mater contains CSF (Cerebrospinal fluid), which helps in cushioning the structures (Canadian Cancer Society, 2020; Margetis et al., 2026; SEER Training Modules, 2026).

The somatic nervous system mainly controls the movements of voluntary muscles (Cleveland Clinic, 2023b; SEER Training Modules, 2026).

The sympathetic nervous system regulates the fight or flight response, while the parasympathetic nervous system controls rest and digest functions of the body (Cleveland Clinic, 2023b; SEER Training Modules, 2026).

Physiology

The main function of the nervous system is to transmit signals from the brain to various parts of the body and from the body parts back to the brain, which ultimately regulates our senses, speech, memory, feelings, coordination, breathing, heartbeat, digestion, and many other bodily functions (Cleveland Clinic, 2023b; SEER Training Modules, 2026).

The main type of cell that makes the whole transmission and reception of the signals possible is called the **Neuron**. A neuron consists of three parts, namely the cell body, dendrites (receiving end) and Axon (transmission end). Myelin coating over axons helps in accelerating the transmission of signals, which means they are faster-acting than the non-myelinated parts. Neurons are highly specialized cells and cannot be replaced if destroyed (Cleveland Clinic, 2023b; Ernstmeyer & Christman, 2024). Different types of neurons are responsible for different functions within the Nervous system:

- **Motor neurons** – responsible for transmitting signals from the brain and spinal cord to the targeted muscles for their respective function.
- **Sensory neurons** – responsible for carrying stimuli from muscles to the brain for interpretation.
- **Interneurons** – connection between the sensory and motor neurons.

(Cleveland Clinic, 2023b; Ernstmeyer & Christman, 2024)

Other Facts

Any surgery or procedure that requires the disruption of pain sensation ultimately affects the CNS and PNS. All forms of anaesthesia, namely general, regional, sedation and local, suppress CNS and PNS activity in order to achieve the desired result (Ernstmeyer & Christman, 2024).

2.3 Patho-Physiology

BHELA, TARANJIT

There are a wide variety of diseases that affect the Nervous system, and certain disorders occur more frequently than others, but overall can be categorized as:

- Degenerative disorders – Parkinson's disease, Alzheimer's disease, Huntington's chorea, amyotrophic lateral sclerosis (ALS)
- Autoimmune disorders – Bell's palsy, multiple sclerosis, neuropathies.
- Vascular disorders – Stroke, Transient ischemic attack (TIA), subdural haemorrhage.
- Infections – meningitis, encephalitis.
- Seizure disorders – Epilepsy
- Mental Health disorders – Schizophrenia, depression, and bipolar disorder.

(Cleveland Clinic, 2024; Johns Hopkins Medicine, n.d.)

The symptoms of these diseases can manifest anywhere from a sudden headache, weakness, pain, rigidity in muscles, to loss of sensation, memory, sight, slurred speech or tremors.

Various tests like EEG, EMG, MRI, CT scan, and lumbar puncture can help diagnose the disease.

Hydrocephalus

This condition is described as the excessive accumulation of CSF in the subarachnoid space of the brain, ultimately causing an increase in Intracranial pressure of the skull. Causes can be abnormal production, absorption or impaired flow. Most commonly seen in infants due to developmental issues. Treatment includes surgical placement of an artificial device (shunts), which can bypass the obstruction, allowing drainage of the excessive fluid into other bodily cavities (Cleveland Clinic, 2022).

Alzheimer's disease

This neurodegenerative disease is the most common cause of dementia in the elderly population, which affects the brain. The progressive degeneration of brain cells affecting neural connections among different parts of the nervous system manifests as cognitive decline and memory loss in the patient. It can also show symptoms like difficulty reasoning, language trouble, behaviour and personality changes and hallucinations. The main cause is linked to the buildup of proteins, mainly amyloid and tau, in the brain. Treatment is mainly focused on managing symptoms, as there is no cure for this disease (Cleveland Clinic, 2025a).

Epilepsy

A long-term condition characterized by abnormal electrical activity in the brain, causing seizures. It can happen after a brain injury, infection, tumour, or stroke, but in many cases the cause remains unknown. Some triggers like lack of sleep, stress, illness and missed medication can make seizures more frequent. Some of the common symptoms of epilepsy include jerking movements, loss of consciousness, confusion, staring spells, irregular heartbeat or breathing and temporary changes in senses. Status epilepticus is a medical emergency caused by back-to-back or long-term seizures. The most common treatment is antiepileptic medication like levetiracetam (Keppra), lamotrigine, valproic acid and carbamazepine (Cleveland Clinic, 2026a).

Stroke

When the brain does not get enough blood flow, the brain cells don't get enough oxygen and start to die. A blocked vessel or bleeding can prevent the brain from getting enough oxygen, resulting in a stroke. Restoring the normal blood flow is of utmost importance in treating stroke to prevent permanent brain damage. The warning signs of stroke can be memorized by the acronym BE FAST – sudden loss of BALANCE, vision changes in EYES, drooping of FACE, sagging or drop in ARMS, slurred SPEECH and critical TIME. The two main types of strokes are classified as Ischaemic (due to a clot) and Haemorrhagic (due to a rupture). TIA, which stands for Transient Ischemic Attack, is the temporary version of a stroke, which suggests the person is at high risk of getting a true stroke if not treated. The treatment depends on how much damage has been done to the brain and usually starts with thrombolytic medications, which help break the clot or surgery to remove the clot. Other medications that manage blood pressure also help (Cleveland Clinic, 2025b).

Bell's Palsy

The temporary paralysis of muscles on one side of the face due to involvement of the 7th cranial nerve. Inflammation and compression of the nerve is one of the causes, but many cases are idiopathic (no clear cause). Symptoms of Bell's palsy are very similar to stroke, but mostly go away with time. It becomes difficult to express full facial functions like blinking, grimacing and wrinkling the forehead on the affected side. It can also be triggered by stress, illness, trauma and improper sleep. Oral corticosteroids (prednisone) and anti-viral medication can speed up the recovery process, but are most effective in the first 48-hours of symptoms (Cleveland Clinic, 2023a).

Parkinson's Disease

When the cells of the brain that make dopamine slowly stop working, the movement disorder that progresses over time is Parkinson's disease. Symptoms include tremors at rest, unstable posture, slower movement, muscle rigidity, etc. The drop in dopamine levels makes it difficult for the brain to send signals to the muscles, resulting in the symptoms mentioned above. It most commonly occurs in males and over 60 years of age. Medications like Carbidopa-levodopa and dopamine agonists help manage daily symptoms and improve quality of life (Cleveland Clinic, 2026b).

2.4 Self Assessment

BHELA, TARANJIT

Self-Assessment: The Nervous System

Activity Description

1. The basic cell that forms the structural and functional unit of Nervous System is –

    a. Alveoli
    b. Nephron
    c. Neuron
    d. Osteocytes

2. What is the order of meninges from innermost to outermost layer?

    a. Dura mater – Pia mater – Arachnoid mater
    b. Pia mater – Arachnoid mater – Dura mater
    c. Arachnoid mater – Pia mater – Dura mater
    d. Dura mater – Arachnoid mater – Pia mater

3. Which part of the neuron transmits the signals to the next neuron?

    a. Dendrite
    b. Myelin sheath
    c. Axon
    d. Cell body

4. How many pairs are there for cranial and spinal nerves?

    a. 15, 17
    b. 12, 31
    c. 31, 15
    d. 12, 17

5. Cerebrospinal fluid is between which two structures?

    a. Arachnoid and Pia mater
    b. Dura and Arachnoid mater
    c. Brain and Pia mater
    d. Dura mater and Skull

Answers:

1. Neuron
2. Pia mater – Arachnoid mater – Dura mater
3. Axon
4. 12, 31
5. Arachnoid and Pia mater

2.5 References

BHELA, TARANJIT

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CHAPTER 3 - RESPIRATORY SYSTEM

Chapter Outline

3.1 Medical Terminology
3.2 Physiology
3.3 Patho-Physiology
3.4 Self Assessment
3.5 References

3.1 Medical Terminology

SHARMA, MARYADA

Medical terms typically consist of three components: *prefix*, *root*, and *suffix*.

Table 3.1.1: Root Words (Kumar et al., 2020)

Root Word	Meaning
pneum- & pulmon-	Lungs
bronch-	Bronchi
trache-	Trachea
larng-	Larynx

Table 3.1.2: Prefixes and Suffixes of the Respiratory System

Prefix / Suffix	Meaning	Example
Hyper-	Excessive	Hypercapnia = elevated CO_2 in the blood
Hypo-	Deficient	Hypoxia = low oxygen levels
Tachy-	Rapid	Tachypnea = rapid breathing
-itis	Inflammation	Bronchitis = inflammation of the bronchi
-osis	Abnormal condition	Cyanosis = bluish discolouration due to low oxygen
-pnea	Breathing	Apnea = absence of breathing
-ectomy	Surgical removal	Pneumonectomy = removal of a lung
-centesis	Surgical puncture	Thoracentesis = removal of fluid from the chest cavity

Table 3.1.3: Abbreviations of the Respiratory System

Abbreviation	Meaning
COPD	Chronic Obstructive Pulmonary Disease
ARDS	Acute Respiratory Distress Syndrome
ABG	Arterial Blood Gas
SOB	Shortness of Breath
RR	Respiratory Rate
CXR	Chest X-Ray

Understanding these abbreviations ensures accurate interpretation of clinical notes, medication orders, and diagnostic reports (McCance & Huether, 2019).

Practical Application of Medical Terminology

Consider the term Chronic obstructive pulmonary disease (**COPD**):

Chronic	+	**Obstructive**	+	**Pulmonary**	+	**Disease**
long-term	+	**airflow blockage**	+	**lungs**	+	**pathological condition**

Breaking down the term clarifies that **COPD** is a long-term lung disease involving airflow obstruction.

Similarly, **Pneumonia** can be interpreted as follows:

Pneumon-	+	**-ia**
lung	+	**condition**

Pneumonia indicates a condition affecting the lung tissue, typically due to infection.

Another example is acute respiratory distress syndrome (**ARDS**):

Acute	+	**Respiratory**	+	**Distress**	+	**Syndrome**
sudden onset	+	**relating to breathing**	+	**severe difficulty**	+	**group of symptoms**

ARDS describes a sudden and severe condition causing respiratory failure.

3.2 Physiology

SHARMA, MARYADA

Table 3.2.1: Major Cell Types of the Respiratory System (Ross & Pawlina, 2019)

Cell Type	Function
Type I alveolar cells (pneumocytes)	Gas exchange
Type II alveolar cells	Surfactant
Ciliated epithelial cells	Move mucus
Goblet cells	Secrete mucus
Alveolar macrophages	Defense
Endothelial cells	Diffusion

Table 3.2.2: Tissues of the Respiratory System (Ross & Pawlina, 2019; Tortora & Derrickson, 2021)

Tissue	Location	Function
Epithelial	Lines airways, and alveoli	Protection, secretion, gas exchange
Connective	Supports lungs	Elasticity and recoil
Muscle	Throughout	Smooth tissue controls airway diameter, and skeletal tissue enables breathing.
Nervous	Throughout	Control of breathing rate and airway tone

Table 3.2.3: Organs of the Respiratory System (Hall & Hall, 2021; Tortora & Derrickson, 2021)

Upper Respiratory Tract		
Organ	**Structure**	**Function**
Nose	Nasal cavity, conchae	Air filtration & warming
Pharynx	Muscular tube	Air passage
Lower Respiratory Tract		
Organ	**Structure**	**Function**
Larynx	Vocal cords	Air passage, voice
Trachea	C-shaped cartilage rings	Conducts air
Bronchi	Branching airways	Distribute air
Lungs	Alveoli	Gas exchange

Interactions with Other Systems

Circulatory System

Transports gases

Nervous System

Controls breathing rate

Muscular System

Ventilation mechanics

Immune System

Alveolar macrophages

Table 3.2.4: Key Human Respiratory Genes and Functions

Gene	Function in the Respiratory System
CFTR	Encodes a chloride channel regulating airway surface liquid and mucus hydration; Loss of function causes impaired mucociliary clearance and chronic infections (cystic fibrosis) (Riordan, 2008).
SFTPB	Encodes surfactant protein B, essential for pulmonary surfactant function and alveolar stability; SFTPB variants cause respiratory distress and surfactant dysfunction (Nevel et al., 2025).
SFTPC	Encodes surfactant protein C, critical for surfactant processing and alveolar integrity; mutations cause interstitial lung disease and neonatal respiratory distress (Nevel et al., 2025).
ABCA3	Encodes an ATP-binding cassette transporter required for surfactant phospholipid transport and lamellar body formation in alveolar type II cells; ABCA3 mutations cause fatal surfactant deficiency (Shulenin et al., 2004).
SERPINA1	Encodes alpha-1 antitrypsin, a serine protease inhibitor that protects lung tissue from neutrophil elastase; Deficiencies cause emphysema and COPD (Stoller & Aboussouan, 2005).
MUC5B	A major component of airway mucus; Promoter variants increase risk for idiopathic pulmonary fibrosis and influence mucus properties (Shrine et al., 2023).

3.3 Patho-Physiology

SHARMA, MARYADA

In the respiratory system, pathological conditions disrupt ventilation, perfusion, gas exchange, and oxygen delivery to tissues.

Etiology of Respiratory Diseases

Microorganisms

contribute to acute respiratory conditions. Pneumonia results from bacterial, viral, or fungal infection of lung parenchyma. Pathogens trigger inflammation within alveoli, leading to fluid accumulation and impaired gas exchange (Kumar et al., 2020).

Genetic abnormalities

contribute to chronic respiratory conditions. Alpha-1 antitrypsin deficiency is an inherited disorder in which reduced protective protein levels allow progressive alveolar destruction, leading to early-onset emphysema and impaired gas exchange. (McCance & Huether, 2019).

Environmental and toxic exposures

include tobacco smoke, air pollution, and occupational chemicals. Chronic exposure may lead to chronic obstructive pulmonary disease (COPD), which includes chronic bronchitis and emphysema. Poisoning from carbon monoxide impairs oxygen transport by binding haemoglobin.

Adverse medication

effects may also impair respiration. For example, opioid analgesics can cause respiratory depression by suppressing the brainstem respiratory centre.

Nutritional factors

such as obesity, contribute to hypoventilation syndromes, while malnutrition weakens respiratory muscles and immune defences.

Table 3.3.1: Common Disease Processes of the Respiratory System

Process	Description
Inflammation	It involves vasodilation, increased vascular permeability, and leukocyte migration. In the lungs, inflammation causes airway narrowing, oedema, and mucus production. Acute inflammation, as seen in pneumonia, may resolve; chronic inflammation, as in asthma or COPD, results in structural remodelling and airflow limitation (Hall & Hall, 2021).
Neoplasia (Lung Cancer)	Malignant tumour of bronchi/alveoli. Types: SCLC (small cell lung carcinoma), NSCLC (non–small cell lung carcinoma). Major causes: smoking, radon, asbestos, air pollution (Kumar et al., 2020). Mechanism: DNA mutations → uncontrolled cell proliferation → tumour → local invasion/metastasis. Staging: extent of spread; Grading: cellular differentiation (poor differentiation → worse prognosis). Symptoms: chronic cough, hemoptysis, chest pain, weight loss, dyspnea. Complications: metastasis of the brain, liver, and bone.
Obstruction	Occurs when airways narrow or collapse. Asthma (reactive airway disease): bronchoconstriction, mucus hypersecretion, episodic wheezing/dyspnea. COPD: chronic inflammation → permanent airflow limitation.

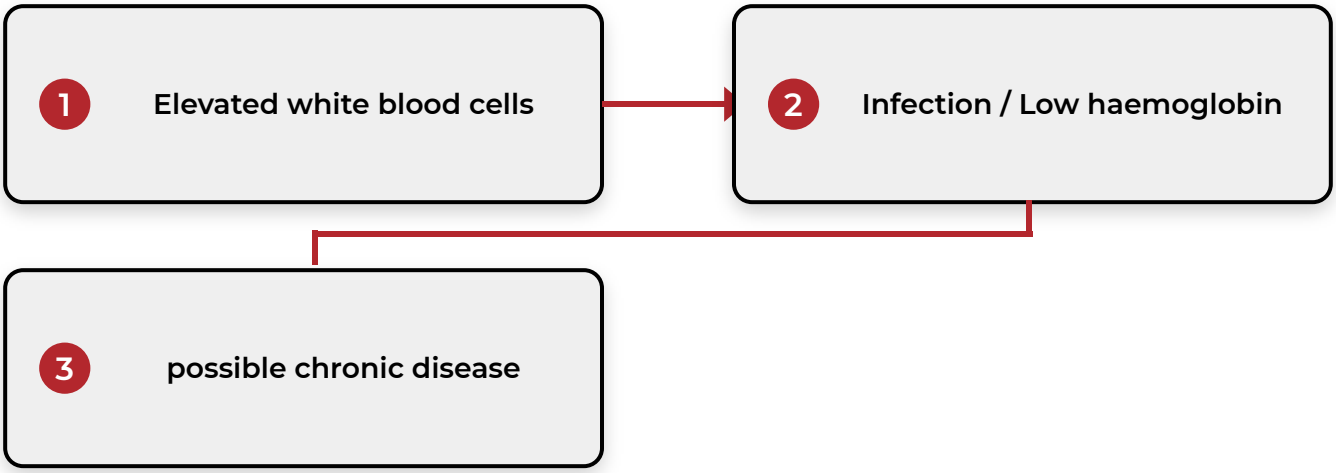
Table 3.3.2: Clinical Manifestations and Structural Changes of the Respiratory System

Condition	Structural Change	Functional Impact	Symptoms
Pneumonia	Alveoli filled with exudate	Lowered oxygen diffusion	Fever, Cough, Crackles
Asthma	Bronchial Narrowing	Reversible obstruction	Wheezing, Dyspnea
COPD	Alveolar Destruction	Air trapping	Chronic Cough
Lung Cancer	Tumor Mass	Obstruction / Invasion	Hemoptysis

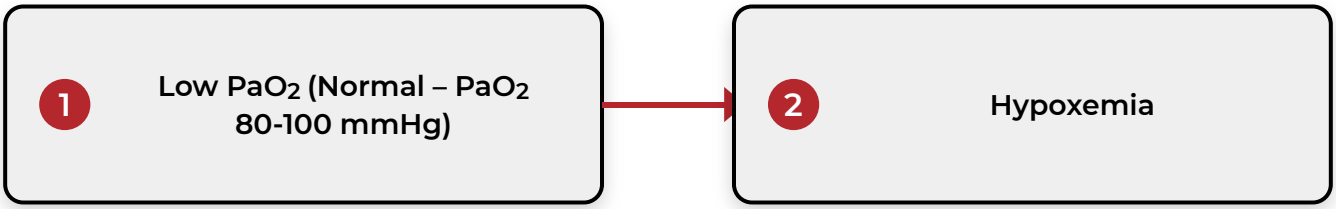
Diagnostic Interventions

Laboratory tests include:

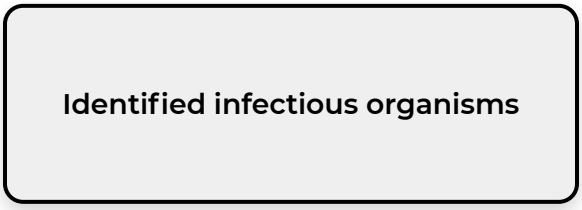
Complete blood count (CBC):



Arterial blood gases (ABGs):



Sputum culture:



Imaging:

Chest X-ray

Pneumonia: Localized consolidation; Lung cancer: mass lesion

CT scan

Confirms tumour size and spread

Pulmonary function tests (PFTs) assess airflow and lung capacity. A reduced FEV_1/FVC ratio is indicative of obstructive respiratory diseases such as asthma or chronic obstructive pulmonary disease (COPD). Although EKG and EEG are not primary respiratory tests, hypoxia may produce cardiac rhythm changes detectable on EKG.

Risk Factors and Population Impact

Risk factors for respiratory diseases include smoking, occupational exposures (e.g., miners, construction workers), genetic predisposition (e.g., primary ciliary dyskinesia), air pollution, pre-existing asthma, and socioeconomic stressors. Populations with higher environmental exposure, limited healthcare access, or genetic susceptibility experience increased disease prevalence.

Table 3.3.3: Types of Interventions of the Respiratory System

Condition	Intervention Type	Example
Asthma	Bronchodilators	Beta-agonists
COPD	Anti-inflammatory therapy	Corticosteroids
Lung Cancer	Surgery / Chemotherapy / Radiation	Antineoplastic agents
Cystic Fibrosis	Airway clearance + CFTR modulators	Targeted biologics

Oxygen therapy improves hypoxemia. Severe respiratory failure may require mechanical ventilation (invasive / non-invasive).

3.4 Self Assessment

SHARMA, MARYADA



Self Assessment: The Respiratory System

Activity Description

1. Which cells are primarily responsible for gas exchange in the lungs?

    a. Type II pneumocytes
    b. Macrophages
    c. Goblet cells
    d. Type I pneumocytes

2. What is the main function of surfactant produced by Type II alveolar cells?

    a. Prevent alveolar collapse
    b. Increase mucus production
    c. Enhance oxygen transport
    d. Stimulate immune response

3. Which structure conducts air and is supported by C-shaped cartilage rings?

    a. Larynx
    b. Bronchi
    c. Pharynx
    d. Trachea

4. What is the primary mechanism of hypoxemia in pneumonia?

    a. Increased surfactant
    b. Airway dilation
    c. Increased hemoglobin
    d. Fluid in the alveoli impairs diffusion

5. What is the term for the accumulation of fluid in the pleural space?

    a. Airway dilation
    b. Pneumonia
    c. Tuberculosis
    d. Pleural effusion

6. A patient with COPD presents with a chronic cough and airflow limitation.
   What structural change is responsible?

   a. Enlarged bronchi
   b. Alveolar destruction
   c. Thickened pleura
   d. Increases surfactant

7. A patient receives opioid medication and develops respiratory depression.
   What is the mechanism?

   a. Suppression of the brainstem respiratory centre
   b. Increased mucus production
   c. Airway obstruction
   d. Reduced surfactant

8. A patient presents with chronic cough, weight loss, and hemoptysis. Imaging reveals a lung mass, and biopsy confirms malignancy.
   Which process is most directly responsible for disease progression?

   a. Reduced metabolic activity of cells
   b. DNA mutation leading to uncontrolled cell proliferation
   c. Controlled cell regeneration
   d. Decreased vascular supply to tumour

Answers:

1. Type I pneumocytes
2. Prevent alveolar collapse
3. Trachea
4. Fluid in alveoli impairing diffusion
5. Pleural effusion
6. Alveolar destruction
7. Suppression of brainstem respiratory centre
8. DNA mutation leading to uncontrolled cell proliferation

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CHAPTER 4 - CARDIOVASCULAR SYSTEM

Chapter Outline

4.1 Medical Terminology
4.2 Physiology
4.3 Patho-Physiology
4.4 Self Assessment
4.5 References

4.1 Medical Terminology

BHELA, TARANJIT

Table 4.1.1: Prefixes of the Cardiovascular System

Prefix	Meaning
Cardio-	Heart
Valvulo-	Valve
Brady-	Slow
Tachy-	Fast
Hyper-	Excessive
Hypo-	Deficient
Endo-	In / within
Peri-	Around / Surrounding

Table 4.1.2: Suffixes of the Cardiovascular System (Nelson & Greene, 2021)

Suffix	Meaning
-pathy	Disease
-plasty	Surgical Repair
-sclerosis	Hardening
-megaly	Enlargement
-stenosis	Narrowing

Examples

Cardiomegaly is as follows:

cardi/o	+	megaly
heart	+	enlargement

Cardiomegaly means enlargement of the heart.

Bradycardia is as follows:

brady	+	cardia
slow	+	heart rate condition

Bradycardia means an abnormally slow heart rate.

Tachycardia is as follows:

tachy	+	cardia
fast	+	heart rate condition

Tachycardia means an abnormally fast heart rate.

Valvuloplasty is as follows:

valvul/o	+	**plasty**
valve	+	**surgical repair**

Valvuloplasty means surgical repair of a valve.

4.2 Physiology

BHELA, TARANJIT

System Overview

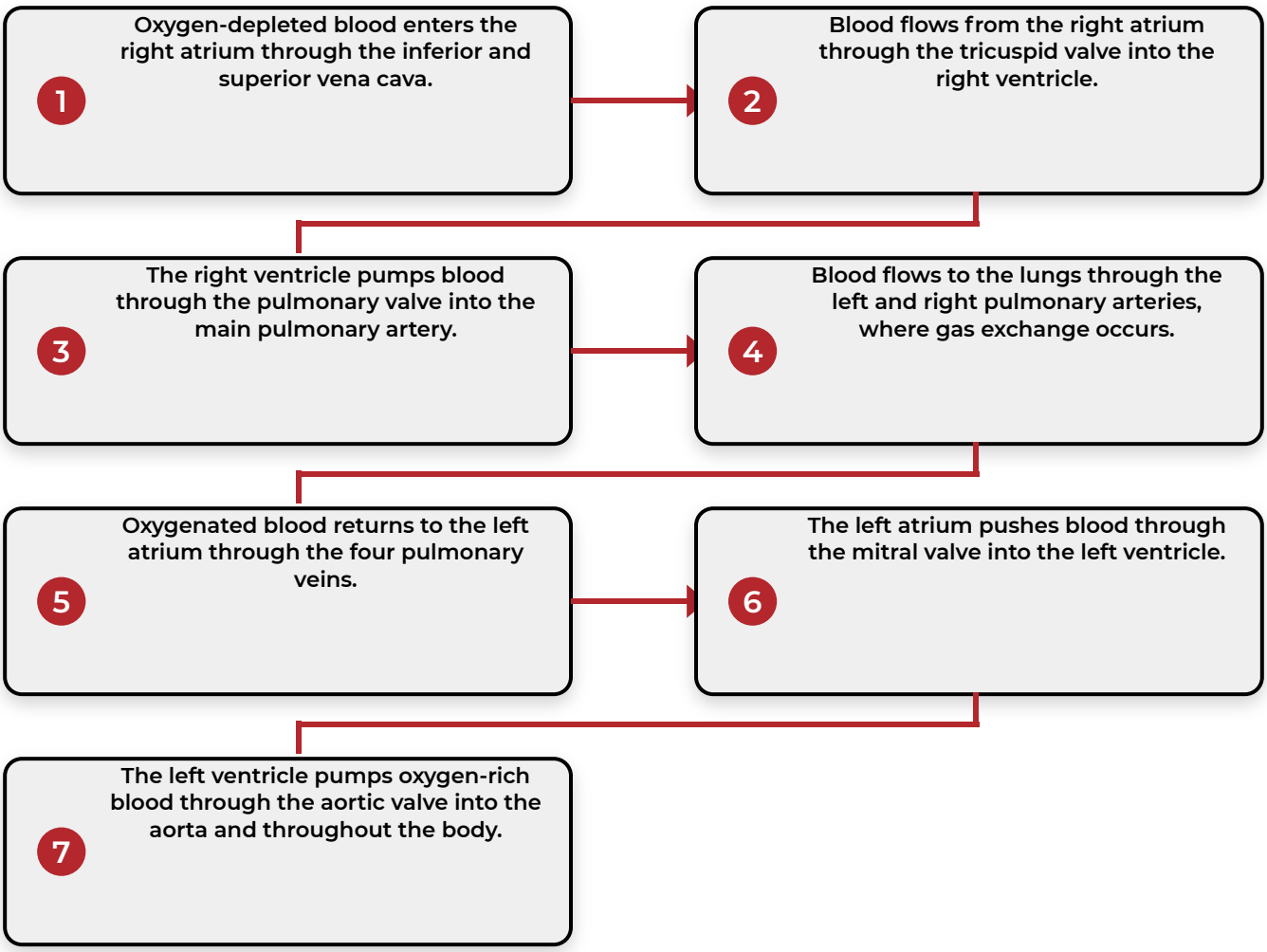
The Cardiovascular system (sometimes called the Circulatory system) consists of the heart and blood vessels that transport nutrients and oxygen-rich blood to all body parts and bring back deoxygenated/ impure blood to the lungs. The heart is the main organ of the circulatory system that pumps blood. Blood vessels like arteries carry that blood away from the heart, veins bring back oxygen-depleted blood to the heart, and capillaries connect very small arteries called arterioles to very small veins called venules (Cleveland Clinic, 2024; Sherrell, 2025).

The two types of blood circulation divide the circulatory system into two categories. The **systemic circulatory system** is the main blood circulation that occurs between the heart and other organs throughout the body. The **pulmonary circulation** moves blood between the heart and the lungs, where exchange of oxygen and carbon dioxide takes place (Cleveland Clinic, 2024; Sherrell, 2025).

The heart is made up of two atria and two ventricles. The upper chambers are atria, the lower chambers are ventricles, which are separated by a wall/septum. There are valves located in these septa that control the flow of blood between them. The valve between the right atrium and ventricle is called the **tricuspid valve**, and the valve between the left atrium and ventricle is called the **mitral valve**. Similarly, there are valves between the left ventricle and the aorta, called the **aortic valve** and between the right ventricle and the pulmonary artery, called the **pulmonary valve**.

Function

The cardiovascular system works through the collaboration of blood vessels with our heart and lungs to move blood continuously through our body. The pathway the blood follows is as mentioned below (Cleveland Clinic, 2024; Sherrell, 2025):



The flow of blood can also be described through what's called a **cardiac cycle**. The cardiac cycle is made up of two phases – diastole and systole.

During diastole, the ventricles of the heart fill with blood. It starts when the aortic or pulmonary valve closes and ends with the mitral or tricuspid valve closing. The blood vessels essentially return blood to the heart in order to prepare for the next ventricular contraction.

Systole is when the ventricles of the heart contract and pump out blood. It starts when the mitral or tricuspid valve closes and ends when the aortic or pulmonary valve closes. The blood is forced out of the ventricles when the pressure inside them becomes greater than the pressure inside the adjacent blood vessels.

Fun Facts: The snapping shut of the heart valves is what causes the iconic "**lub-dub**" sound.

The **pulmonary artery** is the only artery that carries deoxygenated blood, and the pulmonary vein is the only vein that carries oxygenated blood. All other systemic arteries carry oxygenated blood, and all other systemic veins carry deoxygenated blood.

4.3 Patho-Physiology

BHELA, TARANJIT

Overview

Cardiovascular diseases consist of a number of conditions that affect the heart and its blood vessels, involving irregular heart rhythms, narrowing of blood vessels, heart valve issues and conditions present from birth (Cleveland Clinic, 2022; Mayo Clinic, 2024; Painter, 2024). Estimated 32% of deaths in 2022 globally were due to cardiovascular diseases, according to WHO data (World Health Organization, 2025).

Risk factors include Type 2 diabetes, High blood pressure and cholesterol, family history, obesity, Lack of physical activity, tobacco use, Alcohol abuse, chronic kidney disease or autoimmune disease, etc. (Cleveland Clinic, 2022; Mayo Clinic, 2024; Painter, 2024).

Common symptoms include chest pain, also referred to as angina, dyspnea, dizziness, exhaustion, racing heartbeat, pain/cramps in legs while walking, cool or red limbs, numbness and swelling (Cleveland Clinic, 2022; Mayo Clinic, 2024; Painter, 2024).

Management of cardiovascular diseases can be done with medications like aspirin, beta-blockers, calcium channel blockers, ACE inhibitors, diuretics and statins. Surgical operations like bypass, angioplasties, valve repairs, and heart transplants can also be done in some major cases.

Diagnostic tests like blood work to monitor blood sugar, cholesterol and specific proteins can be done to inspect cardiovascular health. Other tests like Electrocardiogram (EKG), Ultrasound, Cardiac CT, Angiograms, stress tests and heart catheterization can also be done to monitor disease progression (Cleveland Clinic, 2022).

Heart Attack

Myocardial Infarction or heart attack is caused when there is a reduction of blood flow to the heart due to blockage in one of the coronary arteries, leading to death of the heart muscle. Thus, the heart is unable to pump blood normally, and the blood flow to the rest of the body gets compromised as well. The two main types of myocardial infarctions are **STEMI** (ST-segment elevation myocardial infarction), which happens when one of the coronary arteries is completely blocked, and **NSTEMI** (non-ST-segment elevation myocardial infarction), which is due to partial blockage but is still a very serious condition. Symptoms may start gradually, including pressure and heaviness in the chest, discomfort spreading to the neck, jaw, shoulder, arm or back; trouble breathing, feeling unusually tired, nausea and vomiting, sweating and dizziness. Sometimes a heart attack can happen without chest pain, also known as a silent heart attack, only presenting as difficulty breathing, sweating, and nausea (Cleveland Clinic, 2025b).

Cardiomyopathy

Any disorder that affects the muscles of the heart is classified as cardiomyopathy, which can cause the heart muscle to enlarge, stiffen or thicken, ultimately leading to insufficient pumping of blood. These conditions tend to get worse with time, leading to heart failure. There are several different types of cardiomyopathies, and their effects can be anywhere from mild to serious. Cardiomyopathy can be both inherited and acquired. Conditions that can lead to acquired cardiomyopathy include autoimmune diseases, chemotherapy, high blood pressure, diabetes, COVID-19, HIV, thyroid diseases, vitamin or mineral deficiencies, etc. It is also possible sometimes to have cardiomyopathy without any reason. Symptoms can be shortness of breath, chest pain, heart flutters, swollen legs, dizziness, or a bloated belly (Cleveland Clinic, 2023; Davis, 2024).

Rheumatic Heart Disease

The valves of the heart can be damaged from rheumatic fever, which is caused by bacterial infections like strep throat or scarlet fever linked to **group A Streptococcus** bacteria. These bacterial infections cause inflammation throughout the body, including the heart, causing permanent valve damage. Children between the ages of 5 and 15 are more prone to get rheumatic heart disease due to untreated strep. Complications of rheumatic fever can manifest even 20 to 30 years after an episode, leading to valve stenosis or regurgitation of blood backwards. Antibiotics like penicillin have been wildly successful in preventing and treating this condition (Cleveland Clinic, 2026).

Deep Vein Thrombosis

As the name suggests, deep vein thrombosis is caused by the development of a blood clot inside a deep vein in the body, such as the legs. This clot can block blood flow partially or completely, and most often occurs due to any vein injury or slow-flowing blood. Pooling of blood often happens after travelling for longer hours. Symptoms can include leg swelling, pain or tenderness, warmth in the swollen area, discoloured skin, etc. These clots can move to different parts of the body and can cause a stroke or pulmonary embolism. Anticoagulants, thrombolytics, and compression stockings can help manage this condition (Cleveland Clinic, 2025a).

4.4 Self Assessment

BHELA, TARANJIT



Self Assessment: The Cardiovascular System

Activity Description

1. How many chambers are there in a human heart?

    a. 6
    b. 4
    c. 3
    d. 5

2. Pulmonary veins return blood to which heart chamber?

    a. Right atrium
    b. Right ventricle
    c. Left atrium
    d. Left ventricle

3. The lub-dub sound of the heart is made by?

    a. Ventricles
    b. Atria
    c. Nodes
    d. Valves

4. The valve between left atrium and left ventricle is?

    a. Semilunar Valve
    b. Bicuspid valve
    c. Mitral valve
    d. Tricuspid valve

5. Pacemaker of the heart is?

    a. SA node
    b. Myocardium
    c. AV node
    d. Purkinje fibres

Answers:

1. 4
2. Left atrium
3. Valves
4. Mitral valve
5. SA node

4.5 References

BHELA, TARANJIT

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CHAPTER 5 - IMMUNE SYSTEM

Chapter Outline

5.1 Medical Terminology
5.2 Physiology
5.3 Patho-Physiology
5.4 Self Assessment
5.5 References

5.1 Medical Terminology

SINGH, AASTHA

Table 5.2.1: Common Roots of the Immune System

Root	Meaning	Example
Immun/o	Immune	Immunodeficiency
Leuk/o	White blood cell	Leukaemia
Splen/o	Spleen	Splenomegaly
Thym/o	Thymus	Thymectomy
Aden/o	Gland	Adenopathy

Table 5.2.2: Common Suffixes of the Immune System

Suffix	Meaning	Example
-oma	Tumor	Lymphoma
-penia	Deficiency	Leukopaenia
-megaly	Enlargement	Splenomegaly

Terminology Breakdown

Leukopaenia is as follows:

leuk/o	+	penia
white blood cell	+	deficiency

Leukopaenia means a deficiency or low level of white blood cells.

Splenomegaly is as follows:

splen/o	+	megaly
spleen	+	enlargement

Splenomegaly means enlargement of the spleen.

Immunodeficiency is as follows:

immun/o	+	deficiency
immune	+	deficiency

Immunodeficiency means a deficiency or weakness in immune function.

5.2 Physiology

SINGH, AASTHA

System Overview

The immune system is responsible for protecting the body against infectious organisms, harmful foreign substances, and abnormal body cells. It works through a coordinated network of organs, tissues, cells, and chemical mediators that identify and eliminate potential threats while maintaining balance within the body (Hall & Hall, 2021).

This system includes white blood cells, lymphatic tissues, lymph nodes, the spleen, thymus, and bone marrow. Together, these structures help defend the body from bacteria, viruses, fungi, and parasites. Immune protection occurs through several mechanisms, including inflammation, phagocytosis, antibody production, and activation of specialized lymphocytes that target harmful substances (Hall & Hall, 2021).

Immune defence is generally divided into two major categories: innate immunity and adaptive immunity. Innate immunity provides immediate, non-specific protection through barriers such as the skin, inflammatory responses, and certain white blood cells. Adaptive immunity develops more slowly but produces highly targeted responses through the action of T-lymphocytes and B-lymphocytes. An important feature of adaptive immunity is immunological memory, which allows the body to respond more effectively to future exposure to the same pathogen and forms the basis of vaccination (Hall & Hall, 2021).

Proper immune regulation is essential for normal body function. Overactivity of the immune system may result in allergies, hypersensitivity reactions, or autoimmune disorders, whereas inadequate immune responses can increase susceptibility to infections and immunodeficiency conditions (Hall & Hall, 2021).

Components of the Immune System

Bone Marrow

- Located in pelvis (largest portion), vertebrae, sternum, ribs and skull
- Produces blood cells (B/T lymphocytes)

Thymus

- Located in the upper chest
- Matures T-lymphocytes

Spleen

- Left upper abdomen
- Filters blood
- Stores lymphocytes

Lymph Nodes

- Located throughout the body
- Filter lymph fluid

Immune Response

Innate Immunity

- First line of defense
- Skin, mucous membranes, inflammation

Acquired / Adaptive Immunity

- Antibody production
- Memory cells

5.3 Patho-Physiology

SINGH, AASTHA

Autoimmune Disorders

Etiology

- Genetic predisposition
- Environmental triggers
- Hormonal factors
- Dysregulated immune response

Symptoms

(varies by condition)

- Fatigue
- Joint pain
- Rash
- Fever
- Organ-specific symptoms

Diagnosis

- ANA
- Rheumatoid factor
- ESR/CRP
- Clinical criteria

Treatment

- Immunosuppressants
- Corticosteroids

Drugs Prescribed

- Methotrexate
- TNF inhibitors
- Corticosteroids

Extra Point

Organ involvement and severity should be reviewed.

(Kumar et al., 2018)

HIV Infection / AIDS

Etiology

- Transmission via sexual contact
- Blood exposure
- Needle sharing
- Vertical transmission (mother to fetus/newborn during pregnancy, childbirth or breastfeeding)

Symptoms

Early:

- Fever
- Fatigue
- Lymphadenopathy
- Rash

Advanced:

- Weight loss
- Recurrent infections
- Night sweats
- Opportunistic infections

Diagnosis

- HIV antigen/antibody test
- Viral load
- CD4 count

Treatment

- Combination antiretroviral therapy (ART)

Drugs Prescribed

- Nucleoside Reverse Transcriptase Inhibitors (NTRIs)
- Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs)
- Protease inhibitors
- Integrase inhibitors

Extra Point

Diseases and opportunistic infections due to compromised immunity.

(Kumar et al., 2018)

Leukemia

Etiology

- Genetic mutations
- Radiation exposure
- Prior chemotherapy
- Unknown/idiopathic causes

Symptoms

- Fever
- Fatigue
- Frequent infections
- Bruising
- Bleeding
- Enlarged lymph nodes

Diagnosis

- CBC
- Bone marrow biopsy
- Cytogenetics

Treatment

- Chemotherapy
- Targeted therapy
- Stem cell transplant

Extra Point

Acute (rapidly growing) vs. chronic (slow-growing) and cell type (lymphocytic vs. myelogenous).

(Kumar et al., 2018)

Hypersensitivity / Allergic Reactions (Most Common)

Etiology

- IgE-mediated response to allergens
- Food, drugs, pollen, insect venom, etc.

Symptoms

- Rash
- Itching
- Swelling
- Shortness of breath
- Anaphylaxis (severe cases)

Diagnosis

- Clinical history
- Allergy testing

Treatment

- Antihistamines
- Corticosteroids
- Epinephrine (IM)

Extra Point

Types of anaphylaxis, difference between allergy and hypersensitivity, how immunity plays a role, and specific diseases under autoimmune and immunodeficient / compromised categories.

(Adams & Bresnick, 2001; Kumar et al., 2018)

5.4 Self Assessment

SINGH, AASTHA



Self Assessment: The Cardiovascular System

Activity Description

1. A patient presents with fatigue, joint pain, a butterfly-shaped facial rash, and a positive Antinuclear antibody (ANA) test.
   Which condition is most likely?

   a. HIV infection
   b. Cellulitis
   c. Systemic Lupus Erythematosus (SLE)
   d. Leukemia

2. Which symptom is most commonly associated with advanced HIV infection?

   a. Hearing loss
   b. Hypertension
   c. Opportunistic infections
   d. Kidney stones

3. Which type of immunity provides immediate, non-specific protection against pathogens?

   a. Adaptive immunity
   b. Innate immunity
   c. Artificial immunity
   d. Passive immunity

4. A patient experiences anaphylaxis after being stung by a bee.
   Which medication should be administered immediately?

   a. Oral antibiotics
   b. Epinephrine (IM)
   c. Acetaminophen
   d. Methotrexate

5. Autoimmune diseases occur when the immune system:

    a. Produces too many red blood cells.
    b. Failure to recognize self body mechanism
    c. Stops producing antibodies completely.
    d. Is infected by bacteria.

Answers:

1. Systemic Lupus Erythematosus (SLE)
2. Opportunistic infections
3. Innate immunity
4. Epinephrine (IM)
5. Failure to recognize self body mechanism

5.5 References

SINGH, AASTHA

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CHAPTER 6 - LYMPHATIC SYSTEM

Chapter Outline

6.1 Medical Terminology
6.2 Physiology
6.3 Patho-Physiology
6.4 Self Assessment
6.5 References

6.1 Medical Terminology

SHARMA, MARYADA

Table 6.1.1: Root Words of the Lymphatic System

Term	Meaning
Lymph-	Lymphatic System
Splen-	Spleen
Thym-	Thymus
Immun-	Immunity

Table 6.1.2: Common Abbreviations of the Lymphatic System

Abbreviation	Meaning
HIV	Human Immunodeficiency Virus
SCID	Severe Combined Immunodeficiency
SLE	Systemic Lupus Erythematosus
CBC	Complete Blood Count
Ig	Immunoglobin

Table 6.1.3: Prefixes and Suffixes of the Lymphatic System

Prefix / Suffix	Meaning	Example
-itis	Inflammation	Lymphadenitis
-oma	Tumor	Lymphoma
-megaly	Enlargemnet	Splenomegaly
-penia	Deficiency	Lymphopenia
hyper-	Excessive	Hyperplasia
hypo-	Deficient	Hypogammaglobulinemia

Examples

Lymphadenopathy is as follows:

Lymph-	+	aden	+	-pathy
lymph node	+	gland	+	disease

Lymphadenopathy means disease or enlargement of the lymph nodes.

Immunodeficiency is as follows:

Immuno-	+	deficiency
immune	+	lack of

Immunodeficiency means an inadequate immune response.

6.2 Physiology

SHARMA, MARYADA

Table 6.2.1: Major Cell Types of the Lymphatic System (Abbas et al., 2021)

Cell Type	Function
Lymphocytes (B cells, T cells, NK cells)	Adaptive Immune Response
B cells	Antibody production (humoral immunity)
T cells	Cell-mediated immunity
Natural Killer (NK) cells	Destroy virus-infected and tumour cells
Reticular cells	Produces reticular fibres forming lymphoid stroma
Macrophages	Phagocytosis, antigen presentation
Endothelial cells (lymphatic)	Lining for lymphatic vessels; Regulation of fluid transport
Dendritic cells	Antigen presentation, Activation of naive T cells
Plasma cells	Antibody Secretion

Table 6.2.2: Key Human Lymphatic Genes and Functions

Gene	Function in Lymphatic System
FOXP3	Regulates T-regulatory cell development; immune tolerance (Bennett et al., 2001).
VEGFC	Lymphangiogenesis; lymphatic vessel development (Kärkkäinen et al., 2004).
IL2RG	Common gamma chain receptor; mutations → SCID (Noguchi et al., 1993).
RAG1/RAG2	V(D)J recombination for B- and T-cell receptors (Schatz & Swanson, 2011).
BTK	B-cell receptor signaling; mutations → X-linked agammaglobulinemia (Tsukada et al., 1993).

Tissues

Lymphoid Tissue

Immune surveillance and response.

Reticular Connective Tissue

Structural support (stroma).

Epithelial Tissue

Present in tonsils and thymus.

Smooth Muscle

Propels lymph through vessels.

Nervous Tissue

Autonomic regulation of lymphatic vessel tone.

Table 6.2.3: Primary and Secondary Lymphoid Organs (Tortora & Derrickson, 2021)

Primary Lymphoid Organs		
Organ	**Structure**	**Function**
Bone Marrow	Hematopoietic Tissue	Produces Lymphocytes; B-cell Maturation
Thymus	Lobules with Cortex & Medulla	T-cell maturation and Selection
Secondary Lymphoid Organs		
Organ	**Structure**	**Function**
Lymph Nodes	Cortex (B Cells), Paracortex (T cells)	Filters lymph; Immune Activation
Spleen	White pulp, Red pulp	Filters Blood; Removes aged RBC
Tonsils	Lymphoid follicles	Protect against inhaled/ingested pathogens
MALT (GALT, BALT)	Diffuse Lymphoid Tissue	Mucosal Immunity

Interaction with Other Systems

Circulatory System

Returns interstitial fluid to the bloodstream.

Immune System

Central role in defence against pathogens.

Digestive System

Lacteals absorb dietary fats.

Cardiovascular System

Maintains fluid balance.

Endocrine System

Hormones influence immune regulation.

6.3 Patho-Physiology

SHARMA, MARYADA

Pathological conditions impair immune surveillance, lymph drainage, and fluid balance.

Etiology of Lymphatic Diseases

1. **Microorganisms:** Viral infections (e.g., Epstein-Barr virus) may trigger lymphadenopathy or lymphoma.
2. **Genetic Abnormalities:** Severe Combined Immunodeficiency (SCID) results from mutations affecting lymphocyte development, leading to profound immunodeficiency.
3. **Injury or Obstruction:** Surgical lymph node removal may cause lymphedema due to impaired lymph drainage.
4. **Autoimmune Disorders:** Systemic lupus erythematosus involves immune dysregulation and autoantibody production.
5. **Neoplastic Processes:** Lymphomas arise from malignant transformation of lymphocytes.

Table 6.3.1: Common Disease Processes of the Lymphatic System (Kumar et al., 2020)

Disease	Process
Inflammation (Lymphadenitis)	Lymph node enlargement due to infection
Neoplasia	• Hodgkin lymphoma (Reed-Sternberg cells) • Non-Hodgkin lymphoma
Obstruction	Lymphedema due to impaired lymphatic drainage
Immunodeficiency	Primary (genetic) or secondary (HIV infection)

Table 6.3.2: Clinical Manifestations and Structural Changes of the Lymphatic System (McCance & Huether, 2019)

Disease	Structural Change	Functional Impact	Common Signs
Lymphedema	Lymph accumulation	Impaired drainage	Limb swelling
Hodgkin Lymphoma	Malignant lymphocytes	Immune dysfunction	Painless lymphadenopathy
SCID (Severe Combined Immunodeficiency)	Absent lymphocyte function	Severe infections	Failure to thrive
Splenomegaly	Enlarged spleen	Hypersplenism	Anaemia

Diagnostic Interventions

Complete blood count (CBC)

Abnormal lymphocyte counts

Flow cytometry

Identifies immune cell populations

Lymph node biopsy

Confirms malignancy

Immunoglobulin levels

Assess humoral immunity

Imaging (CT, PET scan)

Evaluate lymph node enlargement

Risk Factors and Population Impact

Genetic predisposition increases lymphoma risk. Environmental exposures (radiation, chemicals) may contribute to diseases associated with the Lymphatic system. Immunocompromised individuals have higher lymphoma incidence. Ageing alters immune function (Immunosenescence).

Table 6.3.3: Types of Interventions of the Lymphatic System

Condition	Intervention Type	Example
Bacterial Lymphadenitis	Antibiotics	Targeted antimicrobial therapy
Lymphedema	Compression Therapy	Manual lymph drainage
Lymphoma	Chemotherapy / Radiation	R_CHOP regimen
SCID	Bone marrow transplant	Curative Therapy
Autoimmune Disease	Immunosuppressants	Corticosteroids

6.4 Self Assessment

SHARMA, MARYADA



Self Assessment: The Lymphatic System

Activity Description

1. Which cells are primarily responsible for antibody production?

    a. Plasma cells
    b. T cells
    c. Macrophages
    d. NK cells

2. Where do T cells mature?

    a. Spleen
    b. Thymus
    c. Bone marrow
    d. Lymph nodes

3. What is the main function of lymph nodes?

    a. Store fat
    b. Filter blood
    c. Filter lymph and activate immune response
    d. Produce bile

4. Splenomegaly means:

    a. Enlarged spleen
    b. Small spleen
    c. Removed spleen
    d. Infected spleen

5. Which condition results from impaired lymphatic drainage?

    a. Lymphoma
    b. Lymphedema
    c. Leukemia
    d. Anemia

6. A patient presents with painless lymph node enlargement and is diagnosed with Hodgkin lymphoma. What is the key pathological feature?

    a. Reed-Sternberg cells
    b. Mucosal ulceration
    c. Increased RBC destruction
    d. Fibrosis

7. An infant presents with recurrent severe infections and is diagnosed with SCID. What is the primary functional defect?

    a. Enhanced inflammation
    b. Excess antibody production
    c. Impaired lymphocyte function
    d. Increased macrophage activity

8. A 30-year-old patient presents with joint pain, fatigue, and positive autoimmune markers. The provider diagnoses systemic lupus erythematosus (SLE). What is the primary underlying mechanism affecting the lymphatic / immune system?

    a. Complete absence of lymph nodes
    b. Increased bacterial infection of lymph nodes
    c. Autoantibody production causing immune dysregulation
    d. Reduced vascular supply to spleen

Answers:

1. Plasma cells
2. Thymus
3. Filter lymph and activate immune response
4. Enlarged spleen
5. Lymphedema
6. Reed-Sternberg cells
7. Impaired lymphocyte function
8. Autoantibody production causing immune dysregulation

6.5 References

SHARMA, MARYADA

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CHAPTER 7 - DIGESTIVE SYSTEM

Chapter Outline

7.1 Medical Terminology
7.2 Physiology
7.3 Patho-Physiology
7.4 Self Assessment
7.5 References

7.1 Medical Terminology

SHARMA, MARYADA

Table 7.1.1: Common Root words and Prefixes of the Digestive System (Kumar et al., 2020)

Prefix	Meaning	Example
Hepat/o	Liver	Hepatitis = liver inflammation
Gastr/o	Stomach	Gastroenteritis = inflammation of the gastrointestinal tract
Hyper-	Excesssive	Hyperbilirubinemia = elevated bilirubin in the blood
Hypo-	Below normal	Hypoalbuminemia = low albumin levels

Table 7.1.2: Common Suffixes of the Digestive System (Kumar et al., 2020)

Suffix	Meaning	Example
-itis	Inflammation	Hepatitis = liver inflammation
-osis	Abnormal condition or disease	Cirrhosis = chronic liver disease with fibrosis
-phagia	Eating or swallowing	Dysphagia = difficulty swallowing
-ectomy	Surgical removal	Cholecystectomy = removal of the gallbladder

Common Abbreviations and Acronyms

Some commonly used abbreviations related to the digestive system include:

- **NG** – nasogastric (tube for feeding or drainage)
- **NPO** – nothing by mouth (nil per os)
- **ERCP** – *endoscopic retrograde cholangiopancreatography*, a diagnostic and therapeutic procedure for the bile and pancreatic ducts
- **IBD** – inflammatory bowel disease
- **PO** – by mouth (per os)
- **b.i.d.** – twice daily
- **q.i.d.** – four times daily
- **GI** – gastrointestinal

Knowledge of these abbreviations ensures an accurate understanding of orders, medication instructions, and procedure notes (McCance & Huether, 2019).

Practical Application of Medical Terminology

Consider the term gastroesophageal reflux disease (**GERD**):

Gastr/o	+	**Esophag/o**	+	**Reflux**	+	**Disease**
stomach	+	**esophagus**	+	**backward flow**	+	**pathological condition**

Breaking the term into its components clarifies that **GERD** involves the backward flow of stomach contents into the esophagus, often causing symptoms such as heartburn.

Similarly, **hepatocellular carcinoma** can be interpreted as follows:

Hepat/o	+	**Cellular**	+	**Carcinoma**
liver	+	**relating to cells**	+	**malignant tumor**

Thus, **hepatocellular carcinoma** identifies a malignant tumour of liver cells.

7.2 Physiology

SHARMA, MARYADA

Major Cell Types

Enterocytes

Absorption (small intestine)

Goblet cells

Mucus (protection & lubrication)

Parietal cells

HCl + intrinsic factor

Chief cells

Pepsinogen

Enteroendocrine cells

Hormones (gastrin, secretin, CCK)

Paneth cells

Antimicrobial defense

(Hall & Hall, 2021)

Tissues

Epithelium

Absorption, secretion, protection

Connective Tissue

Support, blood vessels (lamina propria)

Smooth Muscle

Peristalsis

Nervous Tissue

Enteric nervous system

Table 7.2.1: Organs of the Digestive System (Tortora & Derrickson, 2021)

Alimentary Canal		
Organ	**Key Structure**	**Function**
Mouth	Teeth, tongue, salivary glands	Ingestion, mastication
Esophagus	Muscular tube	Transport of food
Stomach	Gastric glands	Mechanical & chemical digestion
Small Intestine	Duodenum, jejunum, ileum	Digestion & absorption
Large Intestine	Colon, rectum	Water absorption, feces formation
Accessory Organs		
Organ	**Function**	
Salivary Glands	Produce saliva (amylase)	
Liver	Produces bile, metabolism	
Gallbladder	Stores bile	
Pancreas	Digestive enzymes & bicarbonate	

Interaction with Other Systems

- **Circulatory system:** Transports absorbed nutrients
- **Nervous system:** Regulates digestion
- **Endocrine system:** Hormonal control of digestion
- **Immune system:** Gut-associated lymphoid tissue (GALT)

Table 7.2.2: Key Human Digestive Genes and Functions

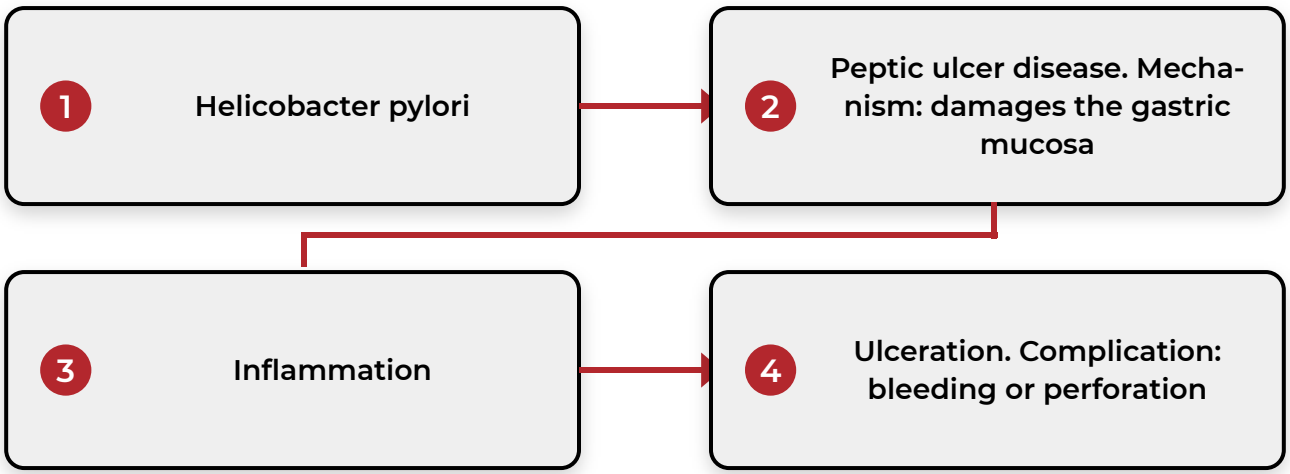
Gene	Function in the Digestive System
PRSS1	Encodes cationic trypsinogen; digests dietary proteins in the small intestine; Mutations – hereditary/chronic pancreatitis (Witt, 2011)
SPINK1	Produces trypsin inhibitor; protects pancreas from premature trypsin activation; variants increase pancreatitis risk (Wang et al., 2025)
LCT	Encodes lactase; hydrolyses lactose into glucose and galactose for absorption; variants – lactose intolerance or persistence (Anguita-Ruiz et al., 2020)
GAST	Encodes the gastrin hormone; stimulates gastric acid secretion; regulates gastric motility and mucosal growth (Dimaline & Varro, 2014)

7.3 Patho-Physiology

SHARMA, MARYADA

Etiology of Digestive Diseases

1. **Microorganisms:**



(Kumar et al., 2020).

2. **Genetic Abnormalities:** A positive sweat chloride test in an infant is diagnostic for *cystic fibrosis*, an autosomal recessive disorder affecting chloride transport. Thick secretions obstruct pancreatic ducts, impairing enzyme delivery and causing malabsorption (McCance & Huether, 2019). This example illustrates how molecular defects alter organ-level function.
3. **Injury or Toxic Exposure:** Alcohol misuse causes hepatocellular injury and fatty liver disease. Acetaminophen toxicity can lead to acute liver failure due to toxic metabolite accumulation.
4. **Adverse Effects of Correctly Taken Medications:** NSAIDs inhibit prostaglandin synthesis, reducing gastric mucosal protection and increasing ulcer risk.
5. **Nutritional Factors:** Chronic high-fat, high-sugar diets contribute to metabolic dysfunction-associated steatotic liver disease. Malnutrition impairs mucosal integrity and immune defence, increasing susceptibility to infection.

Table 7.3.1: Common Disease Processes of the Digestive System

Disease	Information
Inflammation	Definition: Protective response to injury or infection Signs: Redness, heat, swelling, pain Acute inflammation = protective; Chronic = tissue damage and fibrosis Example: Inflammatory Bowel Disease (IBD)
Neoplasia	Definition: Uncontrolled abnormal cell growth Staging = extent of spread Grading = degree of differentiation Example: Colorectal carcinoma (Malignant) and Adenomas (Benign)
Obstruction	Example: Gallstones blocking bile ducts → cholecystitis
Ischemia	Reduced blood flow → tissue necrosis; Example: Mesenteric ischemia

Table 7.3.2: Clinical Manifestations and Structural Changes of the Digestive System

Disease	Structural Change	Functional Impact	Common Signs
Peptic ulcer	Mucosal erosion	Impaired protection	Epigastric pain, bleeding
Cirrhosis	Fibrosis	Portal hypertension	Ascites, Varices
Pancreatitis	Enzymatic autodigestion of pancreatic tissue	Impaired digestion	Severe Abdominal pain

Diagnostic Interventions

Diagnostic testing confirms suspected pathology. Common laboratory tests include:

Complete blood count (CBC)

Normal haemoglobin levels indicate adequate oxygen-carrying capacity; Anemia may suggest chronic gastrointestinal bleeding.

Liver function tests (ALT, AST, bilirubin)

Elevated levels indicate hepatocellular injury or biliary obstruction.

Serum amylase and lipase

Elevated levels suggest acute pancreatitis.

Stool occult blood test

Positive results indicate possible gastrointestinal bleeding.

Cultures identify infectious organisms (e.g., bacterial gastroenteritis). Imaging modalities such as ultrasound or computed tomography (CT) visualize structural abnormalities, including tumours or inflammation. Endoscopy allows direct visualization and biopsy for histologic examination.

Risk Factors and Population Impact

Risk factors influence disease development. Genetic predisposition increases colorectal cancer risk, especially in familial syndromes. Lifestyle factors such as smoking and alcohol use elevate risks for peptic ulcer disease and liver disease. Obesity contributes to gallstones and fatty liver disease. Environmental exposures, chronic stress, and pre-existing conditions such as diabetes also modify disease risk. Certain populations experience higher disease prevalence. For example, Inflammatory Bowel Disease is more common in industrialized nations, suggesting environmental contributions. Hepatitis-related liver disease may be more prevalent in regions with limited vaccination access.

Table 7.3.3: Types of Interventions of the Digestive System

Condition	Intervention Type	Example
Bacterial Infection	Antibiotic	H. pylori treatment
Inflammation	Corticosteroid	IBD therapy
Acid Reflux	Proton pump inhibitor	GERD
Cancer	Surgery / Chemotherapy / Radiation	Colon cancer
Liver Failure	Transplant	End-stage cirrhosis

7.4 Self Assessment

SHARMA, MARYADA



Self-Assessment: The Digestive System

Activity Description

1. Which cell type is primarily responsible for secreting hydrochloric acid and intrinsic factor in the stomach?

    a. Chief cells
    b. Goblet cells
    c. Enteroendocrine cells
    d. Parietal cells

2. What is the main function of enterocytes in the small intestine?

    a. Immune defense
    b. Mucus production
    c. Hormone secretion
    d. Absorption of nutrients

3. Which tissue layer of the digestive tract is primarily responsible for peristalsis?

    a. Smooth muscle
    b. Connective tissue
    c. Nervous tissue
    d. Epithelium

4. Which accessory organ produces bile?

    a. Salivary glands
    b. Liver
    c. Pancreas
    d. Gallbladder

5. What does the prefix “entero-” refer to in clinical terminology?

    a. Intestine
    b. Liver
    c. Stomach
    d. Gallbladder

6. A patient presents with epigastric pain and is diagnosed with a peptic ulcer caused by Helicobacter pylori.What is the underlying pathophysiological mechanism?

    a. Impaired peristalsis
    b. Increased bile production
    c. Mucosal damage leading to ulceration
    d. Decreased enzyme secretion

7. A patient with chronic alcohol use develops cirrhosis.What structural change is most responsible for portal hypertension?

    a. Fibrosis of liver tissue
    b. Enzyme deficiency
    c. Increased bile secretion
    d. Mucosal erosion

8. A patient with diabetic neuropathy experiences delayed gastric emptying (gastroparesis).Which tissue system is most affected?

    a. Nervous tissue (enteric nervous system)
    b. Connective tissue
    c. Epithelial tissue
    d. Smooth muscle only

Answers:

1. Parietal cells
2. Absorption of nutrients
3. Smooth muscle
4. Liver
5. Intestine
6. Mucosal damage leading to ulceration
7. Fibrosis of liver tissue
8. Nervous tissue (enteric nervous system)

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CHAPTER 8 - URINARY SYSTEM

Chapter Outline

8.1 Medical Terminology
8.2 Physiology
8.3 Patho-Physiology
8.4 Self Assessment
8.5 References

8.1 Medical Terminology

SINGH, AASTHA

Table 8.1.1: Root Words and Combining Forms of the Urinary System

Root	Meaning	Example
Nephr/o	Kidney	Nephritis
Cyst/o	Bladder	Cytoscopy
Pyel/o	Renal pelvis	Pyelonephritis
Urethr/o	Urethra	Urethritis

Table 8.1.2: Prefixes and Suffixes of the Urinary System

Prefix/Suffix	Meaning	Example
Hyper-	Above normal	Hypertension
Hypo-	Below normal	Hypokelemia
-uria	Urine	Hematuria
-itis	Inflammation	Cystitis

Example

Nephrolithiasis is as follows:

nephr/o	+	**lith**	+	**iasis**
kidney	+	**stone**	+	**condition**

Nephrolithiasis means a condition involving kidney stones.

8.2 Physiology

SINGH, AASTHA

System Overview

The urinary system is essential for maintaining the body's internal balance and overall physiological stability. Its primary functions include removing metabolic waste products, controlling fluid levels, and regulating electrolyte concentrations. The kidneys serve as the main organs of this system, continuously filtering the cystitis blood to eliminate unwanted substances while conserving materials necessary for normal body function (Hall & Hall, 2021).

Urine production involves a sequence of coordinated processes occurring within the nephrons of the kidneys. These include filtration of blood within the glomeruli, selective reabsorption of water and nutrients back into circulation, and secretion of additional waste substances into the renal tubules. Through these mechanisms, the body is able to excrete waste products such as urea and creatinine while maintaining appropriate levels of electrolytes, glucose, and water (Hall & Hall, 2021).

Beyond waste removal, the kidneys also play an important role in regulating blood pressure through activation of the renin–angiotensin aldosterone system (RAAS). They additionally help maintain acid–base equilibrium, support electrolyte regulation, and produce erythropoietin, a hormone involved in red blood cell production. Because of these diverse functions, even small reductions in kidney function can significantly affect fluid balance, cardiovascular function, and overall homeostasis (Hall & Hall, 2021).

Parts/Organs of the Urinary System

Kidneys

- Located retroperitoneally at T12-L3
- Filter blood and remove waste
- Regulate electrolytes and blood pressure
- Produce erythropoietin
- Maintain acid-base balance

Ureters

- Transport urine from kidneys to bladder

Bladder

- Located in pelvic cavity
- Stores urine

Urethra

- Eliminates urine from body

Steps in the Physiological Processes

The steps in the process of urine formation are:

- Filtration (Glomerular filtration)
- Reabsorption (Tubular reabsorption)
- Secretion (Tubular secretion)
- Urine formation (Excretion)

8.3 Patho-Physiology

SINGH, AASTHA

Urinary Tract Infection (UTI)

Etiology

- Ascending bacterial infection (most commonly E. coli)
- Catheterization
- Urinary obstruction
- Incomplete bladder emptying
- Sexual activity
- Poor hygiene

Symptoms

- Dysuria (painful urination)
- Urinary frequency
- Urgency
- Lower Abdominal/Suprapubic pain
- Hematuria
- Fever (if upper UTI/pyelonephritis)
- Flank pain (maybe kidney involvement?)

Diagnosis

- Urinalysis (nitrates, leukocytes)
- Urine culture
- CBC (if systemic symptoms)

Treatment

- Oral antibiotics (uncomplicated cases)
- IV antibiotics (complicated cases) might be admitted too.
- Hydration

Drugs Prescribed

- Nitrofurantoin
- Trimethoprim-sulfamethoxazole
- Cephalosporins
- Fluoroquinolones

Extra Point

Know the site (cystitis – bladder infection vs pyelonephritis – severe kidney infection), organism, and whether it is catheter-associated. Pyelonephritis is generally more severe.

Chronic Kidney Disease (CKD)

Etiology

- Diabetes mellitus
- Hypertension
- Chronic glomerulonephritis
- Polycystic kidney disease
- Chronic obstruction

Symptoms

(Early stages may be asymptomatic)

- Fatigue
- Oedema (swelling)
- Decreased urine output
- Hypertension
- Nausea
- Pruritus (itching)
- Shortness of breath

Diagnosis

- eGFR (persistent reduction ≥2-3 months)
- Serum creatinine
- Urine analysis
- Renal ultrasound

Treatment

- Dialysis (advanced stages)
- Blood pressure control
- Glycemic control
- Dietary modification
- Transplant

Drugs Prescribed

- Angiotensin converting enzyme inhibitors (ACE inhibitors)
- Angiotensin II receptor blockers (ARBs)
- Erythropoiesis-stimulating agents

Extra Point

Stages of CKD (1-5) and their severity.

(Kumar et al., 2018)

Acute Kidney Injury (AKI)

Etiology

Prerenal: hypovolemia, heart failure

Intrinsic: nephrotoxic drugs, infection

Postrenal: obstruction (stones, enlarged prostate)

Symptoms

- Sudden decrease in urine output
- Fluid retention
- Confusion
- Nausea
- Shortness of breath
- Electrolyte imbalance symptoms

Diagnosis

- Rapid rise in creatinine
- Reduced urine output
- Abnormal electrolytes

Treatment

- Correct the underlying cause
- Fluid management
- Dialysis (if severe)

Extra Point

Know the difference between AKI and CKD.

(Kumar et al., 2018)

Renal Calculi (Kidney Stones)

Etiology

- Dehydration
- High calcium/oxalate levels
- Recurrent UTIs
- Metabolic disorders

Symptoms

- Severe flank pain, radiating to the lower back
- Hematuria
- Nausea and vomiting
- Dysuria

Diagnosis

- Non-contrast CT scan
- Ultrasound
- Urinalysis

Treatment

- Hydration
- Pain management (NSAIDs)
- Alpha-blockers
- Ureteroscopy (removal of stone) with or without Lithotripsy (breaking down stone into small pieces)

Extra Point

Mostly common in males due to longer urethral length

(Adams & Bresnick, 2001)

8.4 Self Assessment

SINGH, AASTHA



Self Assessment: The Urinary System

Activity Description

1. A patient presents with flank pain, fever, nausea, and a burning sensation while peeing. Urinalysis reveals bacteriuria and leukocytes. Which condition is most likely occurring?

    a. Nephrolithiasis
    b. Acute cystitis
    c. Pyelonephritis
    d. Chronic kidney disease

2. A patient presents with fatigue, generalized edema, and shortness of breath. Laboratory results show impaired kidney function and persistent electrolyte abnormalities. Which treatment is most appropriate at this stage of the disease?

    a. Antihistamines
    b. Dialysis
    c. Increased fluid intake only
    d. Oral antibiotics

3. What is the first-line treatment for a urinary tract infection?

    a. Oral antifungals
    b. Oral antibiotics
    c. Fluid management
    d. Corticosteroids

4. A patient is admitted with a sudden decrease in urine output following severe dehydration from gastroenteritis. Laboratory tests show a rapid increase in serum creatinine. The physician expects kidney function to improve once the underlying cause is treated. Which characteristic best supports a diagnosis of Acute Kidney Injury (AKI) rather than Chronic Kidney Disease (CKD)?

    a. The patient has a history of diabetes and hypertension.
    b. Kidney function declined gradually over several years.
    c. The kidney dysfunction developed suddenly and may be reversible.
    d. The patient requires long-term dialysis.

5. A patient with renal calculi develops hydronephrosis. What is the most likely mechanism causing the complication?

    a. Increased erythrocytes in blood
    b. Obstruction of urinary flow, causing back pressure on the kidney
    c. Excessive urine production
    d. Autoimmune inflammation

Answers:

1. Pyelonephritis
2. Dialysis
3. Oral antibiotics
4. The kidney dysfunction developed suddenly and may be reversible.
5. Obstruction of urinary flow, causing back pressure on the kidney

8.5 References

SINGH, AASTHA

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CHAPTER 9 - INTEGUMENTARY SYSTEM

Chapter Outline

9.1 Medical Terminology
9.2 Physiology
9.3 Patho-Physiology
9.4 Self Assessment
9.5 References

9.1 Medical Terminology

SINGH, AASTHA

Table 9.1.1: Common Root Words of the Integumentary System

Root	Meaning	Example
Dermat/o	Skin	Dermatology
Cutane/o	Skin	Subcutaneous
Kerat/o	Hard Tissue	Keratosis
Melan/o	Black Pigment	Melanoma
Hidr/o	Sweat	Hyperhidrosis

Table 9.1.2: Common Suffixes of the Integumentary System

Prefix/Suffix	Meaning	Example
-oma	Tumor	Melanoma
-osis	Condition	Keratosis
-ectomy	Removal	Dermectomy

Terminology Breakdown

Dermatitis is as follows:

dermat/o	+	itis
skin	+	inflammation

Dermatitis means inflammation of the skin.

Melanoma is as follows:

melan/o	+	oma
pigment	+	tumor

Melanoma means a tumour involving pigment-producing cells.

Hyperkeratosis is as follows:

hyper	+	kerat/o	+	osis
excessive	+	keratin	+	condition

Hyperkeratosis means a condition involving excessive keratin.

9.2 Physiology

SINGH, AASTHA

System Overview

The integumentary system forms the outer protective covering of the body and plays an important role in maintaining internal stability and protecting underlying tissues. It consists of the skin and its associated structures, including hair, nails, sweat glands, and sebaceous glands. Together, these components create a barrier between the body's internal environment and external surroundings (Hall & Hall, 2021).

The skin is considered the largest organ of the body and performs several vital functions. These include protection against physical injury and microorganisms, regulation of body temperature, prevention of excessive fluid loss, sensory perception, and synthesis of vitamin D. Through nerve receptors located within the skin, the body is also able to detect touch, pressure, pain, and temperature changes (Hall & Hall, 2021).

The integumentary system works closely with the immune system by acting as both a physical and immunological defence mechanism. When skin integrity is disrupted through injury, burns, or disease, the risk of infection and other complications increases significantly. In addition, abnormalities affecting the skin may reflect underlying systemic conditions (Hall & Hall, 2021).

Due to the large number of dermatological disorders, infections, inflammatory conditions, and malignancies associated with this system, focusing on the major diseases and physiological concepts can help simplify learning and improve understanding for examination preparation.

Components of the Integumentary System

- Skin (epidermis, dermis, hypodermis)
- Hair
- Nails
- Sebaceous (oil) glands
- Sweat glands

Location and Function

Epidermis

- Outermost layer
- Provides a waterproof barrier
- Contains melanocytes

Dermis

- Middle Layer
- Contains blood vessels, nerves, and glands
- Provides strength and elasticity

Hypodermis (Subcutaneous layer)

- Deep layer
- Stores fat
- Insulates body

Functional Response

- **Protective Function:** Physical barrier against pathogens
- **Thermoregulation:** Sweating and blood flow control
- **Sensory Function:** Detects touch, pain, and temperature

9.3 Patho-Physiology

SINGH, AASTHA

Dermatitis (Eczema)

Etiology

- Allergic reactions (contact dermatitis)
- Genetic predisposition (atopic dermatitis)
- Environmental irritants
- Immune system dysfunction

Symptoms

- Itching (pruritis)
- Redness
- Dry, scaly skin
- Blisters (acute)
- Thickened skin (chronic)

Diagnosis

- Clinical examination
- Patient history
- Patch testing

Treatment

- Avoid triggers
- Skin hydration
- Topical corticosteroids
- Drugs: Corticosteroids, Antihistamines, Calcineurin inhibitors

Extra Point

Types (atopic vs. contact) and severity should be known.

Psoriasis

Etiology

- Autoimmune disorder
- Genetic factors
- Triggered by stress, infection, medications

Symptoms

- Thick scaly plaques
- Red inflamed skin
- Itching
- Common sites: elbows, knees, scalp

Diagnosis

- Clinical evaluation
- Skin biopsy (if required)

Treatment

- Topical therapy
- Phototherapy
- Systemic immunosuppressants and Immunomodulators (Methorate, Inflixizumab, etc.), Corticosteroids, Vitamin D analogs, Biologic agents.

Extra Point

Severity Classification (mild, moderate, severe) is important.

(Kumar et al., 2018)

Skin Infection: Bacterial (Cellulitis)

Etiology

- Bacterial entry through skin breaks
- Common organisms: Streptococcus, Staphylococcus

Symptoms

- Redness
- Swelling
- Warmth
- Pain
- Fever

Diagnosis

- Clinical examination
- Culture (if severe)

Treatment

- Antibiotics, Penicillins, Cephalosporin
- Wound care

Extra Point

Another common bacterial infection caused by *Staphylococcus aureus* is impetigo.

(Kumar et al., 2018)

Skin Infection: Fungal (Dermatophytosis / Ringworm)

Etiology

- Fungal infection in warm, moist environments

Symptoms

- Itching
- Ring-shaped rash
- Scaling

Diagnosis

- Clinical examination
- Microscopy (KOH test)

Treatment

- Topical antifungals
- Oral antifungals (severe cases)

Extra Point

Different sites are identified by different nomenclature (e.g. Tinea Capitus if the site is the scalp, or Tinea Fascia if the face).

Skin Cancer

Types

- Basal cell carcinoma
- Squamous cell carcinoma
- Melanoma
- Various other types

Etiology

- UV radiation exposure
- Lack of melanin
- Family history
- Immunosuppression
- Unknown etiology

Symptoms

- New or changing lesion
- Irregular borders of a lump or mass on the skin
- Non-healing sores
- Pigmentation changes

Diagnosis

- Skin biopsy
- Dermoscopy

Treatment

- Surgical excision
- Radiation therapy
- Chemotherapy
- Immunotherapy

Extra Point

Type, stage, and location play a major role in severity and treatment.

(Kumar et al., 2018; Adams & Bresnick, 2001)

Acne Vulgaris

Etiology

- Hormonal changes
- Excess sebum production
- Bacterial growth (*Cutibacterium acnes*)
- Follicular blockage
- Polycystic ovarian syndrome (PCOS)

Symptoms

- Pimples (papules, pustules)
- Blackheads and whiteheads
- Inflammation
- Scarring (severe cases)

Diagnosis

- Clinical examination

Treatment

- Topical therapy
- Oral antibiotics
- Hormonal therapy
- Severe: Retinoids
- Benzoyl peroxide

Extra Point

Severity (mild, moderate, severe) must be known.

9.4 Self Assessment

SINGH, AASTHA



Self Assessment: The Integumentary System

Activity Description

1. A patient presents with thick, red plaques covered with silvery scales on the elbows and knees. Which condition is most likely?

    a. Cellulitis
    b. Melanoma
    c. Acne vulgaris
    d. Psoriasis

2. Which finding is most characteristic of cellulitis?

    a. Painful, warm, swollen area of skin with redness
    b. Ring-shaped rash with central clearing
    c. Blackheads and whiteheads
    d. Pigmented mole with irregular borders

3. Which treatment is commonly prescribed for mild to moderate eczema (dermatitis)?

    a. Antiretroviral therapy
    b. Topical corticosteroids
    c. Chemotherapy
    d. Dialysis

4. What is the primary function of the skin?

    a. Filter blood
    b. Produce white blood cells
    c. Produce insulin
    d. Act as a protective barrier against injury and infection

5. A patient has a new mole that has changed in size, colour, and shape over the past six months. Which condition should be suspected?

    a. Acne vulgaris
    b. Melanoma
    c. Ringworm
    d. Basal cell carcinoma

Answers:

1. Psoriasis
2. Painful, warm, swollen area of skin with redness
3. Topical corticosteroids
4. Act as a protective barrier against injury and infection
5. Melanoma

9.5 References

SINGH, AASTHA

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CHAPTER 10 - MUSCULOSKELETAL SYSTEM

Chapter Outline

10.1 Medical Terminology
10.2 Physiology
10.3 Patho-Physiology
10.4 Self Assessment
10.5 References

10.1 Medical Terminology

BHELA, TARANJIT

Table 10.1.1: Common Root Words of the Musculoskeletal System (Open Education Alberta, n.d.)

Root	Meaning
Oste/o	Bone
Arthr/o	Joint
Chondr/o	Cartilage
My/o	Muscle
Tendin/o	Tendon
Cervic/o	Neck

Table 10.1.2: Common Prefixes and Suffixes of the Musculoskeletal System (Open Education Alberta, n.d.)

Prefix / Suffix	Meaning
-itis	Inflammation
-algia	Pain
-ectomy	Surgical removal
-porosis	Porous condition
-plasty	Surgical repair
A- An-	Without
Bi-	Two
Inter-	Between

Examples

Osteoarthritis is as follows:

oste/o	+	**arthr/o**	+	**itis**
bone	+	**joint**	+	**inflammation**

Osteoarthritis refers to inflammation or degenerative changes involving bones and joints.

Myalgia is as follows:

my/o	+	algia
muscle	+	pain

Myalgia means pain in the muscles.

Tendonitis is as follows:

tendon	+	itis
tendon	+	inflammation

Tendonitis means inflammation of a tendon.

Intervertebral is as follows:

inter	+	vertebr/o	+	al
between	+	vertebrae	+	pertaining to

Intervertebral means pertaining to the area between vertebrae.

10.2 Physiology

BHELA, TARANJIT

Anatomy

The musculoskeletal system is an integrated system involving bones, muscles, joints, tendons and ligaments providing stability, support, shape and movement to the body (Villa-Forte, 2025). It also helps in creating new blood cells and acts as a mineral storage site. It also consists of connective tissue that binds all these components together (Cleveland Clinic, 2024).

Bones

The framework of our body comprises this rigid structure made of strong and hard tissues. Bones protect the delicate structures within the body and contain bone marrow responsible for making new blood cells. Babies are born with approximately 270 bones that fuse together and grow, ultimately making the number 206 in adults. Bone tissue contains a mineralized bone matrix and type 1 collagen fibres. There are mainly three types of bone cells: osteoblasts (bone formation), osteoclasts (bone resorption) and osteocytes (maintain bone). The two layers of bone that differ histologically are Cortical bone (outer layer) and Cancellous bone (spongy inner layer). Classification of bones can be done based on their shape as long bones, short bones, flat bones, sesamoid bones and irregular bones (Sendic & Vaskovic, 2023). The head of a long bone is called the epiphysis on its proximal and distal ends; the neck is called the metaphysis, and the shaft is called the diaphysis.

Muscles

A special form of tissue that has the ability to contract, woven together, makes muscle tissue. The three main types of muscles are Skeletal muscle, smooth muscle and cardiac muscle. The skeletal and cardiac muscles can also be grouped as striated muscles, while smooth muscles are non-striated. The skeletal muscles are the only voluntary muscles that a person can control. The other types are non-voluntary. There are more than 600 muscles throughout our body.

Tendons

A rigid band of connective tissue comprising mainly a protein called collagen that attaches skeletal muscles to bones. The collagen fibres are arranged parallel to each other, providing high tensile strength to tendons. There are also small fluid-filled sacs located under a tendon called bursae, which protect them from injury.

Cartilage

It is a flexible connective tissue that acts as a shock absorber and protects our bones and joints. It reduces friction between bones and prevents the rubbing of bones while in use. Based on composition, cartilage can be classified into three types: Hyaline cartilage, which is the most common in our body, is smooth and slippery; Fibrocartilage is made of thick fibres and is tough, which makes it the least flexible; and Elastic cartilage, which is the most flexible of all due to its bending property.

Joints

The junction where two or more bones meet is called a joint. The joints can be classified based on their composition and also on their function. Based on function, joints can be classified into three types, which are Synarthroses (don't move), Amphiarthroses (limited movement) and Diarthroses (move freely). Based on composition, joints can be Fibrous (thick with more collagen), Cartilaginous (connected by cartilage) and Synovial (contains fluid that lubricates the surface).

Ligaments

Ligaments are also made of dense connective tissue like tendons, but unlike tendons, they connect bone to other bones. They support the skeletal structure by reinforcing joints and stabilizing bones. Based on their location relative to the joint capsule, ligaments can be classified as Capsular, Intracapsular and Extracapsular.

The specialized cells that have the ability to contract, called **myocytes**, are the main cells that form a skeletal muscle. These myocytes are multinucleated, elongated cells surrounded by a membrane called sarcolemma. The cytoplasm of muscle fibres contains proteins called actin and myosin that are arranged into patterns and form a unit called a sarcomere.

The interaction of myofibrils inside the myocytes is what causes muscle contraction. This either increases its tension or shortens the muscle, generating a force that ultimately slows down or facilitates a movement.

Isometric contraction is when the muscle length does not change, and Isotonic contraction is when the tension is unchanged but the length changes. Isotonic contraction is further classified as concentric (muscle shortens due to the force to overcome resistance) and eccentric (muscle stretches due to resistance greater than the force that the muscle generates).

The signal that makes a muscle act is ultimately generated through an action potential in the nervous system. The signal travels through motor neurons that start from the brain and reach the neuromuscular junction, which is the site where nerves and muscles meet.

The skeletal muscle structure gives the tissue four main physiological properties, namely excitability, contractibility, extensibility and elasticity, which make the muscle work in different ways as needed.

10.3 Patho-Physiology

BHELA, TARANJIT

According to the WHO (2022), there are over 150 musculoskeletal disorders that fall within four categories:

- **Joint Conditions:** Osteoarthritis, Rheumatoid arthritis, Gout, Bursitis.
- **Bone Conditions:** Osteoporosis, Osteopenia, Osteomalacia.
- **Muscle and Tendon Conditions:** Muscular dystrophy, Myasthenia gravis, Tendinopathy.
- **Other Conditions:** Fibromyalgia, Lupus erythematosus, Marfan syndrome and others.

Different tests and imaging can assist in diagnosing musculoskeletal disorders, such as CT, MRI, X-rays, Ultrasound, Bone density Scan, Joint fluid tests, etc.

Several treatment options available to treat these conditions can help with pain, inflammation and improve range of motion, which include exercises like walking and swimming, medications like NSAIDs and corticosteroids, cold or heat therapy, physical therapy, joint replacement surgeries and other complementary therapies such as massage and acupuncture (Vevers, 2026).

Gout

It is a type of inflammatory arthritis caused by the crystallization of excess uric acid in the joints. It commonly affects the big toes, causing severe pain and swelling in the joints. Certain foods and drinks contain substances called purines, which, when broken down, form uric acid in the body. Kidneys filter out uric acid from our blood, but when the body starts making too much uric acid, it becomes difficult to filter blood fast enough. This hyperuricemia is the main cause of gout (Cleveland Clinic, 2026a). Risk factors include older age, being a male, genetics, dietary choices, being overweight, diseases like high BP and diabetes, some medications like diuretics, etc. Symptoms usually occur in episodes called flares or gout attacks and can last anywhere from a few days to a few weeks. Treatment includes the use of corticosteroids and NSAIDs that work by reducing pain and swelling in the area (McIntosh, 2025).

Osteoarthritis

The most common type of arthritis, known as wear and tear arthritis, is a progressive disease that worsens over time due to the wear and tear of cartilage lining our joints. Cartilage acts like a lubricant and shock absorber, and when it starts wearing away with time, bones start to rub against each other during movement, causing pain and swelling. The joints affected more commonly are knees, hips, neck, lower back and hands (Brazier, 2024; Cleveland Clinic, 2026b). Osteoarthritis can be primary (develops over time) or secondary (damage to joints leading to OA).

Osteoporosis

Our body has the ability to replace bone cells throughout our lives. At an early age, the body builds more bone tissue and absorbs old bone tissue to maintain its strength, density and integrity. After age 35, these tissues break down at a faster rate than the body can rebuild, leading to weakened and porous bone. This increases the risk of fractures even after a minor fall. Osteoporosis makes the bones much more fragile and weaker than they should be (Cleveland Clinic, 2025b). It doesn't have any typical symptoms like many other diseases, which is why it's called a silent disease. Risk increases after mid-30s, lower estrogen levels, genetic factors, inactivity and immobility. Treatment includes supplements like calcium and vitamin D, lifestyle changes and medication like bisphosphonates that slow down bone loss (Cleveland Clinic, 2025b).

Lupus

It is a chronic inflammatory autoimmune disorder in which the immune system starts to damage our own cells instead of protecting them. The common symptoms include joint pain throughout the body, headaches, rashes (butterfly shaped across the cheeks), fever, hair loss, fatigue, swelling in arms, legs and on the face, blood clots, etc. These symptoms appear in waves called flare-ups, and in between flares, there are periods with little or no symptoms called remission (Cleveland Clinic, 2025a). The exact cause of Lupus is unclear, with females being at nine times greater risk than males. Treatment is more directed towards management of symptoms and to minimize damage to organs, which include medications like NSAIDs, immunosuppressants and steroids (Eske, 2025).

Sjogren's Syndrome

An autoimmune disease affecting moisture-producing glands, characterized by infiltration of white blood cells in exocrine glands like salivary and tear glands, ultimately decreasing their production. Primary Sjogren's syndrome develops alone, but secondary Sjogren syndrome can occur with other conditions like Lupus. This condition affects multiple systems at once and can be very difficult to diagnose. It causes dryness in the eyes and mouth, leading to eye infections, tooth decay and a dry cough (Cleveland Clinic, 2025c). Treatment includes medications to stimulate salivary flow, like pilocarpine, artificial saliva or tears, eye drops, and lubricants for other body parts (Felman & French, 2024).

10.4 Self Assessment

BHELA, TARANJIT



Self Assessment: The Musculoskeletal System

Activity Description

1. _____ connects muscles to bones and _____ connects bone to bone.

    a. Tendon, Ligament
    b. Ligament, Tendon
    c. Cartilage, tendon
    d. Cartilage, Ligament

2. What provides lubrication and protection inside the capsule of freely movable joints?

    a. Osteocytes
    b. Collagen
    c. Marrow
    d. Synovial fluid

3. Which type of muscles can be grouped together as striated muscles?

    a. Skeletal and Cardiac
    b. Smooth and Cardiac
    c. Skeletal and Smooth
    d. Skeletal, Smooth and Cardiac

4. Which type of cells are responsible for the breakdown and resorption of bone?

    a. Osteoblasts
    b. Osteoclasts
    c. Myocytes
    d. Osteocytes

5. The end of a long bone is called _____, the shaft of a long bone is called _____.

    a. Epiphysis, diaphysis
    b. Metaphysis, diaphysis
    c. Epiphysis, metaphysis
    d. Diaphysis, metaphysis

Answers:

1. Tendon, Ligament
2. Synovial fluid
3. Skeletal and Cardiac
4. Osteoclasts
5. Epiphysis, diaphysis

10.5 References

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CHAPTER 11 - ENDOCRINE SYSTEM

Chapter Outline

11.1 Medical Terminology
11.2 Physiology
11.3 Patho-Physiology
11.4 Self Assessment
11.5 References

11.1 Medical Terminology

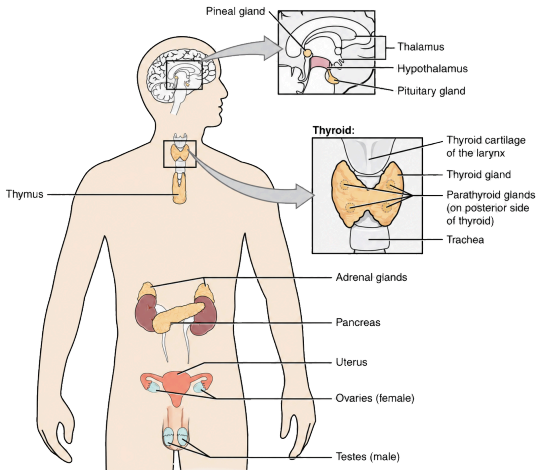
CORRÊA REIS, RICARDO

Table 11.1.1: Prefixes and Suffixes of the Endocrine System

Prefix/Suffix	Meaning
endo-	within
-crine	to secrete
hyper-	excessive
hypo-	below normal
adren/o	adrenal gland
thyroid/o	thyroid gland
pituitar/o	pituitary gland
pancreat/o	pancreas
hormon/o	hormone
glyc/o	sugar

11.2 Physiology

CORRÊA REIS, RICARDO



"The Endocrine System" by OpenStax College, CC BY 3.0. Mods: Added Hypothalmus label.

What is the Endocrine System?

The endocrine system is a network of glands and organs that produce hormones. Hormones are chemical messengers released into the bloodstream, where they travel to target organs and tissues. They regulate many essential body functions, including metabolism, growth, reproduction, stress responses, and maintaining the body's internal balance (homeostasis) (Hall & Guyton, 2011).

Unlike the nervous system, which sends rapid electrical signals, the endocrine system works more slowly but produces longer-lasting effects.

Image Description

Diagram of the human endocrine system showing the locations of major endocrine glands. A side-view brain inset labels the pineal gland, thalamus, hypothalamus, and pituitary gland. A thyroid inset labels the thyroid cartilage of the larynx, thyroid gland, parathyroid glands, and trachea. The main body diagram also labels the thymus, adrenal glands, pancreas, uterus, ovaries, and testes.

Key Points to Consider

- Hormones are chemical messengers carried in the bloodstream.
- The pituitary gland controls many other endocrine glands.
- Insulin lowers blood glucose; glucagon raises it.
- T3 and T4 regulate metabolism.
- PTH regulates calcium balance.
- Cortisol is the body's primary stress hormone.
- Diabetes mellitus and thyroid disorders are among the most frequently encountered endocrine diseases in health records.
- Accurate endocrine documentation is essential for disease classification, coding, and health information management.

11.3 Patho-Physiology

CORRÊA REIS, RICARDO

Common Conditions

Health information professionals should recognize these common conditions:

Diabetes Mellitus

Disorder of glucose metabolism caused by insulin deficiency or resistance.

Hypothyroidism

Decreased thyroid hormone production.

Hyperthyroidism

Excess thyroid hormone production.

Cushing Syndrome

Excess cortisol production.

Addison Disease

Adrenal insufficiency.

Hyperparathyroidism

Excess PTH causing elevated calcium.

Hypoparathyroidism

Low PTH causing decreased calcium.

Acromegaly

Excess growth hormone in adults.

Gigantism

Excess growth hormone in children.

(Hall & Guyton, 2011)

Major Endocrine Glands

Table 11.3.1. Major Glads, Functions, & Disorders. (Hall & Guyton, 2011).

Endocrine Gland	Location	Primary Hormone(s)	Main Function(s)	Common Disorders
Hypothalamus	Base of the brain	ADH (vasopressin), oxytocin, dopamine, somatostatin	Links the nervous and endocrine systems; regulates the pituitary gland and maintains homeostasis	Diabetes insipidus, hypothalamic dysfunction
Pituitary Gland	Base of the brain, below the hypothalamus	GH, TSH, ACTH, FSH, LH, prolactin, ADH, oxytocin	Controls growth, reproduction, metabolism, and stimulates other endocrine glands	Pituitary adenoma, acromegaly, gigantism, growth hormone deficiency
Pineal Gland	Deep within the brain	Melatonin	Regulates sleep–wake cycles (circadian rhythm)	Sleep disorders
Thyroid Gland	Front of the neck	Thyroxine (T4), Triiodothyronine (T3), Calcitonin	Regulates metabolism, growth, and body temperature	Hypothyroidism, hyperthyroidism, thyroid nodules, thyroid cancer
Parathyroid Glands	Behind the thyroid gland	Parathyroid hormone (PTH)	Regulates calcium and phosphorus levels in the blood	Hyperparathyroidism, hypoparathyroidism
Adrenal Glands	On top of each kidney	Cortisol, aldosterone, epinephrine, norepinephrine	Controls stress response, blood pressure, electrolyte balance, and metabolism	Addison disease, Cushing syndrome, pheochromocytoma (benign tumour)
Pancreas (Islets of Langerhans)	Behind the stomach	Insulin, glucagon	Maintains blood glucose levels	Type 1 diabetes, Type 2 diabetes, pancreatic endocrine tumours
Ovaries	Pelvic cavity (females)	Estrogen or Oestrogen, progesterone	Regulates female reproductive function, menstrual cycle, and pregnancy	Polycystic ovary syndrome (PCOS), ovarian failure, and infertility
Testes	Scrotum (males)	Testosterone	Produces sperm and regulates male reproductive development	Hypogonadism, infertility, testosterone deficiency

11.4 Self Assessment

CORRÊA REIS, RICARDO



Self-Assessment: The Endocrine System

Activity Description

1. A patient is newly diagnosed with type 2 diabetes mellitus. Which medication is commonly prescribed as the first-line treatment?

    a. Levothyroxine
    b. Metformin
    c. Prednisone
    d. Furosemide

2. Which medication is required for the treatment of type 1 diabetes mellitus?

    a. Metformin
    b. Insulin
    c. Glipizide
    d. Sitagliptin

3. Which medication belongs to the sulfonylurea class of antidiabetic drugs?

    a. Glipizide
    b. Metformin
    c. Empagliflozin
    d. Semaglutide

4. A patient with type 2 diabetes is prescribed semaglutide (Ozempic). Which drug class does this medication belong to?

    a. Sulfonylurea
    b. GLP-1 receptor agonist
    c. Biguanide
    d. DPP-4 inhibitor

5. Which documentation element is MOST important for accurate coding? Physician documents: Type 2 diabetes mellitus with diabetic nephropathy. Patient currently uses insulin and metformin. HbA1c 8.9%.

    a. Patient's occupation
    b. Presence of nephropathy
    c. Family history
    d. Marital status

6. Which diagnosis was primarily responsible for the admission? A discharge summary states: Patient admitted for diabetic ketoacidosis (DKA). History of Type 1 diabetes mellitus. Treated with intravenous insulin and fluids.

    a. Type 2 diabetes mellitus
    b. Diabetic ketoacidosis
    c. Hypertension
    d. Dehydration

7. Which documentation element has the greatest impact on accurate disease classification? A 64-year-old patient presents with obesity, hypertension, chronic kidney disease, and poorly controlled Type 2 diabetes. Current medications include metformin, insulin glargine, and lisinopril. The physician documents Type 2 diabetes mellitus with diabetic chronic kidney disease.

    a. The patient's age
    b. Presence of chronic kidney disease as a diabetic complication
    c. The patient's blood pressure
    d. The patient's BMI

Answers:

1. Metformin
   Rationale: Metformin is the recommended first-line oral medication for most adults with type 2 diabetes. It improves insulin sensitivity and reduces glucose production by the liver.
2. Insulin
   Rationale: People with type 1 diabetes do not produce sufficient insulin because of the autoimmune destruction of pancreatic beta-cells. Lifelong insulin therapy is required.
3. Glipizide
   Rationale: Sulfonylureas, such as glipizide, stimulate the pancreas to release more insulin.
4. GLP-1 receptor agonist
   Rationale: Semaglutide is a GLP-1 receptor agonist that improves insulin secretion, decreases glucagon release, slows gastric emptying, and can promote weight loss.
5. Presence of nephropathy
   Rationale: The diabetic complication directly affects code assignment.
6. Diabetic ketoacidosis
   CHIMA Tip: When reviewing documentation, identify the condition chiefly responsible for the admission.
7. Presence of chronic kidney disease as a diabetic complication
   Rationale: CHIMA examinations often require candidates to identify the diagnosis or complication that most affects clinical documentation and classification.

11.5 References

CORRÊA REIS, RICARDO

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CHAPTER 12 - REPRODUCTIVE SYSTEM

Chapter Outline

12.1 Medical Terminology
12.2 Physiology
12.3 Patho-Physiology
12.4 Self Assessment
12.5 References

12.1 Medical Terminology

QUAISIE, ALEXANDER

Table 12.1.1: Male reproductive medical terms (Ehrlich & Schroeder, 2021; Fremgen & Frucht, 2024)

Medical Term	Literal Meaning	Definition
Orchitis	Inflammation of the testis	Inflammation of one or both testes
Orchiectomy	Surgical removal of a testis	Removal of one or both testes
Epididymitis	Inflammation of the epididymis	Infection or inflammation of the epididymis
Vasectomy	Removal or division of the vas deferens	A male sterilization procedure
Prostatitis	Inflammation of the prostate	Infection or inflammation of the prostate gland
Prostatectomy	Removal of the prostate	Surgical removal of the prostate gland
Spermatogenesis	Formation of sperm	The process of sperm production

Table 12.1.2: Female reproductive medical terms (Ehrlich & Schroeder, 2021; Fremgen & Frucht, 2024)

Medical Term	Literal Meaning	Definition
Oophoritis	Inflammation of an ovary	Infection or inflammation of an ovary
Oophorectomy	Removal of an ovary	Surgical removal of one or both ovaries
Salpingitis	Inflammation of a fallopian tube	Infection or inflammation of a fallopian tube
Salpingectomy	Removal of a fallopian tube	Surgical removal of one or both fallopian tubes
Hysterectomy	Removal of the uterus	Surgical removal of the uterus
Cervicitis	Inflammation of the cervix	Infection or inflammation of the cervix
Vaginitis	Inflammation of the vagina	Infection or inflammation of the vagina
Colposcopy	Visual examination of the vagina	A diagnostic examination of the cervix and vagina using a colposcope
Endometriosis	Abnormal condition of the endometrium	Growth of tissue similar to the endometrium outside the uterus

Reproductive Term Breakdowns

Oophoritis is as follows:

oophor/o	+	**itis**
ovary	+	**inflammation**

Oophoritis means infection or inflammation of an ovary.

Oophorectomy is as follows:

oophor/o	+	**ectomy**
ovary	+	**surgical removal**

Oophorectomy means the surgical removal of one or both ovaries.

Salpingitis is as follows:

salping/o	+	**itis**
fallopian tube	+	**inflammation**

Salpingitis means infection or inflammation of a fallopian tube.

Salpingectomy is as follows:

salping/o	+	**ectomy**
fallopian tube	+	**surgical removal**

Salpingectomy means the surgical removal of one or both fallopian tubes.

Hysterectomy is as follows:

hyster/o	+	**ectomy**
uterus	+	**surgical removal**

Hysterectomy means the surgical removal of the uterus.

Cervicitis is as follows:

cervic/o	+	**itis**
cervix	+	**inflammation**

Cervicitis means infection or inflammation of the cervix.

Vaginitis is as follows:

vagin/o	+	**itis**
vagina	+	**inflammation**

Vaginitis means infection or inflammation of the vagina.

Colposcopy is as follows:

colp/o	+	**scopy**
vagina	+	**visual examination**

Colposcopy is a diagnostic examination of the cervix and vagina using a colposcope.

Endometriosis is as follows:

endometri/o	+	**osis**
endometrium	+	**abnormal condition**

Endometriosis is a condition in which tissue similar to the endometrium grows outside the uterus.

Orchitis is as follows:

orch/o	+	itis
testis	+	inflammation

Orchitis means inflammation of one or both testes.

Orchiectomy is as follows:

orchi/o	+	ectomy
testis	+	surgical removal

Orchiectomy means the surgical removal of one or both testes.

Epididymitis is as follows:

epididym/o	+	itis
epididymis	+	inflammation

Epididymitis means infection or inflammation of the epididymis.

Vasectomy is as follows:

vas/o	+	ectomy
vas deferens	+	surgical removal

A **vasectomy** is a male sterilization procedure involving the division or removal of part of each vas deferens.

Prostatitis is as follows:

prostat/o	+	**itis**
prostate	+	**inflammation**

Prostatitis means infection or inflammation of the prostate gland.

Prostatectomy is as follows:

prostat/o	+	**ectomy**
prostate	+	**surgical removal**

Prostatectomy means the surgical removal of all or part of the prostate gland.

Spermatogenesis is as follows:

spermat/o	+	**genesis**
sperm	+	**formation**

Spermatogenesis is the process through which sperm cells are produced.

12.2 Physiology

QUAISIE, ALEXANDER

The reproductive system is responsible for sexual reproduction, hormone production, and the development of secondary sexual characteristics (Johns Hopkins Medicine, 2026).

Table 12.2.1. Organs and Functions of the Reproductive System

Reproductive System	Primary Functions	Main organs
Male	• Production of sperm (spermatogenesis) • Secretion of testosterone • Delivery of sperm during ejaculation	• Testes • Epididymis • Vas deferens • Seminal vesicles • Prostate gland • Urethra • Penis • Scrotum
Female	• Production of ova (eggs) • Secretion of estrogen and progesterone • Fertilization, pregnancy, and childbirth	• Ovaries • Fallopian (uterine) tubes • Uterus • Cervix • Vagina • Vulva • Mammary glands (breasts) (National Library of Medicine, n.d.)

12.3 Patho-Physiology

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Common Disease Conditions

Male Reproductive Disorders

Benign Prostatic Hyperplasia (BPH)

A non-cancerous enlargement of the prostate gland causing urinary symptoms.
Terminology:

Benign = Non-cancerous
Prostatic = Prostate gland
Hyperplasia = Increase in cell number

Prostate Cancer

Malignant (cancerous) tumour of the prostate gland.
Common symptoms:

Difficulty urinating
Increased urinary frequency
Hematuria

Orchitis

Inflammation of one or both testes, often caused by infection.

Epididymitis

Inflammation of the epididymis, commonly caused by bacterial infection.

Erectile Dysfunction (ED)

Inability to achieve or maintain an erection adequate for sexual activity.

Female Reproductive Disorders

Endometriosis

Presence of endometrial tissue outside the uterus causing pain and infertility.
Terminology:

endometri/o (endometrium)
osis (abnormal condition)

Polycystic Ovary Syndrome (PCOS)

Hormonal disorder characterized by irregular menstruation, ovarian cysts, and infertility.

Uterine Fibroids

Benign tumours of the uterine muscle.
Terminology:

Leiomyoma = fibroid tumor
lei/o (smooth)
my/o (muscle)
-oma (tumor)

Cervical Cancer

Cancer arising from the cervix, often associated with Human Papillomavirus (HPV).

Ovarian Cancer

Malignancy originating in the ovary.

Pelvic Inflammatory Disease (PID)

Infection of the female reproductive organs, often involving the uterus, tubes, and ovaries.

Vaginitis

Inflammation of the vagina caused by infection, irritation, or hormonal changes.

Common Medical Interventions

Pap Smear

Screening test used to detect cervical abnormalities and cervical cancer.
Terminology:

Cytology = study of cells

Colposcopy

Visual examination of the cervix and vagina using a colposcope.
Terminology:

colp/o = vagina
scopy = visual examination

Transvaginal Ultrasound

Ultrasound examination performed through the vagina to assess pelvic organs.

Cystoscopy

A diagnostic procedure in which a cystoscope (a thin, lighted instrument) is inserted through the urethra into the bladder to examine the lower urinary tract.
Terminology:

cyst/o = urinary bladder
scopy = visual examination

Prostate-Specific Antigen (PSA) Test

Blood test used to screen for prostate disease.

Semen Analysis

Laboratory evaluation of sperm count, motility, and morphology.

Surgical Procedures

Hysterectomy

Removal of the Uterus

Oophorectomy

Removal of one or both ovaries

Salpingectomy

Removal of one or both fallopian tubes

Mastectomy

Removal of breast tissue

Vasectomy

Male sterilization procedure involving the division of the vas deferens

Orchiectomy

Removal of one or both testes

Prostatectomy

Removal of all or part of the prostate gland

12.4 Self Assessment

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Self-Assessment: The Reproductive System

Activity Description

1. A patient undergoes a salpingo-oophorectomy. Which structures were removed?

    a. Ovary and uterus
    b. Uterus and cervix
    c. Ovary and fallopian tube
    d. Cervix and vagina

2. The term epididymitis refers to:

    a. Inflammation of the testis
    b. Inflammation of the epididymis
    c. Enlargement of the prostate gland
    d. Inflammation of the prostate gland

3. A patient presents with abnormal growth of endometrial tissue outside the uterus. Which condition is most likely documented?

    a. Cervicitis
    b. Leiomyoma
    c. Salpingitis
    d. Endometriosis

4. Which medical term literally means visual examination of the urinary bladder?

    a. Cystoscopy
    b. Hysteroscopy
    c. Colposcopy
    d. Urethrotomy

5. A physician documents BPH in a patient's record. What does BPH stand for?

    a. Bilateral Prostatic Hypertrophy
    b. Benign Pelvic Hyperplasia
    c. Benign Prostate Hemorrhage
    d. Benign Prostatic Hyperplasia

6. A patient undergoes a procedure to permanently prevent the transport of sperm through the reproductive tract. Which intervention was most likely performed?

    a. Orchiectomy
    b. Prostatectomy
    c. Vasectomy
    d. Epididymectomy

7. Which structure serves as the primary site for fetal implantation and development during pregnancy?

    a. Uterus
    b. Ovary
    c. Cervix
    d. Endometrium

8. A pathology report identifies a leiomyoma. Based on medical terminology, this finding is best described as:

    a. Cancer of the ovary
    b. Malignant tumour of glandular tissue
    c. Inflammation of uterine tissue
    d. Benign tumour of smooth muscle

9. A patient undergoes a radical hysterectomy for cervical cancer. Which organ is primarily removed?

    a. Vagina
    b. Ovary
    c. Fallopian tube
    d. Uterus

10. A physician performs a colposcopy following an abnormal Pap smear. The primary purpose of this procedure is to:

    a. Examine the bladder
    b. Examine the cervix and vagina
    c. Examine the prostate gland
    d. Examine the ovaries

11. A 68-year-old male reports urinary hesitancy, weak urinary stream, and frequent nighttime urination. Examination reveals enlargement of the prostate gland without evidence of malignancy. Which diagnosis is most consistent with these findings?

    a. Prostate cancer
    b. Orchitis
    c. Benign Prostatic Hyperplasia (BPH)
    d. Epididymitis

12. A woman undergoes surgical removal of the uterus, both ovaries, and both fallopian tubes. Which combination of procedures best describes the surgery?

    a. Bilateral oophoritis
    b. Radical mastectomy
    c. Salpingotomy
    d. Hysterectomy with bilateral salpingo-oophorectomy

13. "Inflammation of the fallopian tube secondary to pelvic inflammatory disease." Which medical term corresponds to this condition?

    a. Oophoritis
    b. Salpingitis
    c. Vaginitis
    d. Endometriosis

14. A male patient undergoes surgical removal of one testis due to testicular cancer. Which procedure was performed?

    a. Orchiectomy
    b. Vasectomy
    c. Prostatectomy
    d. Cystectomy

15. A physician documents menorrhagia. Which clinical finding would most likely be present?

    a. Absence of menstruation
    b. Excessive menstrual bleeding
    c. Painful menstruation
    d. Irregular ovulation

Answers:

1. Ovary and fallopian tube
2. Inflammation of the epididymis
3. Endometriosis
4. Cystoscopy
5. Benign Prostatic Hyperplasia
6. Vasectomy
7. Uterus
8. Benign tumour of smooth muscle
9. Uterus
10. Examine the cervix and vagina
11. Benign Prostatic Hyperplasia (BPH)
12. Hysterectomy with bilateral salpingo-oophorectomy
13. Salpingitis
14. Orchiectomy
15. Excessive menstrual bleeding

12.5 References

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