

# NMED-1771: IMMUNOLOGY AND PATHOPHYSIOLOGY FOR SECTIONAL IMAGING

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## Cuyahoga Community College

**Viewing: NMED-1771 : Immunology and Pathophysiology for Sectional Imaging**

**Board of Trustees:**

January 2024

**Academic Term:**

Fall 2024

**Subject Code**

NMED - Nuclear Medicine Technology

**Course Number:**

1771

**Title:**

Immunology and Pathophysiology for Sectional Imaging

**Catalog Description:**

Introduction to pathophysiology and immunology. Emphasis is on common pathologies found in nuclear medicine, computed tomography, and magnetic resonance imaging and the appearance of these pathologies across multiple planes in various imaging protocols. Includes all commonly-imaged body systems with recognition of abnormal conditions across multiple planes and ability to make the associated imaging changes required to adequately demonstrate the patients pathology.

**Credit Hour(s):**

3

**Lecture Hour(s):**

3

## Requisites

**Prerequisite and Corequisite**

Concurrent enrollment in NMED-1781 Sectional Anatomy for Advanced Molecular Imaging.

## Outcomes

**Course Outcome(s):**

Explain the basic concepts of human immunity and pathophysiology.

**Objective(s):**

1. Identify the nature and courses of the pathologies relevant to diagnostic imaging.
2. Explain cell and antibody mediated immunity.
3. Explain the basic components and mechanisms for human immunity.

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**Course Outcome(s):**

Differentiate between normal and abnormal anatomy appearance across varying planes for nuclear medicine, computed tomography, and magnetic resonance imaging images.

**Objective(s):**

1. Describe the effect of contrast agents on visualizing pathology.
2. Identify changes in anatomical sizes and shapes of structures that can indicate pathology.
3. Identify abnormalities created by contrast imaging agents or poor imaging techniques.
4. Examine the signal characteristics displayed by abnormal tissues during various pulse sequences and imaging modes in illustrating pathological processes.

**Course Outcome(s):**

Identify common pathologies found in various imaging protocols of nuclear medicine, computed tomography, and magnetic resonance imaging, inclusive of all commonly-imaged body systems.

**Objective(s):**

1. Describe anatomical directions and positions.
  2. Identify body cavities.
  3. Identify anatomy and common pathologies recorded on multiplanar images of the head, sinuses, eye and vascular structures, brain, neck, thorax, abdomen, pelvis, spine, upper extremities, and lower extremities.
  4. Identify anatomy and common pathologies recorded on multiplanar images of the head, sinuses, eye and vascular structures, brain, neck, thorax, abdomen, pelvis, spine, upper extremities, and lower extremities.
  5. Identify anatomy and common pathologies recorded on multiplanar images of the head.
  6. Identify anatomy and common pathologies recorded on multiplanar images of the sinuses.
  7. Identify anatomy and common pathologies recorded on multiplanar images of the eye and vascular structures.
  8. Identify anatomy and common pathologies recorded on multiplanar images of the brain.
  9. Identify anatomy and common pathologies recorded on multiplanar images of the neck.
  10. Identify anatomy and common pathologies recorded on multiplanar images of the thorax
  11. Identify anatomy and common pathologies recorded on multiplanar images of the abdomen.
  12. Identify anatomy and common pathologies recorded on multiplanar images of the pelvis.
  13. Identify anatomy and common pathologies recorded on multiplanar images of the spine.
  14. Identify anatomy and common pathologies recorded on multiplanar images of the upper extremities.
  15. Identify anatomy and common pathologies recorded on multiplanar images of the lower extremities.
  16. Discuss the types of imaging changes required to adequately demonstrate the patient's pathology.
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**Methods of Evaluation:**

1. Participation
2. Quizzes
3. Worksheets
4. Exams
5. Case studies

**Course Content Outline:**

1. Immunity and disease pathology
  - a. History and overview
  - b. T cell receptors
  - c. B cell receptors
  - d. Effector Responses: Cell and Antibody-Mediated Immunity
    - i. Monoclonal antibodies
    - ii. Human-anti-mouse-antibody response (HAMA)
  - e. Hypersensitivity and Chronic Inflammation
  - f. Infectious Diseases
  - g. Immunodeficiency Disorders
  - h. Cancer
2. Head Pathology
  - a. Brain
    - i. Vascular disorders
    - ii. Congenital and hereditary disorders
    - iii. White matter disorders
    - iv. Trauma
    - v. Other (i.e., aging, metabolic, idiopathic, iatrogenic, phakomatoses, etc.)
  - b. Neoplastic disorders
  - c. Infections and inflammatory disorders
  - d. Eye and orbital contents
  - e. Sinuses, pharynx (nasal and oral), and larynx

- i. Temporal bone and TMJ
  - ii. Tumor and tumor-like disorders
  - iii. Bell palsy
  - iv. Vascular middle ear anomalies
  - v. Fractures
  - vi. Dislocated TMJ
- 3. Neck Pathology
  - a. Masses
    - i. Nasopharyngeal space
    - ii. Parapharyngeal space
    - iii. Parotid space
    - iv. Retropharyngeal space
    - v. Oropharyngeal space
    - vi. Masticator space
    - vii. Buccinator space
    - viii. Carotid space
    - ix. Laryngeal
    - x. Angiofibroma
    - xi. Hemangioma
    - xii. Hygroma
    - xiii. Thyroid
    - xiv. Glomus jugulare
  - b. Metastases
  - c. Cysts
  - d. Sialolithiasis
  - e. Brachial Plexus
    - i. Masses
    - ii. Malignancy
    - iii. Response to therapy
    - iv. Trauma
- 4. The Spine Pathology
  - a. Spine and spinal cord
  - b. Tumor and tumor-like disorders
  - c. Inflammatory disorders
  - d. Vascular disorders
  - e. Trauma
  - f. Degenerative spine
  - g. Other (e.g., congenital anomalies, demyelinating disorders, etc.)
- 5. Thorax
  - a. Mediastinum
    - i. Thyroid masses
    - ii. Thymoma
    - iii. Duplication cysts
    - iv. Lymph node enlargement
    - v. Lymphoma
    - vi. Teratoma
    - vii. Neurogenic
    - viii. Pancoast tumors
    - ix. Aneurysms
    - x. Esophageal tumors
  - b. Chest wall
    - i. Malignant processes
    - ii. Inflammatory lesions
  - c. Respiratory system
  - d. Cardiac and aorta
    - i. Aneurysm
    - ii. Dissection
    - iii. Coarctation

- iv. Thrombus
- v. Infarction
- vi. Hypertrophic cardiomyopathy
- vii. Pericardial disease
- viii. Intracardiac masses
- ix. Valvular heart disease
- x. Congenital heart conditions
- e. Breast
  - i. Dysplasia
  - ii. Cysts
  - iii. Benign tumors
  - iv. Inflammatory conditions
  - v. Carcinomas
  - vi. Postsurgery or radiation
  - vii. Implant rupture
- 6. Abdomen Pathology
  - a. Liver
    - i. Hemangioma
    - ii. Cysts
    - iii. Abscesses
    - iv. Hepatocellular carcinoma
    - v. Hepatic metastases
    - vi. Venous thrombosis
    - vii. Hemochromatosis
    - viii. Transplant
    - ix. Gallbladder and ductal anomalies
  - b. Pancreas
    - i. Pseudocyst
    - ii. Cystic fibrosis
    - iii. Pancreatitis
    - iv. Transplants
    - v. Adenocarcinoma
    - vi. Islet cell tumors
    - vii. Lymphoma
    - viii. Metastases
    - ix. Ductal anomalies
  - c. Kidneys
    - i. Polycystic kidney disease
    - ii. Renal cell carcinoma
    - iii. Transitional cell carcinoma
    - iv. Metastatic disease
    - v. Wilm's tumor
    - vi. Nephroblastoma
    - vii. Infarction
    - viii. Infection
    - ix. Transplant
  - d. Adrenals
    - i. Adenoma
    - ii. Metastasis
    - iii. Pheochromocytoma
    - iv. Neuroblastoma
    - v. Hemorrhage
  - e. Spleen and lymphatics
    - i. Infections
    - ii. Benign focal lesions
    - iii. Hodgkin and non-Hodgkin lymphoma
  - f. Gastrointestinal (GI) tract

- i. Colon polyps
  - ii. Tumors
  - iii. Congenital anomalies
- g. Vascular disorders
  - i. Renal artery stenosis
- 7. Pelvis Pathology
  - a. Female reproductive organs(uterus, ovaries, vagina and associated structures)
    - i. Neoplastic disorders
    - ii. Inflammatory disorders
    - iii. Endometriosis
    - iv. Ovarian cysts
    - v. Other
    - vi. Congenital anomalies and hereditary disorders
    - vii. Traumatic disorders
  - b. Male reproductive organs (prostate, seminal vesicles and associated structures)
    - i. Neoplastic disorders
    - ii. Inflammatory disorders
    - iii. Other
  - c. Bladder
    - i. Neoplastic disorders
    - ii. Inflammatory disorders
    - iii. Other
- 8. Musculoskeletal Pathology
  - a. Skeletal system
    - i. Traumatic injury
    - ii. Bone fracture union
    - iii. Bone neoplasms and tumor-like lesions
    - iv. Inflammatory disorders
    - v. Other
    - vi. Soft tissues
      - 1. Neoplastic disorders
      - 2. Inflammatory disorders
  - vii. Joints
    - 1. Fibrocartilage disorders
    - 2. Ligament and tendon tears
    - 3. Rotator cuff tear
    - 4. Inflammatory disorders
    - 5. Meniscal disorders
      - a. Meniscal tears
      - b. Meniscal cysts
      - c. Discoid lateral meniscus
  - viii. Other
    - 1. Trauma
    - 2. Congenital anomalies and hereditary disorders
    - 3. Bone marrow abnormalities
- 9. General Vascular Disorders/Pathology
  - a. Atherosclerosis
  - b. Postradiaton injury
  - c. Dissections
  - d. Aneurysms
  - e. Graft patency
  - f. Venous mapping
  - g. Vena caval tumor invasion

## Resources

Bolus, N., & Glasgow, K.W., (Eds.). (2018) *Review of Nuclear Medicine Technology (5th Ed.)*, Reston, VA: Society of Nuclear Medicine and Molecular Imaging.

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Jones, D.W., Hogg, P., & Seeram, E. (Eds.). (2013) *Practical SPECT/CT in Nuclear Medicine*, London: Springer-Verlag.

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