



## Recommended Emergency Radiology Curriculum for Residents

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*This document outlines a model residency curriculum for training in emergency radiology (ER). This is intended as an ideal curriculum to produce comprehensively trained emergency radiologists for academic and private practice with a breadth of training exposure to become expert diagnosticians and thought-leaders in the field. If a specific fellowship does not offer certain components, it is possible and suggested to draw on external educational resources to augment expertise in deficient areas.*

### Traumatic

1. CNS
  - a. Intracranial injury
    - i. Subdural and epidural hematoma
    - ii. Subarachnoid hemorrhage
    - iii. Cortical contusion
    - iv. Diffuse axonal injury
  - b. Blunt and penetrating cerebrovascular injury
  - c. Calvarial and skull base fractures
  - d. Spinal trauma
    - i. Spinal cord contusion/transection
    - ii. Spinal epidural hematoma
    - iii. Nerve root avulsion
2. Spine
  - a. Cranio-cervical junction and cervical spine
    - i. Occipital condyle fracture
    - ii. Atlanto-occipital dislocation/subluxation
    - iii. Atlanto-axial rotary fixation
    - iv. Jefferson fracture
    - v. Dens fracture
    - vi. Hangman's fracture
    - vii. Flexion or extension tear drop fracture
    - viii. Facet dislocation
    - ix. Acute ligamentous injury
  - b. Thoraco-lumbar spine
    - i. Compression fracture
    - ii. Burst fracture
    - iii. Chance fracture
    - iv. Complex fracture-dislocation
    - v. Pathological fracture
3. Head and Neck (non-CNS)
  - a. Maxillofacial fractures (e.g. LeFort fractures)
  - b. Orbit
    - i. Ocular injuries
      - (1) Globe rupture
      - (2) Lens dislocation
      - (3) Vitreous hemorrhage



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- (4) Subchoroidal hemorrhage
    - (5) Retrobulbar hematoma
  - ii. Extraocular muscle herniation/entrapment
- 4. Thoracic
  - a. Pulmonary – contusion, laceration, hematoma
  - b. Pleural - Pneumothorax, hemothorax
  - c. Cardiac and pericardial injury – mediastinal hemorrhage, pneumomediastinum
  - d. Diaphragmatic injury
  - e. Blunt and penetrating injury to the airway and esophagus
  - f. Rib fractures
  - g. Sternal fracture
- 5. Abdominal
  - a. Solid organ trauma: hepatic, splenic, pancreatic, renal and other organs, with familiarity with the American Association of Surgeons of Trauma (AAST) and CT-based classification system.
  - b. Traumatic bowel and mesenteric injury
  - c. Hemoperitoneum, pneumoperitoneum, retroperitoneal hemorrhage
  - d. Bladder, urinary collecting system, and ureteral injury
  - e. Traumatic abdominal wall hernias and diaphragmatic injuries
  - f. Obstetric and non-obstetric female pelvic emergencies
    - i. Uterine trauma
    - ii. Fetoplacental trauma
  - g. Male pelvic emergencies
    - i. Urethral and penile trauma
    - ii. Scrotal and testicular trauma
- 6. Musculoskeletal
  - a. Fractures and dislocations: focus on subtle or missed emergent fractures (e.g., Lisfranc, Segond fractures) and supplemental radiographic views or other imaging
  - b. Familiarity with classification systems where clinically appropriate
- 7. Vascular
  - a. Aortic injury
  - b. Peripheral vascular injury
  - c. Contained (pseudoaneurysm and AV fistula) and uncontained (active bleeding) vascular injury

### Non-traumatic

- 1. CNS
  - a. Cerebrovascular ischemia
    - i. Arterial infarction
    - ii. Venous infarction
  - b. Intracranial hemorrhage
  - c. Intracranial neoplasm
  - d. Intracranial herniation patterns



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- e. Intracranial infections
  - i. Meningitis
  - ii. Encephalitis
  - iii. Abscess/cerebritis
  - iv. Subdural empyema
- f. Dural sinus thrombosis
- g. PRES
- h. Pituitary apoplexy
- i. Spinal cord emergencies
  - i. Cord compression
  - ii. Cauda equina syndrome
- 2. Spine
  - i. Diskitis/osteomyelitis
  - ii. Epidural abscess
  - iii. Disk herniation
- 3. Head and Neck (non-CNS)
  - a. Paranasal sinuses
    - i. Acute or chronic sinusitis
    - ii. Aggressive fungal sinusitis
    - iii. Complications of sinusitis
      - (1) Orbital cellulitis
      - (2) Orbital subperiosteal abscess
      - (3) Osteomyelitis
      - (4) Epidural abscess
      - (5) Subdural empyema
      - (6) Cavernous sinus thrombosis
  - b. Soft tissues of the face
    - i. Orbital cellulitis
    - ii. Parotitis
    - iii. Submandibular sialoadenitis
    - iv. Ludwig angina
  - c. Odontogenic infections
  - d. Neck
    - i. Retropharyngeal and prevertebral abscess/edema
    - ii. Tonsillitis and tonsillar/peritonsillar abscess
    - iii. Epiglottitis
    - iv. Croup
    - v. Lymphadenitis and suppurative adenopathy
    - vi. Jugular thrombophlebitis
  - e. Ear
    - i. Otitis externa and media
    - ii. Cholesteatoma
    - iii. Otomastoiditis



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- iv. Apical petrositis
- 4. Thoracic
  - a. Pulmonary infection and inflammation, including diseases of the airways, parenchyma, and pleura
  - b. Pulmonary edema
  - c. Thoracic vascular emergencies (e.g., aortic aneurysm, pulmonary embolism)
  - d. Primary and metastatic thoracic malignancy; familiarity with thoracic oncologic emergencies
  - e. Foreign body aspiration
- 5. Abdominal
  - a. Gastrointestinal inflammation, infection, and hemorrhage
  - b. Gastric, midgut, and colonic volvulus
  - c. Bowel obstruction
  - d. Bowel ischemia (etiologies and patterns of disease)
  - e. Epiploic appendagitis, omental infarct
  - f. Pancreatitis
  - g. Gallbladder and biliary emergencies
  - h. Urologic infection and calculous disease
  - i. Ascites, peritonitis, intra-abdominal abscess
  - j. Abdominal wall hernias
  - k. Acute and chronic liver parenchymal and vascular disease
  - l. Abdominopelvic malignancies
  - m. Obstetric and non-obstetric female pelvic emergencies
    - i. Subchorionic hemorrhage
    - ii. Placenta previa
    - iii. Placenta abruption and hemorrhage
    - iv. Endometritis
    - v. Spontaneous abortion
    - vi. Fetal demise
    - vii. Ectopic pregnancy
    - viii. Ovarian cystic disease, ovarian mass
    - ix. Ovarian torsion
    - x. Pelvic inflammatory disease
  - n. Male pelvic emergencies
    - i. Testicular torsion
    - ii. Epididymitis, orchitis
    - iii. Acute fluid collections – hydrocele, hematocele, pyocele
    - iv. Testicular infarction
    - v. Abscess
    - vi. Fournier's gangrene
- 6. Musculoskeletal
  - a. Bone and joint infection
  - b. Bone and joint prosthetic and peri-prosthetic complications



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- c. Cellulitis and necrotizing fasciitis
- d. Soft-tissue abscess
- e. Compartment syndrome
- f. Muscle and ligamentous injuries
- 7. Vascular
  - a. Deep venous thrombosis
  - b. Thrombophlebitis
  - c. Peripheral arterial emergencies (e.g., thrombosis)
- 8. Breast imaging
  - a. Mastitis and breast abscess
  - b. Breast implant rupture

### **Advanced imaging interpretive skills (\*may be part of other rotations in residency)**

- 1. Understanding mechanisms of blunt trauma
- 2. Penetrating injuries, including ballistic and stab injuries (e.g., ballistic pressure wave theory)
- 3. Optimal exam protocoling for polytrauma
- 4. CT cystography (trauma): indications and technical factors
- 5. Extremity CTA
- 6. Head and neck CTA\*
- 7. MRI protocoling and interpretation\*
  - a. Brain and spine MRI
  - b. Musculoskeletal MRI for osteomyelitis, or radiographically occult fracture
  - c. Abdominal MRI for appendicitis in the pregnant patient
- 8. Emergent nuclear medicine\*
  - a. Ventilation and perfusion scintigraphy
  - b. Hepatobiliary scintigraphy
  - c. Tagged-RBC scintigraphy for GI bleed
  - d. Osteomyelitis imaging
- 9. Coronary CTA\*
- 10. Dual-energy CT (DECT), if available

### **Non-interpretive skills**

- 1. Awareness of imaging workflow in the ED
- 2. Ability to triage imaging appropriately in times of high volume
- 3. Wellness and burnout
- 4. Time management and work-life integration

### **Quality and safety**

- 1. IV contrast reaction management
- 2. IV infiltration management
- 3. Radiation dose optimization
- 4. MRI safety



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5. Managing imaging of pregnant and pediatric patients in the ED