Monroe Carell Jr.
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at Vanderbilt
Diagnostic Imaging

(615) 343-1842
www.vanderbiltchildrens.com
This manual provides a list of protocols for routine plain film exams performed at the Monroe Carell Jr. Children’s Hospital at Vanderbilt. Exam protocols are listed by category according to body region for your information. When requesting an exam, you may write just the body part on the request and we will perform our routine protocol, as outlined here. Routine protocols have been set up by body part and common pathology for which the examinations are typically requested. When you do this, it is very important that you indicate the reason for the examination, e.g. trauma, R/O fracture, fever and pain, R/O osteomyelitis, etc.

You may also list which views you want, if you know what is required for non-routine pathology in your patient. For example, a routine wrist examination, to assess for a fracture, includes AP, lateral and oblique views. If you need wrist views only to check for a metabolic problem such as rickets, however, only an AP view is necessary. A notation as to the specific history is again essential. In this example, the request might read, “Failure to thrive, Rickets Survey.” If you do not know which views are needed, please specify the diagnosis in question. The radiologist will then be consulted for the specific modifications of the routine examinations that will be necessary.

We are required to perform the examinations as requested. Thus, if you request two views of the wrist to assess for fracture, we will need to call you before performing the complete three-view examination. By providing this manual, we are hoping to decrease the number of callbacks and verbal requests that we have to process. In turn, we will be saving you time away from your patients and your busy schedules.
How to Request an Exam:
CT, US, MRI, Special Procedures* **

1. Call Scheduling: (615) 343-1842
2. Complete and fax the requisition form to (615) 343-1841
3. Give patient instructions, e.g. directions, map and education

PLAIN FILMS
1. Give patient instructions, e.g. directions, map, education

* In all cases of add-on or unscheduled exams, please explain to the patient that they will be “worked-in” as soon as possible, but that a variable wait may be unavoidable.

** Please ensure that we have an appropriate phone number to reach you quickly in case of positive, emergent or unexpected results.
ROUTINE EXAM SERIES FOR PEDIATRIC RADIOLOGY

EXAM OR PART:  WHAT TO REQUEST:

ABDOMEN ............ (a) KUB (supine film)
(b) Flat and upright (for air/fluid levels, free air)
(c) Flat and left lateral decubitus

This is the preferred examination to assess the right lower quadrant, since it directs gas into this region. This view is particularly important when considering intussusception or appendicitis. Air fluid levels and free air are well assessed in this view.

(d) Prone cross table lateral rectum

This additional view is helpful when obstruction is the primary concern, e.g. the child with suspected Hirschprung disease.

CHEST AND BONY THORAX

AC JOINTS ............ AP bilateral with/without weights

CHEST ................ (a) AP only
(b) AP and lateral (routine)
(c) Right or left lateral decubitus
(for effusion or possible pneumothorax)
(d) Bilateral dicubiti (for endobronchial foreign body)

CLAVICLE ............. AP and AP axial

RIBS .................. AP and bilateral obliques (specify rib detail)

SCAPULA ............... AP and lateral

SHOULDER .............. Internal and external rotation

STERNoclavicular JOINTS ............ CT superior for dislocation or disease

STERNUM ............... Lateral and oblique
CT superior for fracture or other pathology

HEAD AND NECK

AIRWAY ............... Soft tissue neck (AP and lateral)

ADENOIDs ............. Soft tissue neck (lateral)

FACIAL BONES....... Seldom helpful; CT superior

MANDIBLE ............ (a) Panorex – Need cooperative older child.
(b) AP and bilateral obliques, Townes

NASAL BONES...... Nasal bones

ORBITS ................. Seldom helpful; CT superior

SINUSES ............... Waters, PA, Caldwell, lateral
CT superior to plain films

SKULL ................ AP, Townes, both laterals

ZYGOMATIC ARCH Buckethandle, Townes

UPPER EXTREMITY

HUMERUS ............. AP and lateral

ELBOW ................. AP and lateral

FOREARM ................ AP and lateral

WRIST ................. AP, lateral, and oblique

HAND ................... AP, lateral, and oblique

FINGERS ................ AP, lateral, and oblique
SPINE AND PELVIS

CERVICAL SPINE AP, lateral, odontoid, and obliques
   “Trauma obliques” in cases of trauma

THORACIC SPINE AP and lateral

LUMBAR SPINE
(a) AP and lateral (trauma only)
(b) AP, lateral, and obliques
   (pain, spondylolisthesis, or rule out spondylolysis)

SCOLIOSIS AP and lateral scoliosis series

PELVIS
(a) AP
(b) AP with frog leg lateral
   Obliques or angled views may be added for specific pathology, such as fractures. In these cases, CT is preferable

HIP (pain) Pelvis with frog lateral
   Both hips are required for evaluation. The symptomatic side should be indicated in the history.

HIP (DDH) AP pelvis
   To rule out DDH >6 months of age, a normal AP is sufficient; frog only necessary if AP abnormal. Request ultrasound <6 months

SI JOINTS CT/MRI (superior and preferable)

SACRUM/COCCYX AP and lateral

LOWER EXTREMITY

FEMUR AP and lateral

KNEE AP and lateral; tunnel view helpful to better assess femoral condyles

PATELLA PA, lateral and sunrise

LOWER LEG AP and lateral tibia/fibula
   *AP, Lateral, oblique for toddler fracture

ANKLE AP, lateral, and oblique
   (Oblique is particularly important to eliminate bony superimposition)

FOOT AP, lateral, and oblique
   (Oblique is particularly important to eliminate bony superimposition)

HEEL (CALCANEUS) Axial (Harris view) and lateral

TOES AP, lateral, and oblique

SPECIAL SERIES

BONE AGE >2 years: AP left hand and wrist
   <2 years: add AP and lateral left knee

RICKETS/RENAL

BONE SERIES Bilateral AP hands/wrists and bilateral AP knees

SHUNT SERIES Evaluates VP shunt integrity

SKELETAL SURVEY (trauma or metastatic)
**FLUOROSCOPIC EXAMINATIONS**

**GENITOURINARY:**

**VOIDING CYSTOURETHEROGRAM (VCUG)**
- No patient preparation for this exam
- Evaluates the urinary tract for vesicoureteral reflux and urethral abnormalities

**NUCLEAR MEDICINE CYSTOGRAM**
Should be requested in cases of:
- Follow up reflux
- Sibling reflux in asymptomatic patients

**IVP**
This examination is seldom done because
- Anatomy of upper tracts is evaluated with sonography; function is quantitated with nuclear medicine.
- Urolithiasis is more accurately and less invasively evaluated with noncontrast CT scan.

**CLINICAL PRESENTATIONS**
- Hematuria/hydronephrosis → US
- Hematuria
  - Stone → uncontrasted CT
  - Mass → contrasted CT
- 1st UTI → VCUG and US

**SEDATION**
We do not sedate for VCUG’s or nuclear medicine cystograms. The child must be awake in order to void.

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**GASTROINTESTINAL**
Note: “barium swallow” is a generic term. Please specify which of the following examinations is needed.

**PATIENT PREPARATION/NPO STATUS**
- Birth – 4 months → 2-3 hours
- 4 months – 2 years → 4 hours
- Over 2 years → 6 hours

**NPO Status is Used:**
- Better evaluation of stomach
- Patient will drink contrast better if they are hungry

**Esophagram:**
- Evaluates entire esophagus from mouth to GE junction. This study does not include evaluation for GE reflux

**Upper Gastrointestinal (UGI):**
- Evaluates GI system from mouth to the proximal jejunum
- Also evaluates for gastro-esophageal reflux
- Note: if reflux and gastric emptying in the setting of non-bilious vomiting are your primary concerns, nuclear medicine examination is preferable since it is more physiologic and allows a longer period of observation for reflux
  *Evaluates for malrotation – ruled out on every UGI and Children’s Hospital

**Upper Gastrointestinal with Small Bowel Follow Through (UGI/SBFT):**
- Evaluates esophagus, stomach, and small bowel to the cecum
- Please forewarn parents that this exam may take several hours
- Consider sonography first if your primary concern is inflammatory bowel disease
  * If only concern is for malrotation-UGI will address.

**BARIUM ENEMA:**

1) **Single Contrast Study** (indicated for constipation)
- No preparation for this exam – No rectal stimulation
- Evaluates entire large intestine
- If evaluating for Hirschprung disease, no rectal temperature or digital exam should be performed 24 hours prior to barium enema—no enemas prior
UNSCHEDULED EXAMINATIONS:
Patients with unscheduled examinations will be done as work-ins as soon as possible. Patients should be advised that a varied waiting period may be unavoidable.

SUGGESTED PROTOCOLS FOR SPECIFIC CLINICAL CONCERNS

- **Endobronchial foreign body** Chest x-ray: AP and bilateral decubiti
- **White-out** hemithorax Chest ultrasound
- **Suspected vascular ring** Upper GI ultrasound
- **Intussusception** KUB, left side down decubitus
- **Bowel obstruction** KUB, left side down decubitus X-table lateral rectum (prone)
- **Abdominal mass** Ultrasound / CT
- **Opso-myoclonus** Chest x-ray, abdominal ultrasound

- **UTI**
  There are many ways to work up a urinary tract infection, but the following are general guidelines:
  
  **First infection, boys and girls**
  **Lower tracts**: Boys and girls: VCUG
  
  All follow-up VCUG’s should be nuclear medicine scans. This is because the anatomy has already been delineated, and the only concern is whether or not the reflux has resolved. The radiation dose for nuclear medicine VCUG’s is significantly less than fluoroscopic VCUG’s.

  **Upper Tracts. Anatomy:**
  
  Boys: Ultrasound
  Girls: Ultrasound
  
  If an anatomic abnormality is identified, function is quantified with nuclear medicine renal scan.

  **Pyelonephritis:** Contrast CT
  
  **Febrile UTI in Infant:** Sonography to rule out pyonephrosis should not be delayed.

MRI/CT SEDATION GUIDELINES

- **CT scan** takes only minutes to perform. Therefore, if non-contrasted, many children can be done without sedation, particularly young infants in whom a bottle and swaddling are usually sufficient.

- **If CT is done with contrast, sedation may be required. This is because only one dose of contrast can be given, and if the child moves, the images cannot be repeated.**

- **MRI** takes a long time to perform, usually 30-60 minutes, depending on the size of the body region, and the complexity of the study. Therefore, sedation is usually required in all infants and young children.
You and the child’s parents know the children best, and are in best position to judge which children at borderline ages will tolerate the examinations without sedation.

SEDATION

The Pediatric Diagnostic Imaging Sedation Service provides sedation for MRI and CT studies. This comprises an attending physician and pediatric nurse practitioner from the Division of Pediatric Critical Care. Patients with complicating factors or advanced multisystem disease may require general anesthesia and will be referred for evaluation by a pediatric anesthesiologist.

The following children routinely require sedation For MRI:
- Most all children under 8 years of age
- Most all children under 13 years of age undergoing multiple studies (e.g. brain plus total spine)
- Developmentally delayed patients or those with behavioral disorders

For CT
From 6 months to 3 years of age undergoing 3D imaging of the head

Sedation for other patients will be discussed and arranged on an individual basis, as warranted by the child’s individual needs, clinical condition, and the requirements of the study.

Types of sedation
Intravenous sedation will be used for all children undergoing MRI and most children ages one to three years undergoing 3D Head CT. Infants less than one year undergoing 3D Head CT are usually sedated orally.

To schedule a sedated study
Call the MCJCHV Diagnostic Imaging Scheduling Department at (615) 343-1842 from 7:30 am to 6 pm.

Please include the following additional information when discussing the study with the child’s parents:
- Need for I.V. placement, when applicable.
- Parents should plan to remain in the diagnostic imaging recovery area until the child returns completely to baseline, usually within one to two hours after the procedure
- Parents should notify the Diagnostic Imaging recovery room (615) 936-4929 in the event of intercurrent illness that persists the day before the study (especially cough, congestion, other respiratory symptoms.)
- Bring legal documents if you have custodial rights.
- Any NPO or pre exam instructions should be strictly followed.

For specific NPO (fasting requirements) please visit the Sedation Services Web site.

Thank you for your assistance in helping us to arrange and plan your patient’s sedation in order that it may be a safe, efficient, and family-friendly experience. Please fax all correspondence to (615) 343-1841. Please call the numbers listed above with any questions or concerns.