How to Approach Radiology Procedures

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What procedures do we perform?

- **Venous**
  - Venograms, venous access, catheters, ports, IVC filter placement/retrieval, dialysis catheters, fistulagram, deep venous thrombosis and pulmonary embolism treatment and lysis, varicose vein treatment, varicocele/pelvic congestion

- **Arterial**
  - Peripheral arterial disease (claudication and critical limb ischemia), mesenteric angiography, renal artery embolization, renal angiogram/stenting, uterine artery embolization, visceral artery aneurysms, pseudoaneurysm treatment, subclavian artery stenting

- **Gastrointestinal**
  - Gastrostomy, jejunostomy, bariatric embolization, gastrointestinal bleeding, abscess drainage

- **Genitourinary**
  - Nephrostomy, nephroureterostomy, ureteral stents, nephrolithiasis management, suprapubic catheters

- **Hepatobiliary**
  - Transjugular intrahepatic portosystemic shunts, balloon occluded retrograde transvenous obliteration, biliary drainage, biliary stenting

- **Oncology**
  - Biopsy, liver/kidney ablation, chemoembolization, selective internal radiotherapy, soft tissue tumor ablation, preoperative embolization

- **Women’s Health**
  - Uterine artery embolization, placenta accrete/previa/increta embolization, fallopian tube recanalization

- **Men’s Health**
  - Prostate artery embolization, pudendal nerve block

- **Palliation**
  - Celiac plexus block, cryoneurolysis, phantom limb pain ablation, tunneled pleural/abdominal effusion catheter placement

- **Musculoskeletal**
  - Vertebroplasty/kyphoplasty, desmoid tumor ablation, preoperative embolization
What to know about the patient:

The Procedure

- What procedure are they having, and why?

- Have they had this procedure before?
  - If so, any complications, including over/undersedation, access issues, etc.
  - A review of prior reports and procedural imaging are invaluable

- Review of associated relevant imaging is mandatory
  - Ultrasound, CT and/or MRI for vascular access
  - CT abdomen, MRI abdomen, or even lowest slices of a CT chest for gastrostomy placement
  - Ultrasound or CT for biliary or nephrostomy placement
  - Abscess drainage usually requires CT for thorough evaluation
What to know about the patient:

**Procedure specific details**

- **Percutaneous nephrostomy:** is it unilateral or bilateral?
  - If unilateral, the side for intervention **MUST BE MARKED**

- **Venous access:** have they had multiple prior catheters? Are certain veins known to be thrombosed, open or closed? What type of catheter do they need and why? Tunneled or not?
  - Are they now, or might they be in the future, a candidate for dialysis? If so, know that subclavian access must be avoided as it risks all future fistula creation in that extremity

- **ESRD:** when was the last time they were dialyzed? Do they have a fistula or a graft (these are very different things)
  - A fistula is native artery to native vein
  - A graft includes an interposed segment of artificial material
What to know about the patient:

**Current Clinical Status:**

- Where is the patient? (ICU, floor, outpatient)
- What is their code status?
- Are they consentable?
  - If not, next of kin, power of attorney, phone # should be entered in EMR
- If patient has dementia, is continuing with the procedure appropriate?
  - Evidence demonstrates gastrostomy tube placement in dementia often results in more harm than benefit

**Basics**

- Are they NPO?
  - 2 hrs for clear liquids
  - 6-8 hours for solid foods and non-clear liquids
- Are there any infectious signs/symptoms
  - If they have blood cultures, have they been clear for 48-72 hrs
- Vital signs? Improving, worsening, stable?
  - Severe HTN increases risk of bleeding
- What is their ASA Score?
What to know about the patient:

<table>
<thead>
<tr>
<th>Current Clinical Status:</th>
<th>ASA Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>● ASA 1: A normal healthy patient</td>
<td>● ASA 3: patient with severe systemic disease</td>
</tr>
<tr>
<td>○ usually an outpatient coming for an elective procedure,</td>
<td>○ the most common for in IR. most inpatients. ANY patient with ESRD is</td>
</tr>
<tr>
<td>such as Vascath in a Stem Cell Donor, or a healthy person</td>
<td>AT LEAST an ASA 3</td>
</tr>
<tr>
<td>presenting for a thyroid nodule biopsy</td>
<td>● ASA 4: patient with severe systemic disease that is a constant threat</td>
</tr>
<tr>
<td></td>
<td>to life</td>
</tr>
<tr>
<td></td>
<td>○ these are unstable inpatients that REQUIRE general anesthesia…too</td>
</tr>
<tr>
<td></td>
<td>unstable for moderate sedation.</td>
</tr>
<tr>
<td>● ASA 2: A patient with mild systemic disease</td>
<td>● ASA 5: A moribund patient who is not expected to survive</td>
</tr>
<tr>
<td>○ a very common outpatient, sometimes an inpatient. example</td>
<td>○ usually trauma or on-call emergency</td>
</tr>
<tr>
<td>is a person with cancer, otherwise well</td>
<td></td>
</tr>
</tbody>
</table>
What to know about the patient:

**Current Clinical Status:**

- Labs:
  - within 30 days is usually good enough
- INR <1.5 (or sometimes <2.0 is ok)
  - Need a recent INR if using anticoagulants
- Platelets >50

- Serum Potassium (increased cardiac events)

- GFR > 30 (Creatinine <2.0), especially if contrast is to be used
  - mounting evidence this may not matter

**Chart Review**

- Medications:
  - Warfarin, Plavix, Aspirin 325mg held for 5 days
  - Heparin IV held for 2-4 hours
  - Dabigatran/Apixaban/etc held for: 24-48 hrs
- Allergies:
  - Contrast, lidocaine, opioids, versed, antibiotics, latex, nickel
    - Make sure to note degree of reaction
  - Anaphylaxis to anything
What to know about the patient:

**Physical Exam**

- **General disposition:**
  - Cardiopulmonary reserve / oxygen requirements? Are they on respiratory support?
  - Can the patient lay flat / tolerate the procedure?
  - Are they “of size” (= very large)
  - What access / IVs do they currently have?

- **Airway:**
  - Do they use CPAP, BiPAP, or have COPD
  - Any limitation to neck mobility, unusually thick neck?
  - Recent head and neck surgery?
  - What is their Mallampati Score?

**Mallampati:**

- **Class I**
  - Soft palate, fauces, uvula, anterior and posterior pillars
- **Class II**
  - Soft palate, fauces, uvula
- **Class III**
  - Soft palate and BASE of uvula
- **Class IV**
  - Soft palate not seen
Pain Management:

**Moderate Sedation**

- **IV Drugs: Most commonly Fentanyl and Versed**
  - Common starting dose 1 mg Versed, 50 mcg Fentanyl
  - Higher tolerance may require Dilaudid (dose ~1 mg)
  - Allergies may suggest use of Morphine (dose ~2 mg)

- **If opioid induced itching -> Benadryl (25-50 mg)**
  - Benadryl administration correlates with oversedation so it should not be used routinely

- **Nausea** most commonly treated with Zofran

- **Local anesthesia: Lidocaine +/- sodium bicarbonate**
  - Either way, the patient WILL feel it
Pain Management:

**Oversedation**

- Reversal of opioids with Naloxone (Narcan)
- Reversal of benzodiazepines with Flumazenil (Romazicon)

**Adverse Reactions**

- Mild urticaria
- Bronchospasm
- Laryngeal edema
- Hypotension with tachycardia
- Hypotension with bradycardia
- Severe hypertension
- Seizures
- Pulmonary edema
- Diphenhydramine 25-50 mg IV or PO
- Albuterol inhaler +/- epinephrine
- Epinephrine IV or IM*
- Elevate legs, fluid bolus, +/- epinephrine
- Elevate legs, fluid bolus, +/- atropine
- Nitroglycerine 0.4 mg sublingual +/- labetalol
- Valium 5 mg IV or Versed 1 mg IV
- Lasix 20-40 mg IV +/- morphine

*Epinephrine SC or IM (1:1,000) 0.1 to 0.3 ml (0.1 to 0.3 mg) or, especially if hypotension evident, (1:10,000) slowly IV 1 to 3 ml (0.1 to 0.3 mg). ***EPI PEN***
Procedural Risks:

Infection, bleeding, injury to adjacent structures

- Antibiotic coverage:
  - Not universal around the world, in the USA, or likely even within your department
  - Coverage is based on area from which bugs would enter bloodstream
    - (percutaneous = skin, biliary = enteric, etc)

- Risk of bleeding: see chart

- Special cases:
  - kidneys higher risk of uncontrolled bleeding
  - gastrostomy tube higher risk of peritonitis
  - embolization of solid organs (fibroid embolization, kidney, liver, spleen, etc) causes a post-embolization syndrome (flu-like symptoms for 1-2 weeks post procedure)
  - traumatic spleen embolization needs weeks of antibiotics and possible vaccination
Post Procedure Care:

- Vascular access (ports, permcaths, PICCs, etc) placed in IR are ready for immediate use

- Femoral arterial access requires
  - *4-6 hours leg straight if manual compression utilized
  - *2 hours leg straight if closure device is used

- Radial arterial access compressive band remains in place ~1 hr

- Gastrostomy tube will generally have one of these two approaches:
  - Challenge in 2-4 hours, may eat overnight
  - Challenge in 24 hours, NPO overnight

- Moderate sedation patient should be stable for 1 hour prior to discharge
Post Procedure Care:

Resumption of anticoagulants →

TABLE 3: Recommendations for Management of Anticoagulants

<table>
<thead>
<tr>
<th>Medication</th>
<th>Interval Between Last Dose and Procedure</th>
<th>Resumption After Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Bleeding Risk</td>
<td>Medium Bleeding Risk</td>
</tr>
<tr>
<td>Warfarin</td>
<td>5 d</td>
<td>5 d</td>
</tr>
<tr>
<td>UFH (IV)</td>
<td>1 h</td>
<td>4 h</td>
</tr>
<tr>
<td>UFH (SQ)</td>
<td>4 h</td>
<td>4 h</td>
</tr>
<tr>
<td>LMWH (SQ)</td>
<td>12 h</td>
<td>12 h</td>
</tr>
<tr>
<td>Dabigatran</td>
<td>24 h</td>
<td>48 h</td>
</tr>
<tr>
<td>Rivaroxaban</td>
<td>24 h</td>
<td>48 h</td>
</tr>
<tr>
<td>Apixaban</td>
<td>24 h</td>
<td>48 h</td>
</tr>
<tr>
<td>Fondaparinux</td>
<td>24 h</td>
<td>36 h</td>
</tr>
<tr>
<td>Acyva</td>
<td>None</td>
<td>4 h</td>
</tr>
<tr>
<td>Desirudin</td>
<td>None</td>
<td>4 h</td>
</tr>
<tr>
<td>Bivalirudin</td>
<td>None</td>
<td>4 h</td>
</tr>
</tbody>
</table>

Note—UFH = unfractionated heparin, SQ = subcutaneous, LMWH = low-molecular-weight heparin. Data from [6-9, 13, 19].

Resumption of antithrombotics