



# 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**
  - Vertebral body augmentation/kyphoplasty, desmoid tumor ablation, pre operative 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: Basics

- 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
- 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:

## Current Clinical Status: ASA Score

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

# What to know about the patient:

## Current Clinical Status: Chart Review

- **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

- **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:**

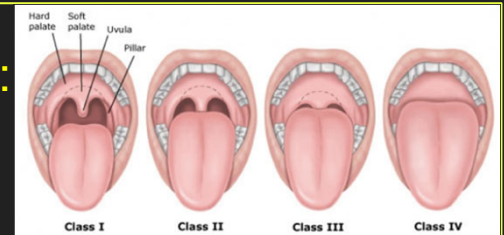
- Contrast, lidocaine, opioids, versed, antibiotics, latex, nickel
  - Make sure to note degree of reaction
- Anaphylaxis to anything

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

**TABLE 1: Nonvascular Percutaneous Procedures and Risk of Bleeding**

Low Risk	Moderate Risk	High Risk
Thoracentesis	Intraabdominal (excluding liver and spleen) and retroperitoneal (excluding renal) biopsy or drainage, lung, chest wall, or retroperitoneal biopsy or drainage	Renal, hepatic, or splenic parenchymal biopsy
Paracentesis	Percutaneous cholecystostomy tube (original placement and exchanges)	Biliary intervention (new tract)
Superficial aspiration or drainage (excluding intrathoracic or intraabdominal sites)	Simple RFA procedure	Complex* RFA procedure
Superficial biopsy (thyroid, peripheral lymph nodes, breast)	Gastrostomy tube placement (original placement and exchanges)	Nephrostomy tube placement (original placement and exchanges)
Drainage catheter exchange	Biliary tube exchange	Lumbar puncture, myelography, epidural injection

Note—RFA = radiofrequency ablation.  
 \*A complex RFA procedure entails treatment of a lesion in a location near major vessels or when a large amount of hepatic or nonhepatic parenchyma must be traversed to access the lesion.

- 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**

Jaffe TA, Raiff D, Ho LM, Kim CY. Management of Anticoagulant and Antiplatelet Medications in Adults Undergoing Percutaneous Interventions. AJR Am J Roentgenol. 2015 Aug;205(2):421-8. doi: 10.2214/AJR.14.13342.

## 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**

Medication	Interval Between Last Dose and Procedure			Resumption After Procedure		
	Low Bleeding Risk	Medium Bleeding Risk	High Bleeding Risk	Low Bleeding Risk	Medium Bleeding Risk	High Bleeding Risk
Warfarin	5 d	5 d	5 d	12 h	12 h	12–24 h
UFH (IV)	1 h	4 h	4 h	1 h	1 h	1 h
UFH (SQ)	4 h	4 h	6 h	Immediate	Immediate	1 h
LMWH (SQ)	12 h	12 h	12 h	6 h	6 h	6 h
Dabigatran	24 h	48 h	72 h	24 h	48 h	48 h
Rivaroxaban	24 h	48 h	48 h	24 h	48 h	48 h
Apixaban	24 h	48 h	72 h	24 h	48 h	48 h
Fondaparinux	24 h	36 h	48 h	6 h	6 h	6 h
Acova	None	4 h	4 h	1 h	1 h	1 h
Desirudin	None	4 h	4 h	1 h	1 h	1 h
Bivalirudin	None	4 h	4 h	1 h	1 h	1 h

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

**TABLE 5: Recommendations for Management of Antithrombotics**

Medication	Interval Between Last Dose and Procedure			Resumption After Procedure			Comment
	Low Bleeding Risk	Medium Bleeding Risk	High Bleeding Risk	Low Bleeding Risk	Medium Bleeding Risk	High Bleeding Risk	
ASA, low dose	None	None	None	Immediate	Immediate	Immediate	Variability in duration of action, long acting NSAIDs require longer interval before procedure
ASA, high dose	None	5 d	5 d	Immediate	Immediate	Immediate	
ASA and dipyridamole	2 d	5 d	5 d	Immediate	Immediate	Immediate	
NSAIDs	None	None	24 h–10 d	Immediate	Immediate	Immediate	
Cilostazol	None	None	24 h	Immediate	Immediate	Immediate	Recent surgery is a contraindication (within 4 wk)
Clopidogrel	5 d	5 d	5 d	Immediate	Immediate	Immediate	
Prasugrel	5 d	5 d	7 d	24 h	24 h	24 h	
Ticagrelor	5 d	5 d	7 d	24 h	24 h	24 h	
Tirofiban	—	—	—	—	—	—	Recent surgery is a contraindication (within 6 wk)
Eptifibatide	—	—	—	—	—	—	Recent surgery is a contraindication (within 6 wk)
Abciximab	NR	NR	NR	—	—	—	Recent surgery is a contraindication (within 6 wk)

Note—Dash (—) indicates that there are no recommendations available. ASA = acetylsalicylic acid (aspirin), NSAIDs = nonsteroidal antiinflammatory drugs, NR = not recommended. Data from [6–9, 13, 19, 41].

← Resumption of antithrombotics

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