NON-OPERATING ROOM ANAESTHESIA (NORA)

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anesthesiologist

- Nonoperating room anesthesia (NORA)
  - Anesthesia at remote location
  - Outpatient anesthesia
  - Office-based anesthesia (OBA)
- **Importance**;
  - **Number of NORA activities** have increased rapidly (CT, MRI, neuroradiologic procedure or electroconvulsive therapy)
  - **More Complex of the procedure**, and situation and patients
- Encompasses all sedation and anaesthesia provided by anesthesiology services outside of the operating room environment.
- Area remote from main operating room
  - Radiology Department Endoscopy suites MRI Dental Clinics

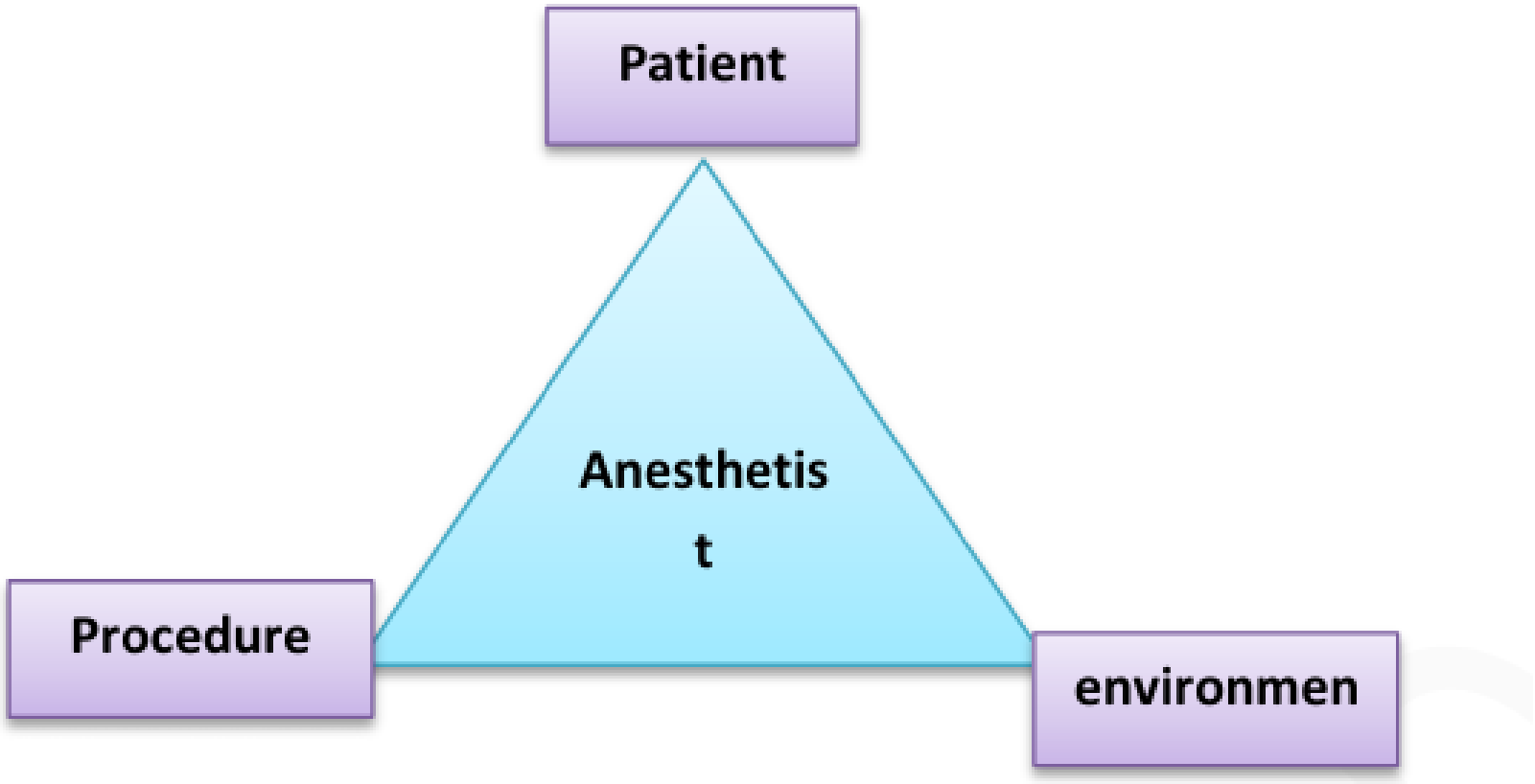
ANESTHESIA OR MRI AND CT SCAN

Dr.zikrullah mallick

Special problem of NORA

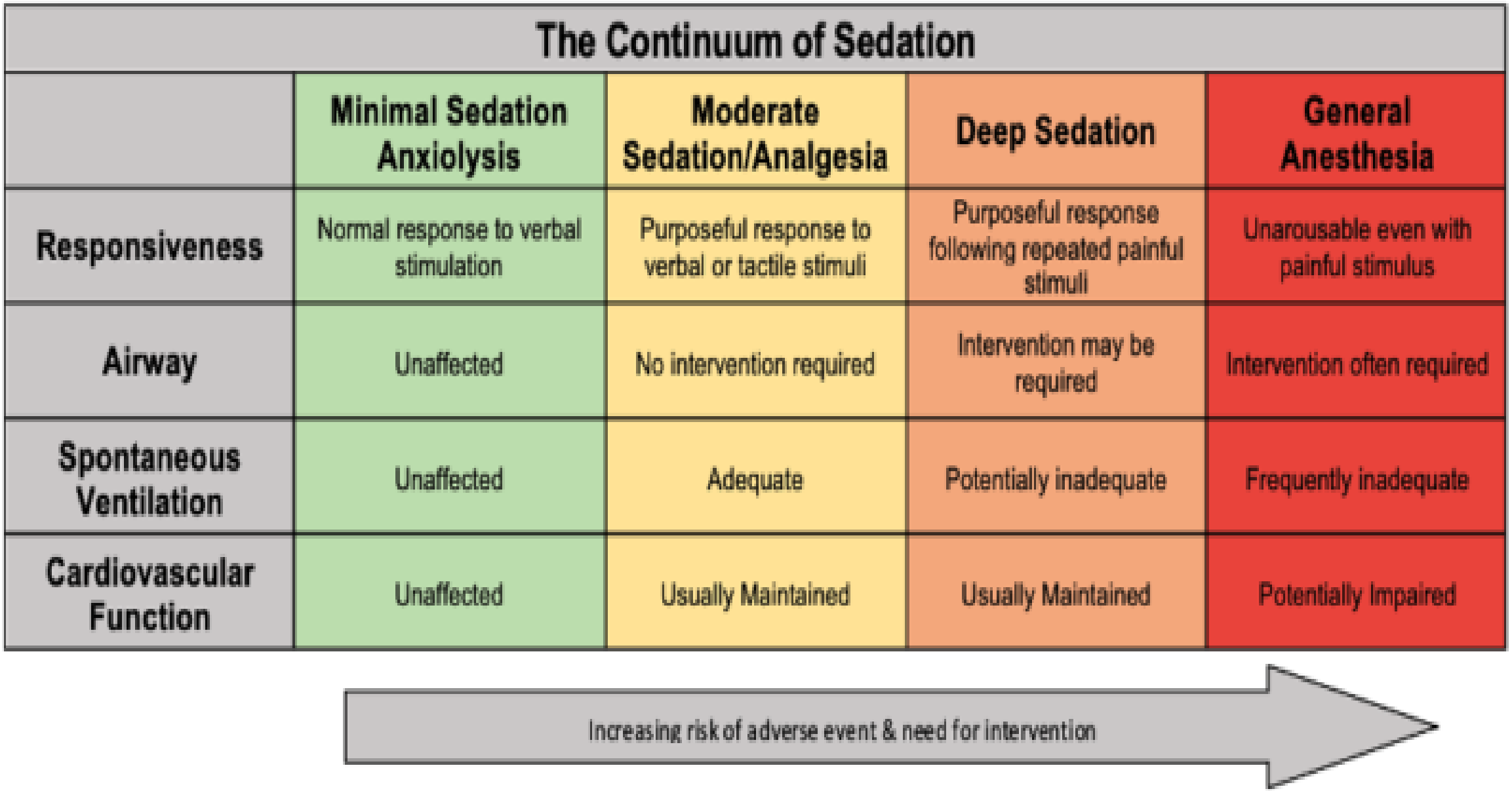
- Limited working place, limited access to the patient
- Electrical interference with monitors and phones, lighting and temperature inadequacy,
- Use outdated, old equipment
- Less familiar with the management of patients
- Lack of skilled personnel, drugs and supports

Three step approaches to NORA



Patients

- Most Patients **tend to be older. (>50 yrs)**
- receive monitored anesthesia care (MAC) or sedation
- Children commonly require sedation or anesthesia for diagnostic and therapeutic procedures.
- thorough preanesthetic assessment, standard preanesthetic care.
- sound anesthetic plan with appropriate level of monitoring and appropriate postanesthetic care.


The Continuum of Sedation
Minimal Sedation Anxiolysis
Moderate Sedation/Analgesia
Deep Sedation
General Anesthesia
Responsiveness
Normal response to verbal stimulation
Purposeful response to verbal or tactile stimuli
Purposeful response following repeated painful stimuli
Unarousable even with painful stimulus
Airway
Unaffected
No intervention required
Intervention may be required
Intervention often required
Spontaneous Ventilation
Unaffected
Adequate
Potentially inadequate
Frequently inadequate
Cardiovascular Function
Unaffected
Usually Maintained
Usually Maintained
Potentially Impaired
Increasing risk of adverse event & need for intervention

Patient factors requiring Sedation or Anesthesia for Nonoperating Room

- ❑ Claustrophobia
- ❑ Anxiety
- ❑ Cerebral palsy
- ❑ Developmental delay
- ❑ Learning difficulties
- ❑ Seizures
- ❑ Movement disorders
- ❑ Pain
- ❑ Acute trauma, with unstable cardiovascular, respiratory or neurological function
- ❑ Children below 10 years old.

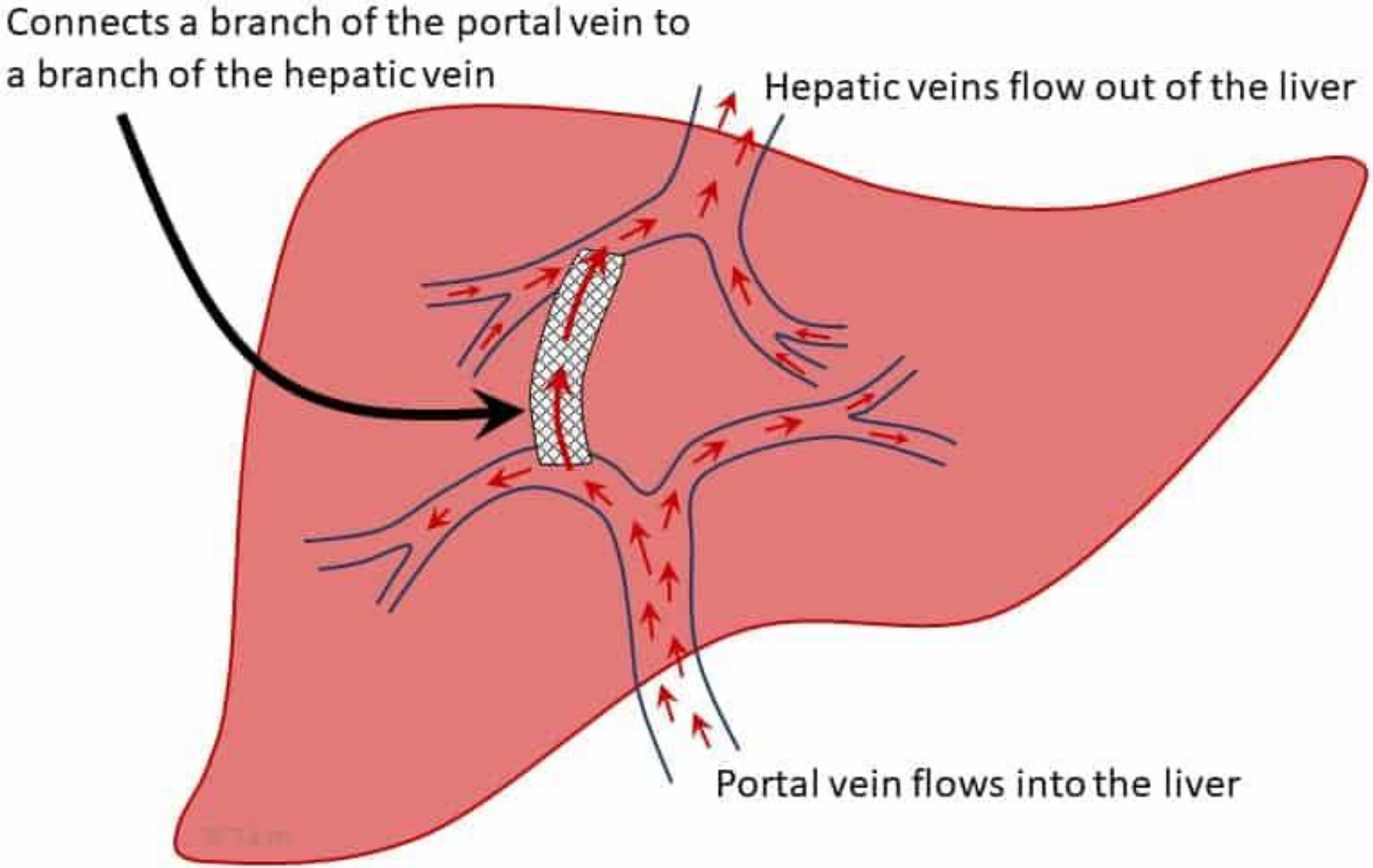
Procedures

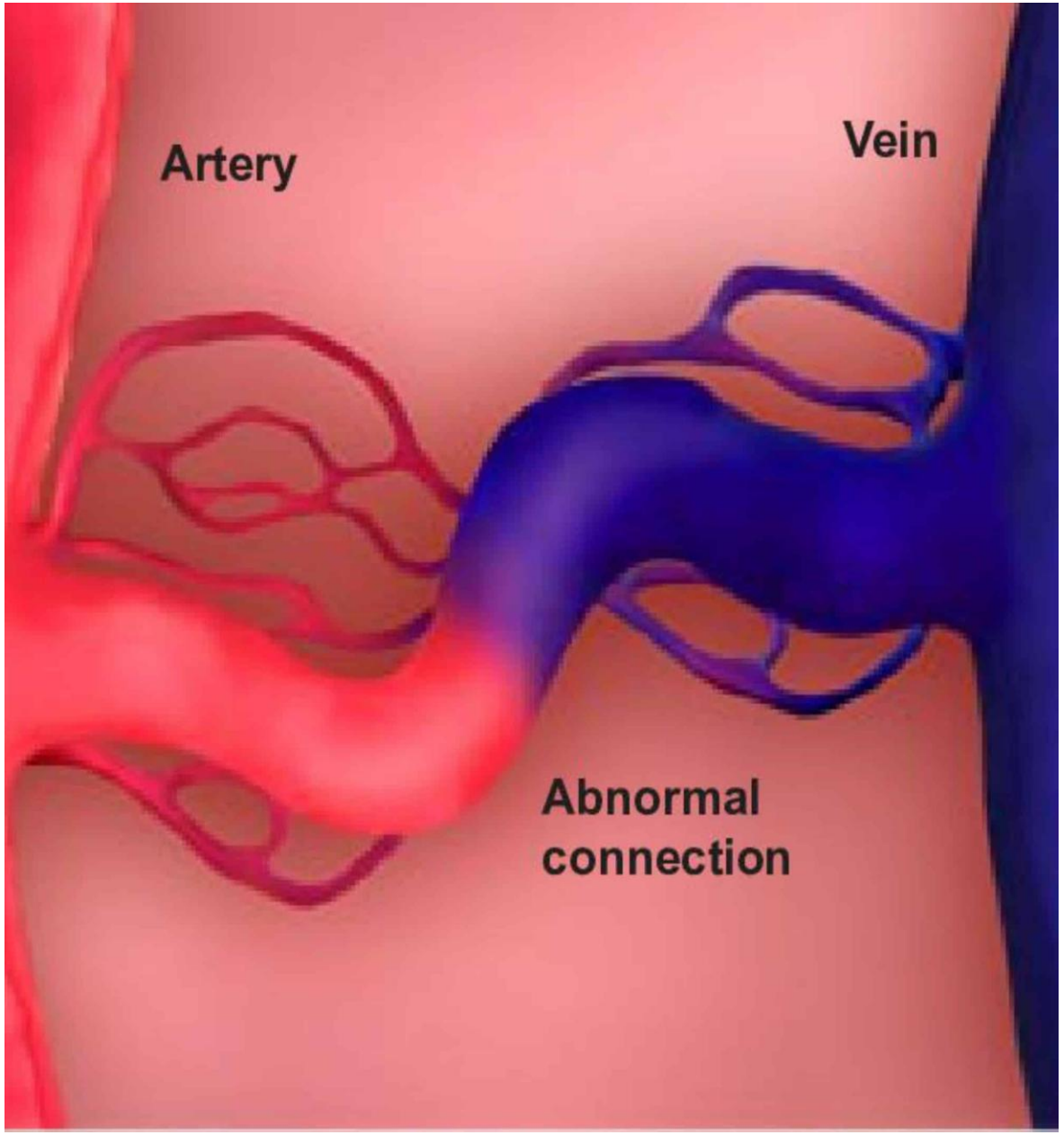
- Nature of the procedure, including patient position, grade of painful procedure, and its duration.
- Optimum anesthesia plan provides safe patient care and facilitates the procedure.
- Discussion with proceduralist for emergencies and adverse outcomes

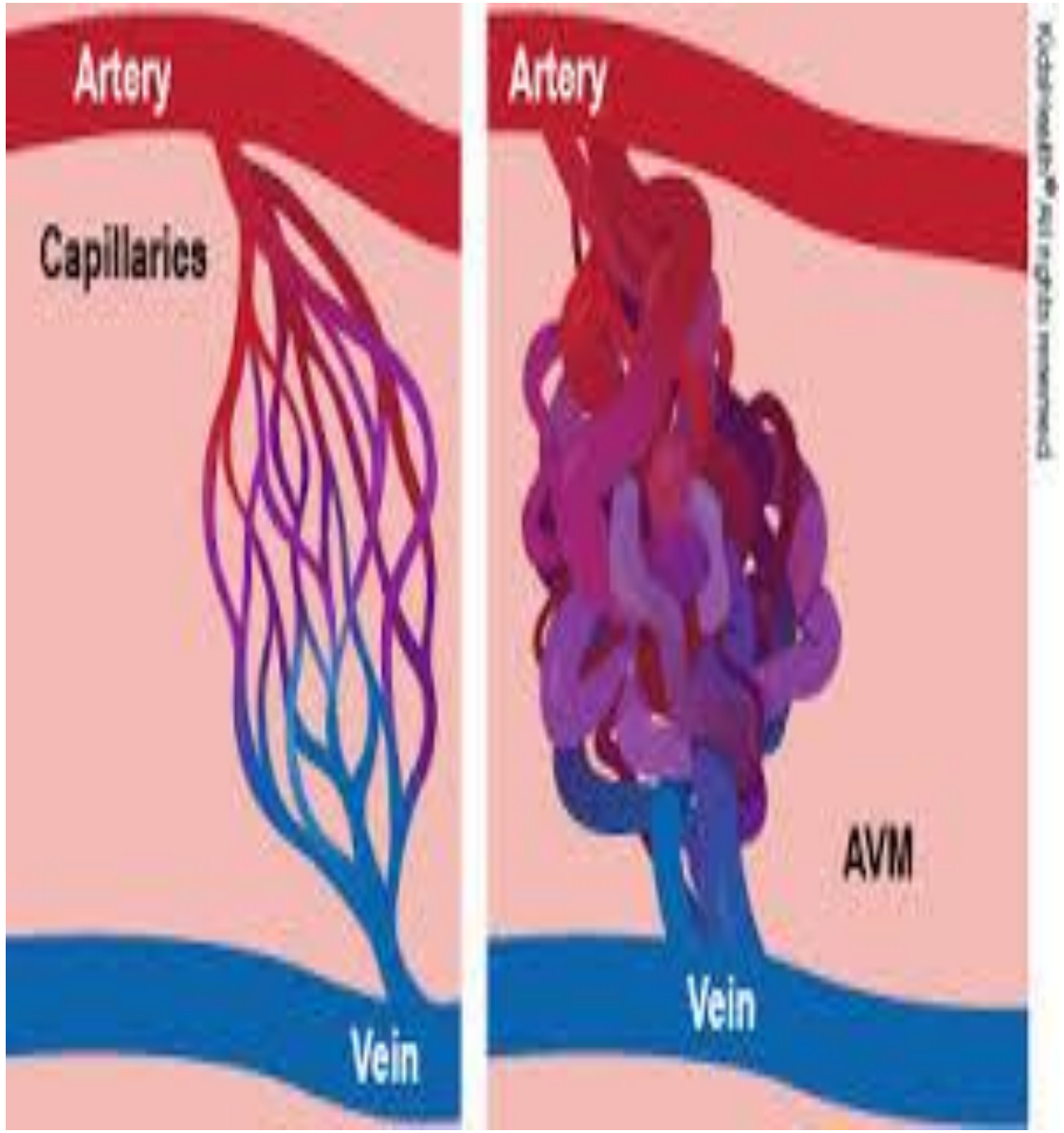
COMMON NONOPERATING ROOM ANESTHESIA PROCEDURES

Radiologic imaging

- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Positron emission tomography (PET)
- Various vascular imaging, stenting, and embolization procedures
- Radiofrequency ablation (RFA)
- Transjugular intrahepatic portosystemic shunt (TIPS)
- Diagnostic and therapeutic interventional radiology
- Occlusive (“closing”) procedures: o Embolization of cerebral aneurysm/AVM/vascular tumors
- Opening procedures: o Angioplasty/stenting/thrombolysis in stroke cerebral atherosclerosis or cerebral vasospasm


Connects a branch of the portal vein to a branch of the hepatic vein
Hepatic veins flow out of the liver
Portal vein flows into the liver


Artery
Vein
Abnormal
connection

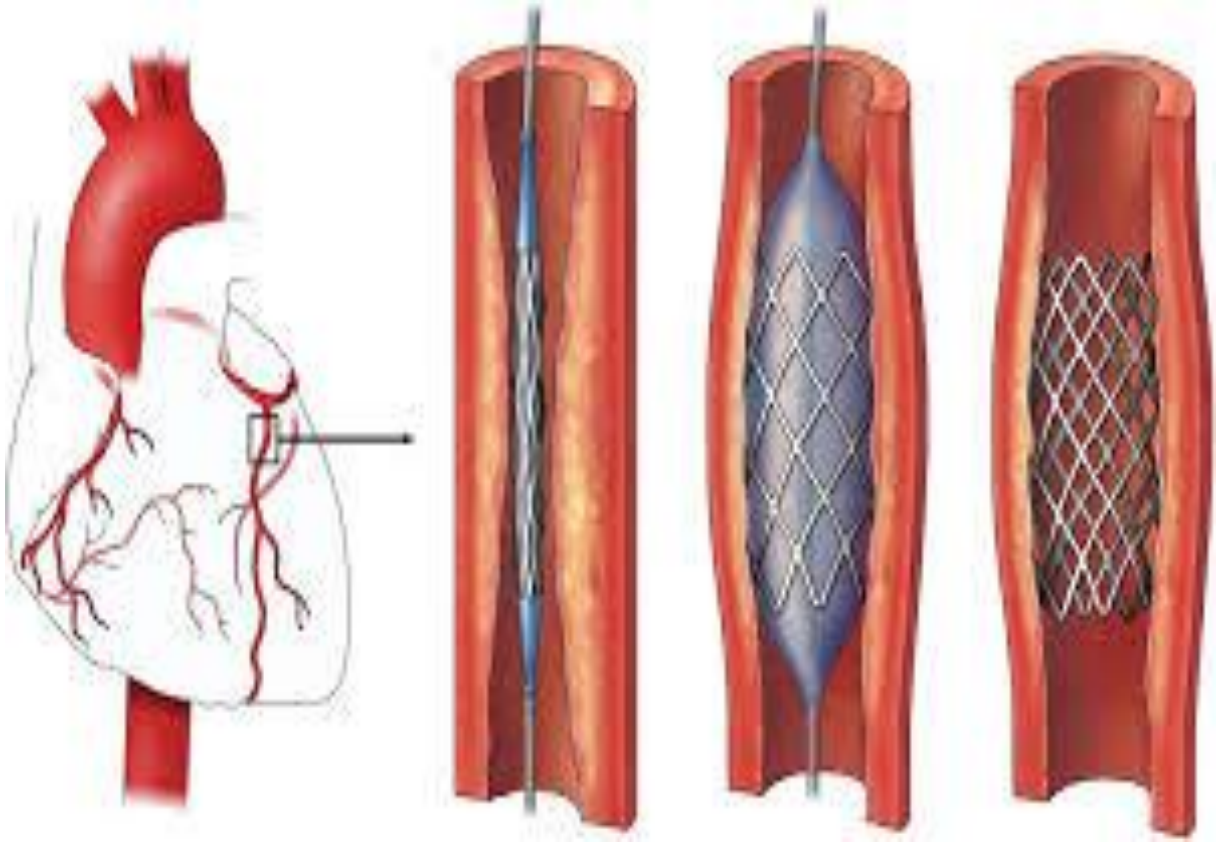

Artery
Capillaries
Vein
Artery
AVM
Vein

Radiotherapy

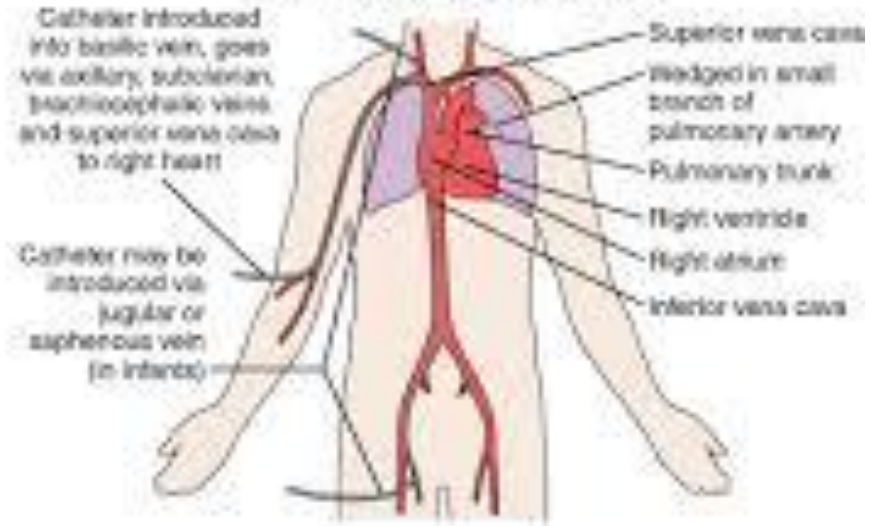
- Radiation therapy
- Intraoperative radiotherapy

Diagnostic and therapeutic interventional cardiology

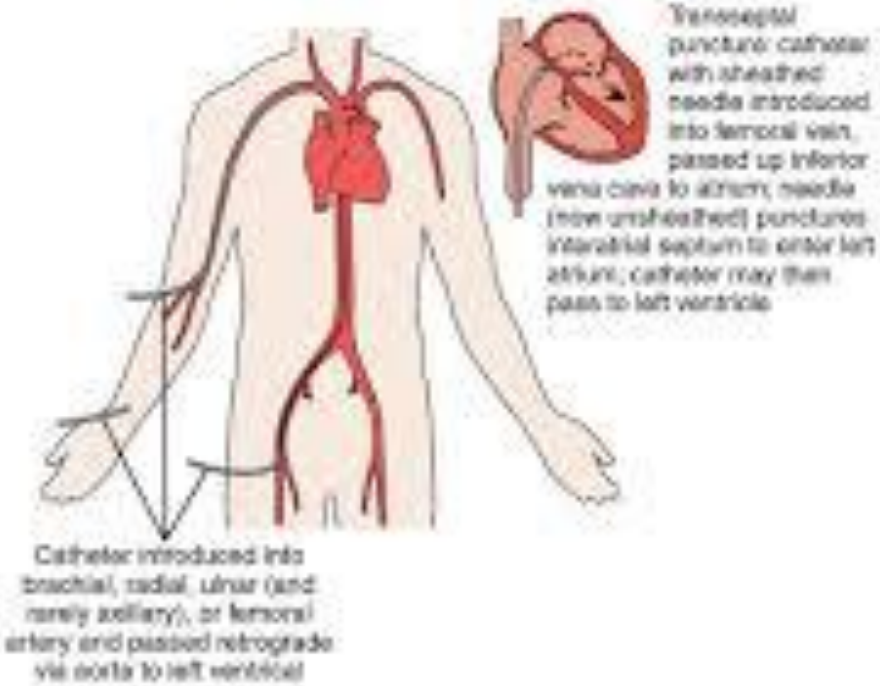
- Cardiac catheterization laboratory
- Diagnostic cardiac catheterization
- Percutaneous coronary interventions (PCI)
- Interventional techniques for management of structural heart disease (Transcatheter aortic valve implantation [TAVI])
- Placement of left ventricular cardiac assist devices for hemodynamic support



RIGHT HEART CATHETERIZATION



LEFT HEART CATHETERIZATION



Electrophysiology laboratory (EPL)

- ❑ Electrophysiology studies and radiofrequency ablation
- ❑ Implantation of biventricular pacing systems and cardioverter defibrillators
- ❑ Cardioversion and transesophageal echocardiography

Other Procedures

- ❑ Diagnostic and therapeutic interventional gastroenterology
- ❑ Upper gastroenterology endoscopy
- ❑ Esophageal dilatation or stenting
- ❑ Percutaneous endoscopic gastrostomy tube placement
- ❑ Endoscopic retrograde cholangiopancreatography (ERCP)
- ❑ Colonoscopy
- ❑ Liver biopsy

Pyschiatry

- ❑ Electroconvulsive therapy (ECT)

Dentistry

- ❑ **Dental extractions**
- ❑ **Restorative dentistry**

ASA guidelines for non-operating room anesthesia locations

- Reliable O2 source with backup supply
- Suction apparatus
- Waste gas scavenging
- Self-inflating resuscitation bag.
- Adequate monitoring equipments
- Safe electrical outlets for emergency power supply
- Adequate illumination, battery backup
- Sufficient space for anaesthesia personnel, equipment
- Emergency cart, defibrillator, drugs, etc
- Reliable means for two-way communication
- Applicable facility, safety codes met Appropriate postanaesthetic management.

Patient Transfer

- Sick, unstable patients are transferred back and forth between ICU, OR and NOR locations for imaging, therapeutic, or diagnostic procedures.
- Skilled personnel to evaluate, monitor and support he patient medical condition.
- Portable ventilators and adequate supplies of oxygen
- Manual self-inflating bag
- Anesthetic and emergency drugs, equipment for intubation or intubation, portable suctions

Liquid and Food Intake	Minimum Fasting Period (hours)
Clear liquids (for example, water, clear tea, black coffee, carbonated beverages, and fruit juice without pulp)	2
Breast milk	4
Nonhuman milk, including infant formula	6
Light meal (for example, toast and clear liquids)	6
Regular or heavy meal (may include fried or fatty food, meat)	8

Anesthetic technique

- **General anesthesia**: tracheal intubation or LMA best prevention of motion invasive, time and resource consuming, atelectasis

- **Sedation/analgesia**: less invasive, cost and time saving high rate of failure, high airway and respiratory depression

- **No anesthesia**

Conscious sedation versus monitored anesthesia care

- **Conscious sedation**:

- a medically controlled state of depressed consciousness that **allows protective reflexes to be maintained and retains the patient's ability to maintain a patent airway** and to **respond appropriately to physical and verbal stimulation.**
- **MAC**: an anesthesiologist provides specific anesthesia services to particular patients with local or no anesthesia who undergoing a planned procedure
- Some may add a fifth state to these classifications, that is; **dissociative anesthesia** provided by ketamine, causes analgesia and amnesia without loss of airway reflexes or cardiopulmonary stability.

Definition of general anesthesia and levels of sedation/Analgesia

Table 2: Levels of Sedation

Factors	Minimal Sedation	Moderate Sedation/Analgesia	Deep Sedation	General Anesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful response to verbal or tactile stimulation	Purposeful response to repeated or painful stimulation	Unarousable even with painful stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous Ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

Environmental consideration for NORA

❑ X ray & Fluoroscopy

- C arm moves back & forth takes large space &means of dislodging IV and ETT.
- so, limit the time of exposure to radiation
- increase the distance from source or radiation.
- (> or < according to inverse square of distance from source)
- use protective shielding

Anesthesia for CT

- Less complex
- Use standard monitoring
- Less anesthetic time
- Higher levels of radiation exposure

Contrast media

- Are iodinated compounds
- MRI contrast are ionic & nonionic.
- chelated metal containing gadolinium, iron, manganese.

Allergic reaction

- History
- Symptoms: skin reactions, airway obstruction, angioedema, and cardiovascular collapse.

❑ Treatment:

- corticosteroids, H1 and H2 blockers. Oxygen, epinephrine, β2-agonists, and intubation, IV fluids

❑ Prevention:

- corticosteroids
- **Renal** (increase S. Creatinine of 0.5mg/dl or 25% from baseline within 48 hrs to 72 hrs.)
- **CIN (contrast induced nephropathy**)

❑ Risk factor for CIN

- Renal disease
- Prior renal surgery
- Proteinuria -DM -HTN -Gout

Magnetic Resonance Imaging

❑ Anesthesia for MRI

- a noninvasive diagnostic technique that uses magnetic properties of atomic nuclei
- to produce high-resolution, multiplanar cross-sectional images of the body.
- Ferromagnetic materials should be excluded from the area of magnet.
- **Implantable medical devices: pacemakers, vascular clips, automatic implantable cardioverter-defribillators, mechanical heart valves**.

- High magnetic field
- Need specialized compatible equipment
- Radiofrequency noise
- Metallic implants or implanted devices
- Patients with implanted pacemakers, ICDs, or pulmonary artery catheters may not have MRI scans.

Electroconvulsive therapy (ECT)

- **Objectives**: **treat major depression, no responded to medications, suicidal.**
- **Periods**: 6 to 12 treatments over 2 to 4 weeks
- **Anesthetic goals**

1. amnesia and rapid recover
2. Prevent damage
3. Control hemodynamic response.
4. Avoid interference with initiation and duration of induced seizure.

absolute contraindication:

- intracranial hypertension

Choice of anesthetic technique depends upon

- patient’s comorbidities,
- duration,
- practioner preference and
- patient requirements.

- Deep sedation or
- GA with intubation or supraglottic airways.
- Sedation with oral route benzodiazepines or as intravenous sedation or MAC.
- **Small infants**: ”
- feed, wrap, and scan”
- Oral chloral hydrate: 80-100mg/kg 30-60 min before procedure.
- Rectally administered barbiturates or
- **General anesthesia with propofol, ketamine or inhaled anesthetics**

Complication of NORA

Minor Complications (in order of frequency)

- Postoperative nausea and vomiting
- Inadequate postoperative pain control
- Hemodynamic instability
- Minor neurologic complications such as postdural puncture headache (cardiology and radiologic locations)
- Minor respiratory complications (cardiology and radiologic locations)
- Complications related to central/intravenous lines (cardiology locations)
- Need for opioid reversal (cardiology and radiologic locations)

Major Complications

- Unintended patient awareness (gastroenterological locations)
- Anaphylaxis (radiology procedures and cardiology locations)
- Need for upgrade of care
- Serious hemodynamic instability
- **Respiratory complications**
- Need for resuscitation
- Central and peripheral nervous system injury (radiology procedures and cardiology locations)
- Vascular access-related complications (radiology procedures and cardiology locations)
- Wrong patient/wrong site (radiology procedures and cardiology locations) Fall or burn (radiology procedures and cardiology locations)

Discharge criteria

1. **Cardiovascular function and airway patency are satisfactory and stable.**

2. **The patient is easily arousable**, and **protective reflexes are intact.**
3. **The patient can talk (if age appropriate)**
4. **The patient can sit up** (if age appropriate)
5. **Adequate state of hydration**.


Thank you!