Endoscopy in High-risk Patients

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Patient dependent risk factors

- Elderly patients
- ASA≥3
  - Poorly controlled DM/HTN
  - COPD
  - Obesity(BMI ≥40)
  - MI,CVA,TIA, CAD/Stents, valve dz
  - Sepsis
  - AKI, ESRD
- Acute GI bleeding under pain medications, sedatives, antidepressants, alcoholics
- craniofacial abnormalities or pharyngolaryngeal tumors

ASA PS Classification	Definition	Examples, including, but not limited to:
ASA I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use
ASA II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples include (but not limited to): current smoker, social alcohol drinker, pregnancy, obesity (30 < BMI < 40), well-controlled DM/HTN, mild lung disease
ASA III	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (>3 months) of MI, CVA, TIA, or CAD/stents.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Examples include (but not limited to): recent (< 3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis
ASA V	A moribund patient who is not expected to survive without the operation	Examples include (but not limited to): ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes	

Procedure dependent risk factors

- Duration of the procedure
- Painful maneuvers associated to endoscopy
- the need of a motionless patient for complex techniques
- type of endoscopy required

Elderly Patients

- Geriatric patients: ≥ 65 years of age
- Advanced age: ≥ 80 years of age

- Preparation
  - less likely to tolerate high-volume oral preparations – poor colonic preparations (16%-21%)
  - electrolyte-balanced polyethylene glycol–based colonoscopy preparations

- Assessment of comorbid conditions: cardiopulmonary status
- Evaluate patient's functional status, cognitive ability

Sedation, Analgesia in Elderly Patients

- Increased response to sedatives
- Arterial oxygenation deteriorates with age, causing V/Q mismatch
- Cardiorespiratory stimulation in response to hypoxia or hypercarbia is blunted
- CNS depressants produce greater respiratory depression causing greater incidence of transient apnea
- Increased risk of aspiration

Sedation, Analgesia in Elderly Patients

- Age-related increase in lipid fraction of body mass yields an expansion of the distribution volume for benzodiazepines
- Reduced hepatic/renal clearance mechanisms

  → prolongation of recovery after sedation
- **Reduced dose requirements of sedative agents**
- Administration of **fewer agents** at a **slower rate** and with **lower** initial and cumulative **doses**
  - Doses based solely on mg/kg may produce profound respiratory depression and hypotension
  - Midazolam, Fentanyl,, Propofol

Procedural indications/outcomes in the elderly

- Upper endoscopy
  - GI bleeding (74%), reflux symptoms (53%), weight loss (53%), dysphagia(50%), anemia (49%)
  - 9.8% diagnosed with peptic ulcer disease or a new diagnosis of malignancy
  - patients older than **85 years of age** had a threefold increase in **peptic ulcer disease** or **malignancy** compared with patients 65 to 69 years of age([OR] 3.1; 95% CI, 2.0-4.7; P Z .001)
    - Male sex, weight loss, bleeding, symptoms of GERD
  - Usually safe, well-tolerated in the elderly

Procedural indications/outcomes in the elderly

- Upper endoscopy with PEG tube placement
  - patients of advanced age having poorer survival rates after PEG placement compared with patients younger than 70 years of age

- Colonoscopy
  - **no consensus** regarding when to discontinue colonoscopy **screening for colorectal cancer**
  - **octogenarians** have a higher prevalence of **colonic neoplasia (28.6%)** (vs.50 to 54 years of age (13.8%)), the mean extension in life expectancy with colonoscopy has been demonstrated to be lower for octogenarians than for the younger group (0.13 years vs 0.85 years)
  - 75% **higher risk of serious adverse events** (perforation, GI bleed, blood transfusions) in patients of advanced age undergoing colonoscopy compared with patients 66 to 69 years of age
  - decision to perform screening colonoscopy in patients of advanced age should be individualized

Procedural indications/outcomes in the elderly

- ERCP
  - Biliary obstruction as a leading indication (73.7%)
  - **therapeutic success** rates of ERCP in octogenarians are **comparable** to success rates in younger patients
  - **adverse events** including pancreatitis, perforation, bleeding from ERCP in the elderly are similar between groups

Obesity

- More prone to hypoxemia when sedated, potentially increasing the risk of cardiopulmonary adverse events
- Accumulation of sedatives
- Dosage adjustment of sedatives needed

Acute GI Bleeding

- no significant differences in neither mean decrease in SBP nor bradycardia
- mean time required to complete the endoscopic procedure and mean dosage of propofol were both significantly higher in the group with gastrointestinal bleeding
- no differences in the frequency of hypoxemia between both groups

Endoscopy following Acute coronary syndrome

- Increased risk of arrhythmias, HF, further ischemic events, death
- Stress of undergoing procedures with the utilization of procedural sedation -↑ cardiac complications, procedural risk
- No consensus regarding the optimal timing of an urgent endoscopy following an ACS
- Medical therapy for ACS (**DAPT, heparin**) increases the risk of significant **GI bleeding**

Endoscopy following Acute coronary syndrome

- Among patients with ACS, rate of overt GI bleeding is 0.7-1.3%
- Incidence of **Overt GI bleeding** FOLLOWING **PCI** is 1.2-2.3%
- Patients who have **GI bleeding following ACS** have a **higher all-cause mortality** compared to their non-bleeding counterparts in addition to **higher rates of cardiac mortality**
- Preventative measures: PPI, H2RA
- Improving endoscopic outcomes by
  - Hemostatic powders(TC-325) to lessen intraprocedural time
  - Procedural ECG monitoring

Endoscopy following Acute coronary syndrome

- 1178 patients with a recent ACS underwent 1188 endoscopies primarily to investigate **suspected gastrointestinal bleeding** (81.2%).
- 810 EGDs (68.2%), 191 colonoscopies(16.1%), 100 sigmoidoscopies (8.4%), 64 PEGs (5.4%), 22 ERCPs (1.9%) were performed **9.0 ± 5.2 days after ACS**, showing principally **ulcer disease** (25.1%; 95% CI 22.2–28.3%) and **normal findings** (22.9%; 95% CI 20.1–26.0%).
- 108 **complications** occurred (9.1%; 95% CI 7.6–10.9%), with **hypotension** (24.1%; 95% CI 17.0–32.9%), **arrhythmias** (8.1%; 95% CI 4.5–18.1%), **repeat ACS** (6.5%; 95% CI 3.1–12.8%) as the most frequent. All-cause mortality was 8.1% (95% CI 6.3–10.4%), **with 4 deaths attributed to endoscopy (<24 hours after ACS, 3.7% of all complications; 95% CI 1.5–9.1%)**

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Hypertension

- Commonly seen during endoscopic procedures
- Often aggravated by patients not taking medications before the procedure

Pregnant women

- the **fetus** is particularly sensitive to maternal hypoxia, hypotension -> might lead to fetal demise
- Maternal oversedation resulting in hypoventilation or hypotension
- maternal **positioning** precipitating inferior vena cava compression by the gravid uterus can lead to **decreased uterine blood flow** and **fetal hypoxia**
- **Teratogenesis** (from medications given to the mother and/or ionizing radiation exposure) and premature birth

Endoscopy in pregnancy

- Always consult with an obstetrician, regardless of fetal gestational age.
- Always have a **strong indication**, particularly in high-risk pregnancies.
- Defer endoscopy to **second trimester** whenever possible.
- Position patient in **left pelvic tilt** or left lateral position to avoid vena cava or aortic compression.
- **Before 24 weeks** of fetal gestation**, confirm the presence of the fetal heart rate** by Doppler **before sedation** is begun and **after the endoscopic procedure**.
- **After 24 weeks** of fetal gestation, **simultaneous electronic fetal heart and uterine contraction monitoring** should be performed before and after the procedure.
- Endoscopy is contraindicated in placental abruption, imminent delivery, ruptured membranes, or uncontrolled eclampsia.
- when electrocautery is required, **bipolar** electrocautery should be used. If monopolar electrocautery must be used, the grounding pad should be placed to minimize flow of electrical current through the amniotic fluid

Indication of endoscopy in Pregnant women

- Significant or continued GI bleeding
- Severe or refractory nausea and vomiting or abdominal pain
- Dysphagia or odynophagia
- Strong suspicion of colon mass
- Severe diarrhea with negative evaluation
- Biliary pancreatitis, symptomatic choledocholithiasis, cholangitis
- Biliary or pancreatic ductal injury

Medications in pregnancy

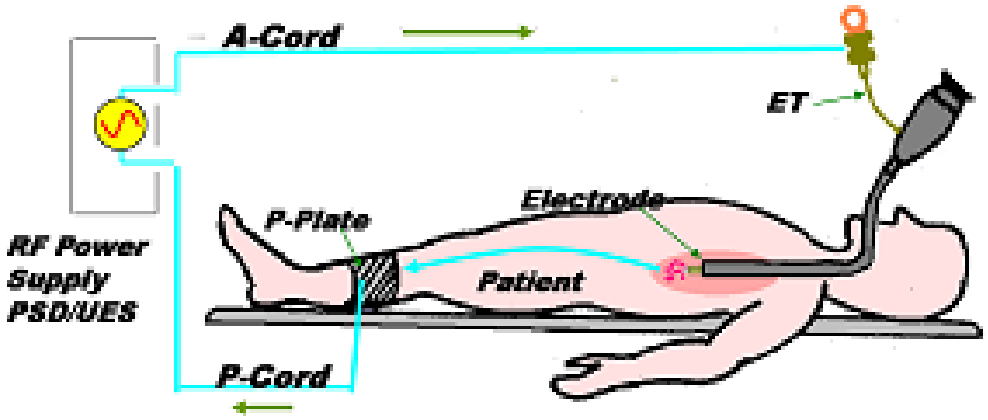
- **Meperidine**(Category B):preferred over morphine (Category C)
- **Fentanyl**(category C): rapid onset of action, shorter recovery time, not teratogenic (embryocidal in rats)
- **Naloxone**(Category B): crosses placenta within 2 min of IV administration. should be used only in respiratory depression, hypotension, or unresponsiveness in a closely monitored setting
- Benzodiazepines (Category D)
  - Diazepam should not be used; associated with cleft palate, neurobehavioral disorders
  - Midazolam is preferred benzodiazepine after first trimester

Medications in Pregnancy

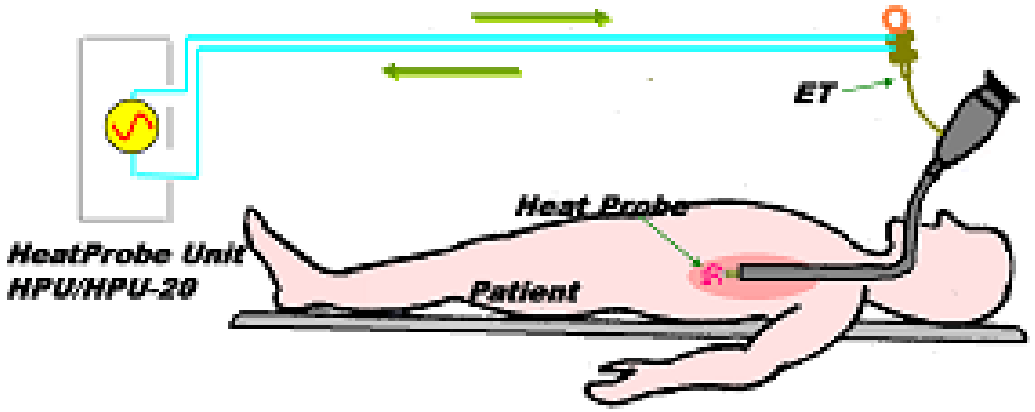
- **Flumezenil(Category C)**
- **Propofol(Category B)** has narrow therapeutic index
- **Topical anesthetics(lidocaine, category B)**
- **Colon cleansing agents:** Polyethylene glycol soln(Category C), Sodium phosphate preparations(Category C)
- In lactating patients, Caution should be exercised in the use of certain medications because these drugs may be transferred to the infant through breast milk
  - Midazolam: withhold nursing of the infant for at least 4 hours following administration of midazolam
  - Fentanyl: compatible with breastfeeding
  - Meperidine: can be transferred to the infant, may have neurobehavioral effects
  - Propofol: no interruption of breastfeeding

Endoscopy in patients with implanted electronic devices

- Electrocautery use during GI endoscopy
  - Radiofrequency current in a unipolar or bipolar/multipolar fashion



Unipolar system



Bipolar system

- electrocoagulation or electrosection (cutting effect) by heat generated resistant to the flow of current
- Monopolar cautery used for endoscopic polypectomy, sphincterotomy, APC
- Bipolar/multipolar cautery used for control of local hemorrhage from ulcers or other vascular lesions (bicap probes)

Electromagnetic interference

- Effect of an electromagnetic field of the function of any electronic device
  - Conducted EMI
  - Radiated EMI

- endoscopic or surgical electrocautery devices that determine the likelihood of interference with implanted devices
  - intensity of the generated EMF
  - the frequency and waveform of the signal
  - the distance between the electrocautery application, the leads of the implanted device
  - the orientation of the leads with respect to the EMF

- Cutting current causes more EMI than coagulation current
- Less EMI with bipolar devices

Electromagnetic interference

- EMI generated by an electrosurgical instrument on an implanted device
- The **signal** may be **interpreted as** physiologic or pathophysiologic, temporarily **inhibiting or triggering output**.
- The signal may be interpreted as **noise**, temporarily or permanently causing the device to revert to a mode preset by the manufacturer

Pacemakers

- Asynchronous mode vs. Synchronous mode
- Indications: sinus-node dysfunction, atrioventricular (AV) block
- Device malfunction : pacing inhibition, pacing triggering, automatic mode switching, spurious tachyarrhythmia detection
  - “pacemaker dependent” patients are at risk of severe bradycardia or asystole

ICDs

- Indications: Hx of ventricular arrhythmia, at risk because of LV dysfunction
- Pulse generator, 1 or more leads for pacing and defibrillation electrodes
- VT, VF -> delivery of antitachycardia pacing, counter shock, antibradycardia pacing
- signal caused by electrocautery is 1600 times greater than the sense threshold of the ICD, can be detected as VT or VF by ICDs if the signal is sufficiently close to the sensing electrode and prolonged to meet programmed detection criteria

Management of patients with cardiac devices

- Periprocedural planning
  - cardiac device make, model, type (eg, single/dual chamber, biventricular)
  - indication for the device
  - degree of pacemaker dependence
  - the patient's underlying heart rhythm
  - a history of device utilization to treat VT and VF

Management of patients with PPM

- **Pacemaker dependent patients** undergoing endoscopy in which **prolonged electrocautery** (especially unipolar) is anticipated may require temporary (via magnet application) or permanent **reprogramming of the pacemaker** to an **asynchronous mode** (VOO or DOO)
- Apply **bipolar or multipolar** currents rather than unipolar currents whenever possible.
- Whenever **unipolar** cautery is required, place the **grounding pad** on the patient in a location such that the applied current does not pass close to or through the leads of the cardiac device.
- **Minimize the strength** of the electrosurgical current applied.
- Apply the electrosurgical current **intermittently** and for the **shortest** amount of time possible.

Management of patients with ICD

- ICD **interrogation and reprogramming** to suspend tachycardia detection and/or therapies to prevent the potential risk of inappropriate ICD therapies during use of electrocautery is recommended
- A **magnet** could also be used if interrogation is not feasible
- Must be monitored continuously in a setting where VT/VF can be immediately recognized and treated with external defibrillation (attempts to avoid placing pads directly over the ICD generator)

Reference

- **Modifications in endoscopic practice for the elderly** *Gastrointest Endosc 2013:78:1-7*
- **Guidelines for endoscopy in pregnant and lactating women** *Gastrointest Endosc 2012;76:18-24*
- **Endoscopy in patients with implanted electronic devices** *Gastrointest Endosc 2007*
- **Position statement: nonanesthesiologist administration of propofol for GI endoscopy** *Gastrointest Endosc 2009;70:1053-1059*
- **Safety of Digestive Endoscopy following Acute Coronary Syndrome: A Systematic Review** *Canadian Journal of Gastroenterology and Hepatology Vol 2016 (2016), Article ID 9564529, 11 pages*
- **Multisociety sedation curriculum for gastrointestinal endoscopy** *Gastrointest Endosc. 2012 Jul;76(1):e1-25*
- **Challenging Propofol Sedation In Gastrointestinal Endoscopy: High Risk Patients And High Risk Procedures***European Medical Journal - Gastroenterology,* 2012:1:39-44