# ASA physical status

| Physical Status Classification | Description |
|---|---|
| PS-1 | A normal healthy patient |
| PS-2 | A patient with mild systemic disease that results in no functional limitations, e.g., HTN, DM |
| PS-3 | Severe systemic disease w/function limitations, e.g., angina, severe COPD, uncontrolled HTN |
| PS-4 | Severe systemic disease that is constant threat to life: CHF, unstable angina, advanced organ dyfcn |
| PS-5 | Moribund, not expected to survive w/out operation, e.g. ruptured AAA, PE, head injury w/↑ICP |
| PS-6 | Organ donor |
| Emergency operation | Any pt requiring emergency operation. Healthy pt, emergency surgery = PS-1E |

# Procedure Type

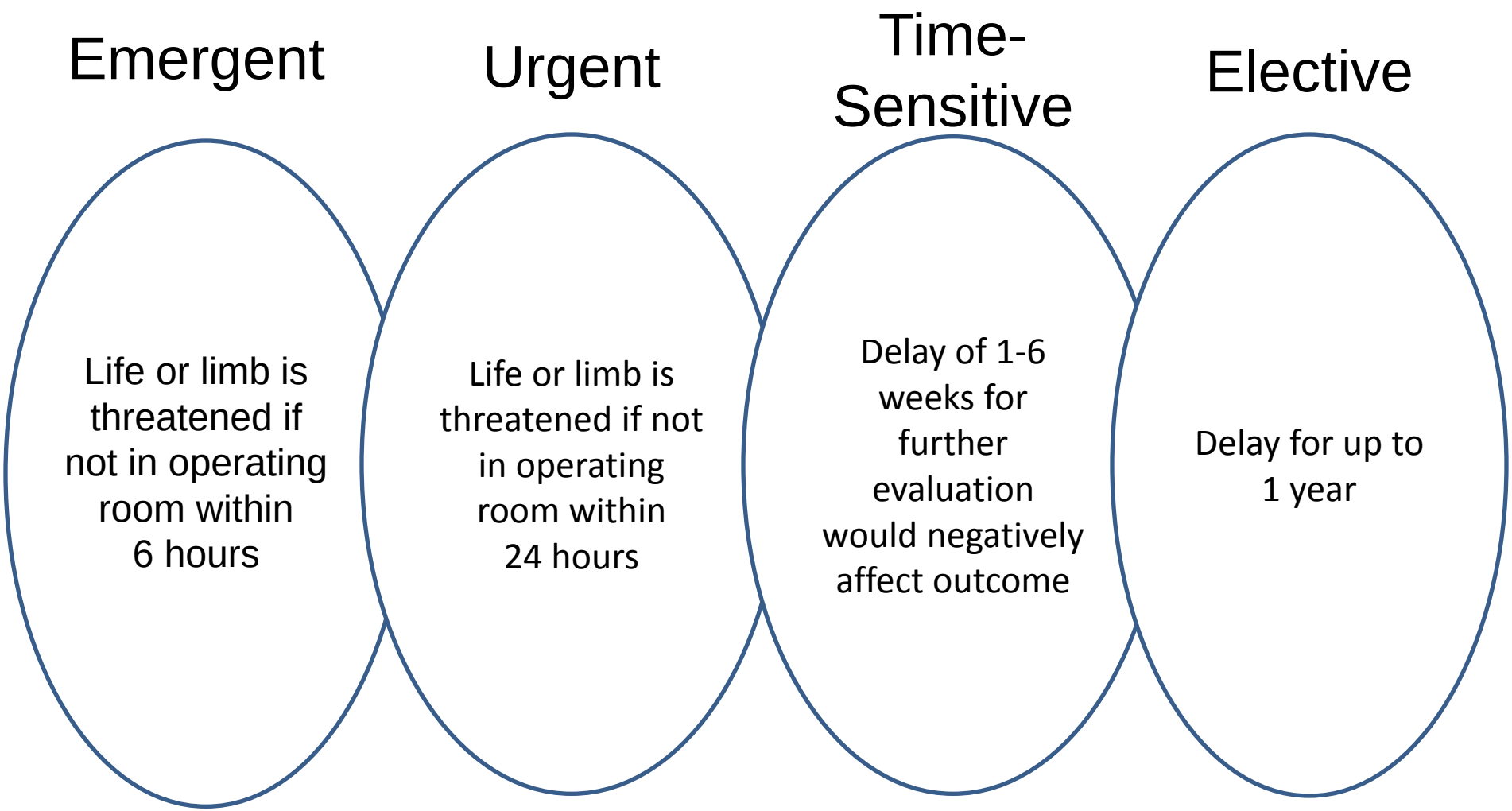
**Low Risk**

- Combined surgical and patient characteristics predict a risk of major adverse cardiac event (MACE) < 1%
- Ex: Cataracts, plastics

**High Risk**

- Any procedure with MACE risk > 1%
- No longer distinguishes between intermediate and high risk because recommendations the same
- Risk can be lowered by less invasive approach (endovascular AAA)
- Emergency procedures increase risk

# Definition of Timing of Surgery



# Preoperative Testing

# Risks & costs vs. benefits

- Medical testing associated w/significant cost
  - Real $
  - Potential harm
- ‘Routine’ preop testing cost = $3B annually
- Abnormal test found to be false (+) can lead to significant cost & real harm
- 84% of pts in one study had at least 1 preop lab abnormality
  - Resulted in surgery cancellation rate of 9%
  - Investigators believed only 3 pts of 272 benefitted from preop testing

# Risks & costs vs. benefits

- Mayo studies (1991-1997)
  - Minimal benefits from routine testing
  - Did not find that routine preop labs needed in healthy pts
  - Current practice rapidly identifies needed testing
- Cardiovascular testing
  - If noninvasive test (+), invasive test(s) & procedure(s) often follow
  - Morbidity associated w/testing & revascularization procedures may be > potential benefits

# Preop labs – asymptomatic pts

| | General Anesthesia | | Sedation for MAC & regional | Nerve block |
|---|---|---|---|---|
| Age | Men | Women | MAC | Local |
| <40 | None | Hgb/hct<br>HCG? | None | None |
| 40-50 | ECG | H & H<br>HCG? | None | None |
| 50-64 | H & H<br>ECG | H & H<br>ECG | H & H | None |
| 65-74 | H&H, ECG<br>BUN, Cr, gluc | H&H, ECG<br>BUN, Cr, gluc | H & H<br>ECG | H & H |
| >74 | H&H, ECG<br>BUN, Cr, gluc, CXR | H&H, ECG<br>BUN, Cr, gluc, CXR | H&H, ECG<br>BUN, Cr, gluc | H & H<br>ECG |

# Which preop labs are needed?

- Bare minimum, e.g., hgb, preop screening for healthy patients
- Significant baseline disease, e.g., HTN, CAD, DM, need additional studies
  - EKG, electrolytes, CXR
- 19,000 cataract surgery pts studied with preop H & P
  - Control group had no labs
  - Treatment group had EKG, CBC, lytes, BUN, Cr, glucose
  - No significant outcome differences with/without labs


- **Schein OD, Katz J, Bass EB, et al.** The value of routine preoperative medical testing before cataract surgery. Study of Medical Testing for Cataract Surgery. *N Engl J Med.* 2000 Jan; 342( 3): 168-75

# Suggested protocol for screening tests based on H & P and risk:benefit

- CBC
  - Neonates
  - Physiologic age ≥ 75
  - Class C procedure
  - Malignancy
  - Renal dz
  - Tobacco use
  - Anticoagulant use
- Coags
  - Chemotherapy
  - Hepatic dz
  - Bleeding disorder
  - Anticoagulants
- Lytes
  - Renal dz
  - DM
  - Diuretic, digoxin, steroid use
  - CNS dz
- BUN/creatinine
  - Physiologic age ≥ 75
  - Class C procedure
  - C-V disease
  - Renal disease
  - DM
  - Diuretic or digoxin use
  - CNS disease
- Blood glucose
  - Physiologic age ≥ 75
  - Class C procedure
  - DM
  - Steroid use
  - CNS disease
- Liver function tests
  - Hepatix disease
  - Hepatitis exposure
  - Malnutrition

# Suggested protocol for screening tests based on H & P and risk:benefit

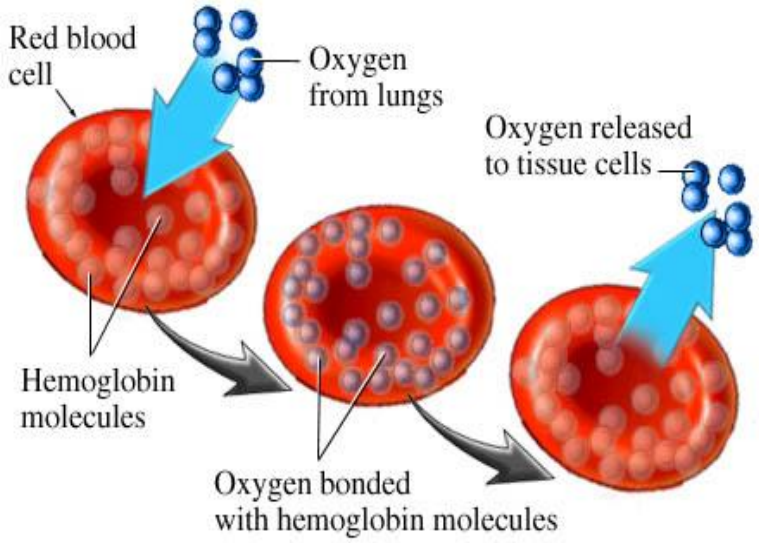
- CXR
  - Physiologic age ≥ 75
  - C-V disease
  - Pulmonary disease
  - Malignancy
  - Radiation therapy
  - Tobacco ≥ 20 pack years
- ECG
  - Physiologic age ≥ 75
  - Class C procedure
  - C-V disease
  - Pulmonary disease
  - Radiation therapy
  - DM
  - Digoxin use
  - CNS dz
- Pregnancy test
  - Possible pregnancy
- Albumin
  - Physiologic age ≥ 75
  - Class C procedure
  - Malnutrition
- Type & screen
  - Physiologic age ≥ 75
  - Class C procedure

# CBC

- Baseline hematocrit indicated in any procedure w/risk of blood loss
- Standard regarding lowest acceptable periop hct & indication for preop transfusion has evolved
  - Current recommendation of National Blood Resource Education Committee: hgb of 7 g/dL acceptable in pts w/out systemic dz
  - In pts w/systemic dz, signs of inadequate systemic oxygen delivery (tachycardia, tachypnea) are indications for transfusion

# Hemoglobin & hematocrit

- Loss of blood expected in surgical patients
  - need to know baseline value
- Multiple etiologies for anemia
  - malignancy, diverticulosis, GI bleeding
- Increased risk for anemia
  - teenage girls, young women, infants, elderly men
  - $Fe^{++}$ deficiency $1^{o}$ cause infants, young women; inflammatory disease in older people



# Hematology tests

- Baseline hgb useful to predict need for transfusion in cases with significant anticipated EBL
- Expected EBL
  - <500 ml: arthroscopy, laparoscopic cholecystectomy, inguinal herniorrhaphy
  - >500 ml: hysterectomy, joint replacement, major GI/GU; vascular, cardiothoracic, intracranial (Greenberg, 2004)

# Surgical mortality & preop hemoglobin

| Preoperative Hgb (gm/dL) | Mortality (%) |
|---|---|
| 0-6.0 | 62 |
| 6.1-8 | 33 |
| 8.1-10 | 0 |
| > 10 | 7 |

# Preoperative hemoglobin

- Lower acceptable limit, e.g., < 10 gm, occasionally considered safe based on compensatory mechanisms in otherwise healthy patients.
- Above doesn’t apply to elderly, patients with pulmonary disease, coronary, or other chronic disease processes.

# Electrolytes

- In the past, pts routinely had entire chemistry panel preop
  - May be cheaper to get 'standard battery' of tests, e.g., chem 7, than 1 particular test, e.g., $K^+$
  - Testing rarely leads to any change in periop mgmt
    - 1 exception: What would you expect the value of preop testing to be in pts w/chronic renal failure?
- Consensus:
  - Lack of routine testing in asymptomatic adults
  - Creatinine & glucose recommended in older pts
  - Pts w/systemic diseases or medications that affect kidneys, BUN & creatinine indicated

# Indications for preop comprehensive metabolic panel

- Reason to check lytes is to see if abnormalities exist that ↑ risk of arrhythmias r/t volume shifts
  - ID problems that may increase risk of acute renal failure postoperatively
    - Preop creatinine > 2
  - Diuretics, digoxin
- Glucose
  - Diabetics, steroid rx
    - **Smetana GW, Macpherson DS.** The case against routine preoperative laboratory testing. *Med Clin North Am.* 2003 Jan; 87( 1): 7-40.

# Coagulation Studies

- Coag disorders can have significant impact on surgical procedure & periop mgmt
- Abnormal labs in absence of clinical abnormalities rarely lead to periop problems
- Pts w/known or inherited coagulopathies such as hemophilia or von Willebrand's dz require preop pt preparation
  - Important to identify coag disorders, histories of abnormal bleeding
- PT, PTT needed when:
  - Previous bleeding disorders
  - Known/suspected liver disease
  - Malabsorption or malnutrition
  - Certain antibiotics and chemo agents
  - Implications for regional anesthesia (especially epidural)

# Coagulation studies

- If bleeding hx (-), PT/PTT indicated when:
  - Severe liver disease, malnutrition (vit K deficiency)
  - ? Spont bruising, excessive bleeding after minor trauma/dental extractions/prior surgery/menses
  - Anticoagulant rx
- Relatively avascular surgeries such as cataract procedures may not need preop coag studies
- If surgery high risk in terms of EBL, baseline coags good to obtain
  - **Macpherson CR, Jacobs P, Dent DM.** Abnormal perioperative haemorrhage in asymptomatic patients is not predicted by laboratory testing. *S Afr Med J.* 1993 Feb; 83( 2): 106-8.)

# International Normalized Ratio

- Established by WHO and the International Committee on Thrombosis and Hemostasis for reporting the results of blood coagulation tests.
- All results are standardized using the international sensitivity index for the particular thromboplastin reagent and instrument combination utilized to perform the test.
- For example, a person taking Coumdin might optimally maintain a prothrombin time (a "pro time" or PT) of 2 to 3 INR. No matter what laboratory checks the prothrombin time, the result should be the same even if different thromboplastins and instruments are used. This international standardization permits the patient on Coumadin to travel and still obtain comparable test results.
  - http://www.medterms.com/script/main/art.asp?articlekey=9184, accessed 5/26/07

# Liver function tests

- Identify patient with unexpected liver disease
- Quantify baseline liver function prior to surgery
- In one series, only 30% of baseline liver abnormalities (elevated bilirubin or aspartate amino transferase) were predictable by chart review

# Pregnancy testing

- Routine pregnancy testing in women of child-bearing potential varies across clinical settings
- Rationale for pregnancy testing:
  - Specific agents may be avoided r/t tertatogenicity concerns
  - Surgery may be delayed
- Information re: LMP can help define potential but doesn't eliminate possibility
- One recommendation:
  - Limit pregnancy testing to females who believe they are pregnant or who cannot tell if they are pregnant

# Chest x-rays

- American College of Physicians:
  - CXR indicated in presence of active chest dz or intrathoracic procedure
    - Not on basis of advanced age
    - But other guidelines suggest CXR reasonable in pts > 60
- Meta-analysis showed abnormalities found in 10% of 'routine' preop CXRs
  - Routine preop CXR only indicated in pt w/history or clinical evidence of active pulmonary dz
  - *May* only be indicated routinely in pts > 60

# Unexpected abnormalities on preop CXR

- Tracheal deviation
- Mediastinal or pulmonary masses
- Pulmonary blebs
- Aortic aneurysm
- Pulmonary edema
- Pneumonia
- Atelectasis
- Cardiomegaly

# Chest x-rays

- Preop CXR can identify abnormalities that may lead to either delay or cancellation of planned surgery
- Identification of these can lead to care modification:
  - Pneumonia, pulmonary edema, pulmonary nodules, mediastinal mass
  - Does Size of nodule MATTER??
- Routine testing in the population without risk factors can lead to more harm than benefit
  - Substantial harm can result from additional procedures based on shadows seen on CXR

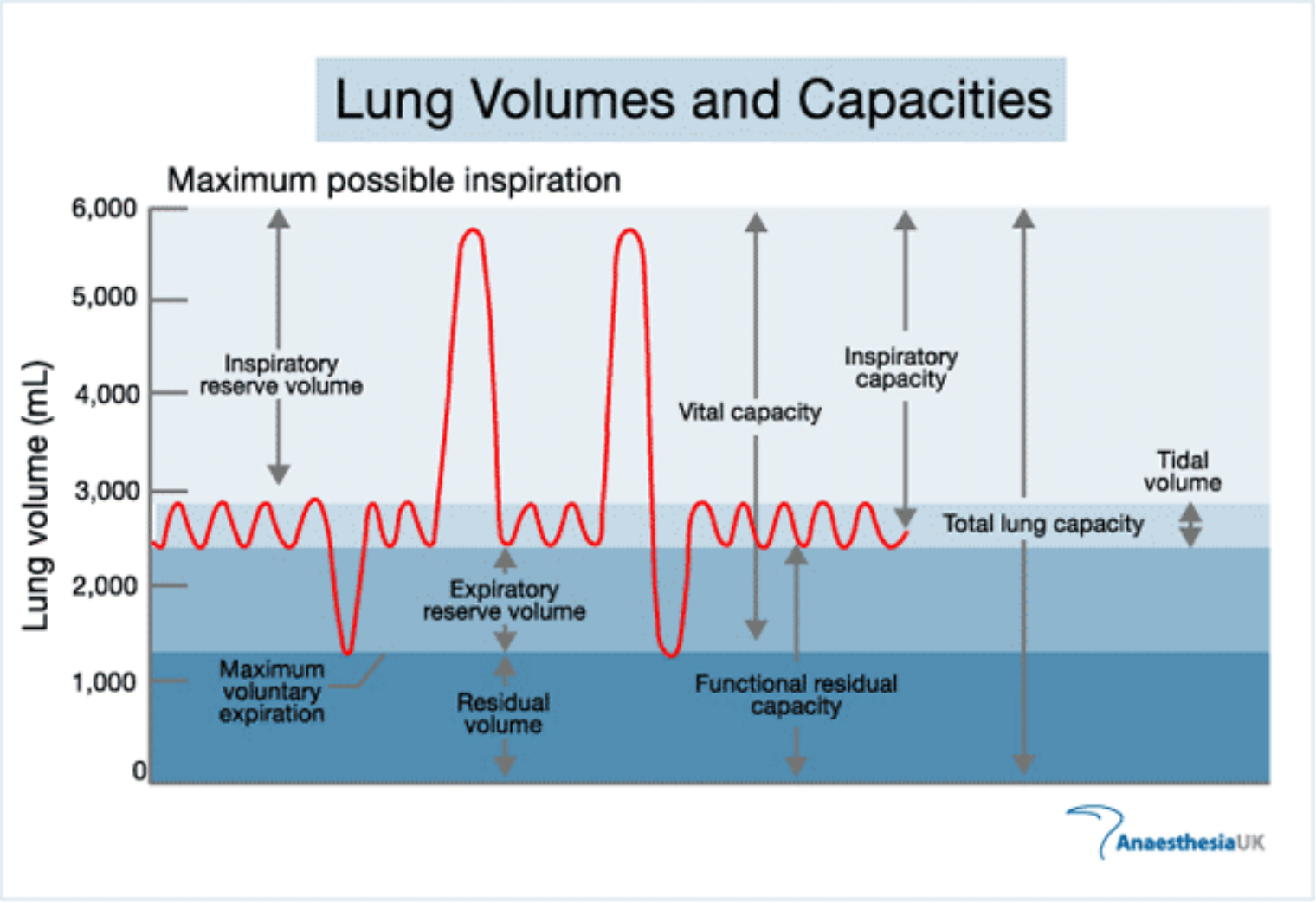
# EKGs

- MI within 3-6 months of surgery has increased risk for perioperative reinfarction
- Consider EKGs for these groups:
  - men > 40 yo, women > 50 yo
  - pts with HTN, DM, PVD
  - diseases with cardiac involvement, e.g., malignancy, collagen disease
  - electrolyte abnormalities (known/suspected)
  - major surgical procedures; indications change…

# EKGs

- Preop EKGs indicated in males > 50, females > 60
- Under these ages:
  - h/o treated arrhythmia; CAD or CHF; severe PVD; morbid obesity; longstanding or poorly controlled HTN or diabetes; smoking > 20 pack years; family h/o MI before age 60 (Greenberg, 2004).
  - May not be necessary for pts undergoing minor procedures with conscious sedation.
    - **Smetana GW, Macpherson DS.** The case against routine preoperative laboratory testing. *Med Clin North Am.* 2003 Jan; 87( 1): 7-40.)

# Pulmonary Function Tests



# PFTs

- Spirometry
- Measurement of lung volumes
- Diffusion capacity
- Flow-volume loop

# Indications for diagnostic urinalysis

- History
  - dysuria, frequency, hesitancy, discharge, flank pain, renal dz, diabetes, collagen dz, use of drugs that affect renal function
- Physical examination
  - fever without other source; costovertebral angle tenderness; generalized edema; abnormal prostate examination, jaundice
- **UTI may cause delay** of elective procedures, e.g., total **joint replacements**

# What to give and What to hold

- Give…..BP meds except Ace inhibitors, diuretics,  and ARBs
- Give parkinsons meds, pain meds, psych meds (except MAO inhibitors)(Lithium?), statins, GERD meds
- Hold oral agent Diabetic meds.  (metformin, glyburide, Glipizide) Insulin will vary
- Hold ASA, Coumadin, Plavix sometimes?

# Operative considerations

- Consider pre-op glucose control level, length and extent of procedure.
- Insulin dependent patients s/b first case of day
- Surgery is stressful, insulin resistance will increase
- Short procedures in well controlled patients may not need any change in regimen, 93% of NIDDM pts don’t need intervention.
- Consider aspiration risks and give Reglan

# Oral hypoglycemic agents

- Biguanides (Metformin)-Risk of lactic acidosis, should d/c on day of procedure and some recommend holding 48 hrs prior.
- Sulfonylurea and meglitinide drugs (secretagogues: glipizide, glyburide, glimepride, repaglinide)- be aware of delayed hypoglycemia, hold day of procedure consider holding day prior.
- Thiazoladinediones (-glitazones) may hold day of and restart with PO feeding. Beware CHF.

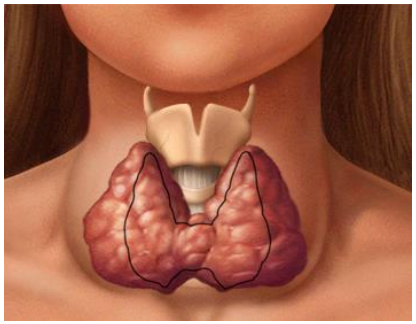
# Insulin

- Preop- No strict guidelines as regimens vary, some favor holding long-acting insulin night before surgery, esp in pts with history of hypoglycemic episodes. Usually give 1/2-2/3 normal doses on AM of procedure. Follow closely
- Insulin drip, 50 U in 500cc start .5-1.0 U/hr and titrate to effect. Follow closely, check BG Q 1hour or less. D/c when resume PO.

# Post-op

- Post-op BG goal lower than 150, ok if lower than 200.
- Recent studies show attempts at intensive control have increased risk of hypoglycemic episodes, which outweigh benefits of tighter control.
- Return to PO and restart meds as soon as appropriate

# Thyroid Disease



- Hyperthyroidism
  - Palpitations, weight loss, heat intolerance, diarrhea, sweating
- Hypothyroidism
  - Weight gain, cold intolerance, constipation
- TSH, $FT_4$, $FT_3$
- CXR
- ECG
- Continue medications on day of surgery

# Adrenal suppression risk-Steroid

- Prednisone or its equivalent > 20 mg/day
- Use >3 weeks
- No suppression if <5 mg/day
- Glucocorticoids affecting contractility and vascular tone
- Dose equivalency
  - Hydrocortisone 20 mg =
    - Prednisone 5 mg
    - Methylprednisolone 4 mg
    - Dexamethasone 0.75 mg

# COPD & pulmonary risk

- COPD = ↑ risk for postop pulm complications
- Need aggressive rx preop if they don't have optimal ↓ airflow obstruction or exercise capacity
  - Bronchodilators, PT, abx, steroids
  - No preop wheezing
- Asthmatics have ↑ risk for perioperative bronchospasm

# Asthma

- Determine inciting factors
  - Severity, reversibility, current status
- Indicators of disease severity
  - Frequent use of bronchodilators
  - Hospitalizations
  - Requirements for systemic steroids
- Possibility of adrenal insufficiency in pts who have received > burst & taper steroids in previous 6 mo

# Preventive strategies

- Lung expansion maneuvers
  - Deep breathing exercises/chest PT
  - Incentive spirometry
  - Preop education r/t these measures
- Pain control
- Smoking cessation
  - Higher risk of postop pulmonary complications
    - CO, nicotine elimination: 12-24 hrs
    - ↓ sputum after 1-2 weeks, but up to 8 wks needed to ↓ rate of postop pulmonary complications

# Preventing post-operative pulmonary complications

- Pre-op
  - Smoking cessation for eight weeks
  - Ipratropium/tiotropium for clinically significant COPD
  - Inhaled beta-agonists for COPD/asthma with wheezes/dyspnea
  - Preop steroids for non-optimized COPD/asthma
  - Delay elective surgery if infected
  - Antibiotics for infected sputum
  - Preoperative inspiratory muscle training (IS)

# Prevention

- Peri-op
  - Keep/choose procedure <3-4 hrs
  - Minimize duration of anesthesia
  - Avoid upper abdominal/thoracic procedure when possible
  - Regional anesthesia in very high-risk pts
  - Avoid pancuronium in high-risk pts

# Prevention

- Post-op
  - Deep breathing/incentive spirometry in high risk pts
  - Epidural analgesia in place of parenteral opioids

    - Probably:
      - Continuous positive airway pressure (CPAP),
      - intercostal nerve blocks, and

# Obstructive Sleep Apnea

- See following orange slides not amenable to changing.

# Pre-operative Anesthetic Considerations

- General anesthesia suppresses upper airway muscle activity, and may cause the airway to close
- May be safer, even in "out-patient" procedures to keep pt with severe OSA overnight for monitoring
- How will patient do once they are laid flat and sedated/anesthetized?
- What degree of sleep apnea is present?
- Knowing they are more prone to post-op respiratory complications, can regional anesthesia be used?
- Review patients' anesthetic history- what was done, how did they do?
- Awake intubation?

# Peri-operative Anesthesic Considerations

- If having surgery to treat OSA, airway can be narrowed from swelling and inflammation
  - Decadron 8mg IVP
- Can intermediate acting NMB's be used to avoid residual blockade (ex: Cisatracurium, Rocuronium, Atracurium, Vecuronium vs. longer acting Pancuronium?)
- Reverse completely
- Extubate in sitting position. Make sure pt is REALLY awake
- OSA is associated with obesity:
  - reduced oxygen reserve-Pre-oxygenation is very important
  - Aspiration risk- pre-medicate
- What will the narcotic requirement be post-operatively?
  - Respiratory depressants

# Post-operative Anesthetic Considerations

- Have CPAP machine available in PACU
- Guidelines from American Society of Anesthesiologists:
  - OSA patients should be monitored 3 hours longer than non-OSA patients
  - Pt should be monitored for 7 hours after any episode of airway obstruction or hypoxemia while patient is breathing room air and left unstimulated