What is old?

What is a 'normal' old heart?

What ECG abnormalities increase with age?

What ECG rhythms increase with age?

What are current recommendations for preop ECG's?

What surgeries are common in the elderly population?

Rhythm devices, anything new?

Biomarkers, what are they, and how might they help?

What is old in the US?

The definition of retirement in the US is typically 65 years

A society is considered relatively old when the fraction of the population aged 65 and over exceeds 8-10%.

1900- elderly fraction in the US was 4.1%

2000- elderly fraction in the US was 12.6%

2030- projected to increase to 20%
**ECG Monitoring in the Elderly**

*What is the normal age-related heart rate*

- Although normal pulse rate values change a bit with advancing age, those differences are insignificant
- A 21-year-old man in good physical condition, for example, typically has a pulse rate between 62 and 65 beats per minutes
- This norm fluctuates a little over the years, but at age 65, it is still between 62 and 65
- If not in good physical condition, the resting heart rate is determined by disease and medication effects

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**ECG Monitoring in the Elderly**

*What are the most common ECG Abnormalities*

- Abnormalities increase with age
- Approx 50% of 50 year olds have ECG abnormalities
- LVH
- Increases in PR, QRS, and QT intervals
- Decrease in QRS amplitude
- Left ward axis shift in the frontal plane
- Prior MI
- Bundle branch block and Atrial Fibrillation
- Non-specific ST-segment and T-wave changes

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A 21-year-old man in good physical condition, for example, typically has a pulse rate between 62 and 65 beats per minutes.
ECG Monitoring in the Elderly

**Preop ECG’s- When are they indicated?**

- Age not considered a reason to obtain a preop ECG
- Symptoms determine testing
  - ASA Preop Practice Advisory: No added predictive risk value of the preop ECG over symptoms
  - Centers for Medicare and Medicaid Services do not reimburse for preop ECG’s, or age-based ECG’s
- AHA/ACC Recommendations for a preop ECG
  - At least 1 clinical risk factor for vascular surgery
  - Type of surgery

Summary of References: 1-6


ECG Monitoring in the Elderly

**Preop ECG’s- When are they indicated?**

AHA/ACC Recommendations for preop ECG

- **Class I: Recommended**
  - At least 1 clinical risk factor for vascular surgery
- **Class IIa: Reasonable**
  - No clinical risk factors and vascular surgery
- **Class IIb: May be reasonable**
  - At least 1 clinical risk factor and intermediate risk surgery
- **Class III: Not indicated**
  - Asymptomatic persons for low-risk (out-patient) surgeries


ECG Monitoring in the Elderly

**Preop ECG’s- Significant Arrhythmias**

AHA/ACC: Arrhythmias to postpone elective surgery

- High grade block or Mobitz II AV block
  - High-Grade: ≥2 sinus P waves block consecutively in the context of periodic AV conduction
- 3rd degree AV block
- Symptomatic ventricular arrhythmias
- SVT with an uncontrolled ventricular rate
- Symptomatic bradycardia
- Newly recognized VT

Ventricular Tachycardia

Atrial Fibrillation

Classification of AV Block

- **Degree of Block**
  - Partial
    - First-degree AV block (1:1 AV conduction)
    - Second-degree AV block (less than 1:1 AV conduction)
    - Types I (Wenckebach) and Type II
  - Complete AV block (no AV conduction at all)
    - Third-degree AV Block

- **Location of Block**
  - Nodal: At the level of the AV node
    - Second-degree Type I (Wenckebach) AV block
  - Infranodal
    - Second-degree Type II AV block
    - Third-degree (complete) AV block

ECG Monitoring in the Elderly

- **Pacemakers & ICDs**
  - Millions have pacemakers, many hundred thousands ICDs
  - Patients have Pacemaker/ICD cards
  - Companies have 24-hr phone lines with humans
  - Devices should be checked after surgery to ensure they are still functioning as intended; that they were not inadvertently altered during surgery by electro-cautery
  - Batteries won’t run out during surgery
ECG Monitoring in the Elderly

Pacemakers & ICDs—

- ICD devices should be deactivated for surgery when the surgeon uses unipolar cautery
- When an ICD is deactivated, backup defibrillation must be immediately available
- Intermittent unipolar cautery does not guarantee the ICD will not discharge
- CVP placement is not contraindicated, but deserves special consideration in a patient with a pacemaker or an ICD, as there is potential for lead wire dislocation or infection

ECG Monitoring in the Elderly

Pacemakers & ICDs—What will the magnet do?

- Converts a “regular” pacemaker from the inhibited, or synchronous mode, to the asynchronous, or fixed-rate mode
- Deactivates the ICD sensing, and subsequent therapy, for atrial (SVT) or ventricular (VT, VF) tachycardias
- May do nothing at all
- Can active threshold testing mode
- Can ‘theoretically’ cause R-on-T induced arrhythmias
Cautery Induced Pacemaker Inhibition

Magnet Converts Pacemaker to Asynchronous Mode

ECG Monitoring in the Elderly

What the magnet does NOT do?

- Magnets have NO effect on devices that are patient-activated, such as devices for termination of atrial fibrillation.
- Magnets will NOT turn off the pacing function in either a pacemaker or a combined ICD/pacemaker device.
- Magnets will NOT change the pacing settings in a combined ICD/pacemaker device.
- A magnet will NOT prevent reprogramming, or cause reprogramming, of a pacemaker or an ICD, during cautery.

ECG Monitoring in the Elderly

Cardiac Safety Biomarkers

- heart rate
- blood pressure
- lipids
- troponin
- C-reactive protein (CRP)
- QT or QTc interval

- Individualized risk assessment
- Critical path collaborations
- Improved biomarkers of cardiac safety

Cardiac Safety Research Consortium
Clinical Pharmacology & Therapeutics (2009); 86, 1, 101–4

ECG Monitoring in the Elderly

Cardiac Safety Biomarkers

To assess if levels of inflammatory biomarkers serve as independent predictors for drug or procedure outcome

- The Role of Cardiac Biomarkers in Prediction of Outcome in Atrial Fibrillation Patients Undergoing Catheter Ablation
- QT interval as a Safety Biomarker in Drug Development

http://clinicaltrials.gov/ct2/show/NCT01148914
http://www.nature.com/clpt/journal/v86/n1/full/clpt200970a.html
ECG Monitoring in the Elderly

Summary

- Elderly, in years, depends on your perspective
- Resting heart rate is unchanged in healthy older adults
- Static 12-lead ECG abnormalities increase with age
- Preop ECG abnormalities not associated with symptoms are not predictive of postop complications
- No consensus exists for a preop ECG based on age
- Future preop testing may measure biomarkers to identify patients at risk for postop arrhythmias, or to better individualize postop cardiac risk assessment

Recommendations

- Don’t obtain a preop ECG based solely on age
- Obtain an ECG if the history, or symptoms, of cardiac disease is present
- Obtain a preoperative ECG for vascular surgery
- Cataract surgery using topical anesthesia does not require a preop ECG
- A preop ECG can be useful for postop comparison
- Use your judgment, document your reasons

References- preop ECGs

3. The role of testing in the preoperative evaluation. Hepner DL. Cleveland Clinic Journal of Medicine volume 76 • supplement 4 November 2009
### References - ECG findings in the elderly


### References - specific surgery


### References - guidelines & advisories

17. Practice Advisory for the Perioperative Management of Patients with Cardiac Implantable Electronic Devices: Pacemakers and Implantable Cardioverter-Defibrillators. An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Cardiac Implantable Electronic Devices. Anesthesiology, V 114 • No 2, 247 February 2011

### References - biomarkers

21. QT as a Safety Biomarker in Drug Development. Whellan et al. Clinical Pharmacology & Therapeutics (2009); 86, 1, 101–4