

Here Come the Centenarians!



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Objectives

- Discuss age-related changes
 - CV, Pulmonary, CNS, Pharmacokinetics
- Apply evidence-based ACC/AHA guidelines to aging population
- Anesthetic implications

“Estimate of Certainty (Precision) of Treatment Effect”

“Size of Treatment Effect”

	Class I <i>Benefit >>> Risk</i>	Class IIa <i>Benefit >> Risk</i> <i>Additional studies with focused objectives needed</i>	Class IIb <i>Benefit ≥ Risk</i> <i>Additional studies with broad objectives needed; Additional registry data would be helpful</i>	Class III <i>Risk ≥ Benefit</i> <i>No additional studies needed</i>
	Procedure/Treatment SHOULD be performed/administered	IT IS REASONABLE to perform procedure/administer treatment	Procedure/Treatment MAY BE CONSIDERED	Procedure/Treatment should NOT be performed/administered SINCE IT IS NOT HELPFUL AND MAY BE HARMFUL.
Level A <i>Multiple (3-5) population risk strata evaluated*</i> <i>General consistency of direction and magnitude of effect</i>	<ul style="list-style-type: none"> • Recommendation that procedure or treatment is useful/effective • Sufficient evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> • Recommendation in favor of treatment or procedure being useful/effective • Some conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> • Recommendation’s usefulness/efficacy less well established • Greater conflicting evidence from multiple randomized trials or meta-analyses 	<ul style="list-style-type: none"> • Recommendation that procedure or treatment not useful/effective and may be harmful • Sufficient evidence from multiple randomized trials or meta-analyses
Level B <i>Limited (2-3) population risk strata evaluated*</i>	<ul style="list-style-type: none"> • Recommendation that procedure or treatment is useful/effective • Limited evidence from single randomized trial or non-randomized studies 	<ul style="list-style-type: none"> • Recommendation in favor of treatment or procedure being useful/ effective • Some conflicting evidence from single randomized trial or non-randomized studies 	<ul style="list-style-type: none"> • Recommendation’s usefulness/efficacy less well established • Greater conflicting evidence from single randomized trial or non-randomized studies 	<ul style="list-style-type: none"> • Recommendation that procedure or treatment not useful/effective and may be harmful • Limited evidence from single randomized trial or non-randomized studies
Level C <i>Very limited (1-2) population risk strata evaluated*</i>	<ul style="list-style-type: none"> • Recommendation that procedure or treatment is useful/effective • Only expert opinion, case studies, or standard-of-care 	<ul style="list-style-type: none"> • Recommendation in favor of treatment or procedure being useful/ effective • Only diverging expert opinion, case studies, or standard-of-care 	<ul style="list-style-type: none"> • Recommendation’s usefulness/efficacy less well established • Only diverging expert opinion, case studies, or standard-of-care 	<ul style="list-style-type: none"> • Recommendation that procedure or treatment not useful/effective and may be harmful • Only expert opinion, case studies, or standard-of-care

Suggested phrases for writing recommendations †

should
is recommended
is indicated
is useful/effective/beneficial

is reasonable
can be useful/effective/ beneficial
is probably recommended or indicated

may/might be considered
may/might be reasonable
usefulness/effectiveness is unknown /unclear/uncertain or not well established

is not recommended
is not indicated
should not
is not useful/effective/beneficial
may be harmful

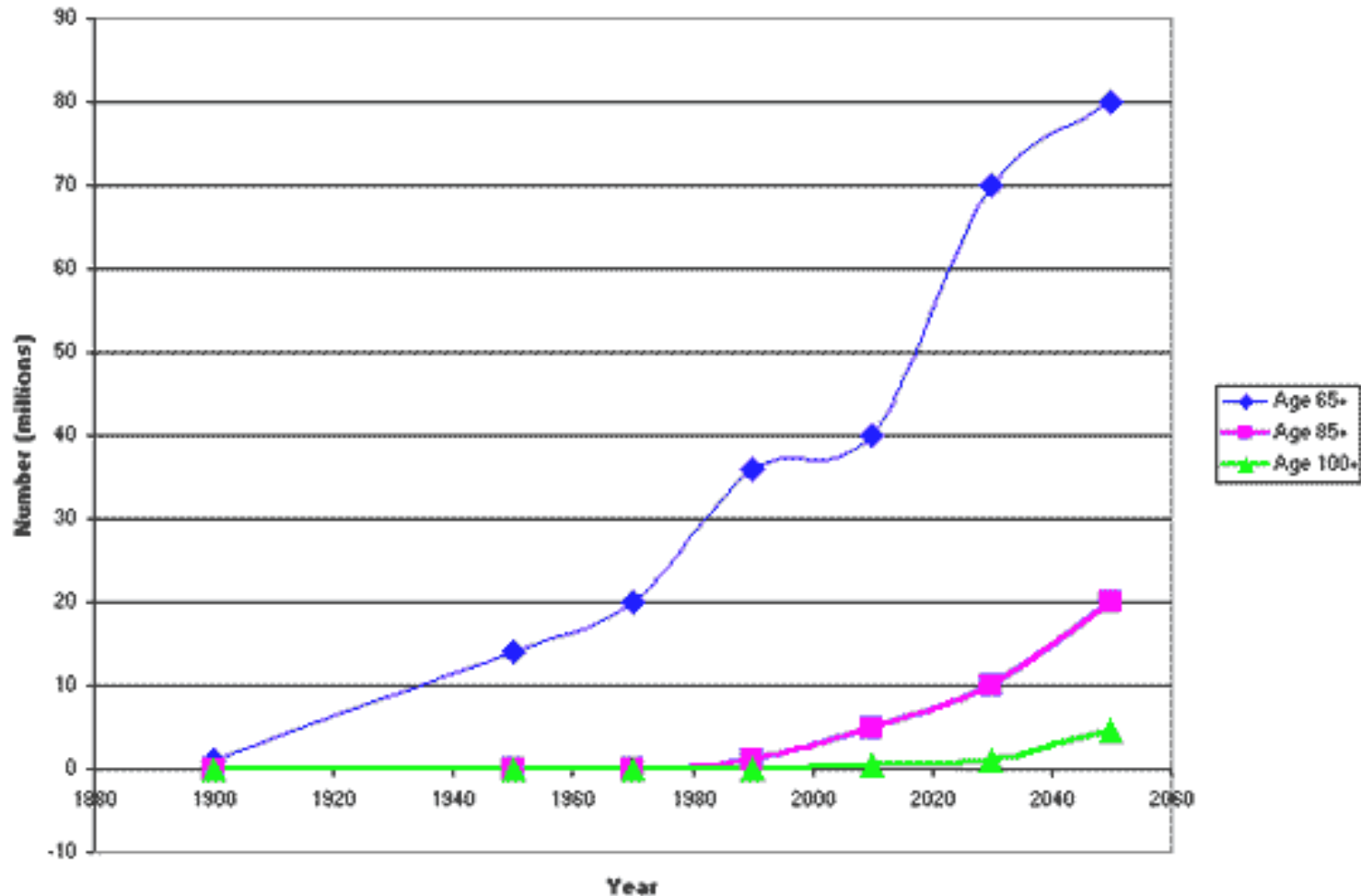
*Data available from clinical trials or registries about the usefulness/efficacy in different sub-populations, such as gender, age, history of diabetes, history of prior MI, history of heart failure, and prior aspirin use. A recommendation with Level of Evidence B or C does not imply that the recommendation is weak. Many important clinical questions addressed in the guidelines do not lend themselves to clinical trials. Even though randomized trials are not available, there may be a very clear clinical consensus that a particular test or therapy is useful or effective.

†In 2003, the ACC/AHA Task Force on Practice Guidelines developed a list of suggested phrases to use when writing recommendations. All recommendations in this guideline have been written in full sentences that express a complete thought, such that a recommendation, even if separated and presented apart from the rest of the document (including headings above sets of recommendations), would still convey the full intent of the recommendation. It is hoped that





Current Aging Statistics

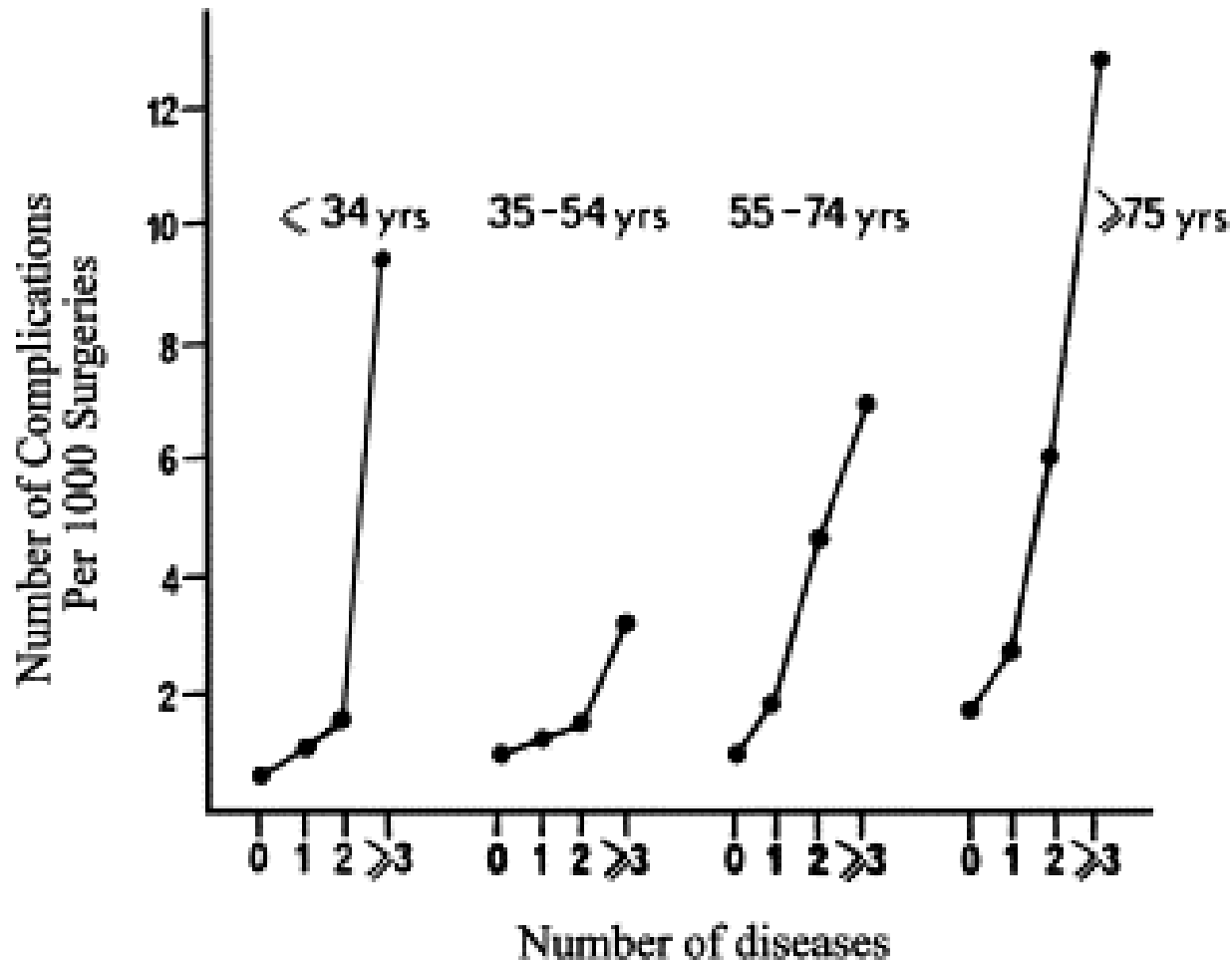


from Federal Interagency Forum on Aging-Related Statistics, "Older Americans 2000: Key Indicators of Well-Being," at www.agingstats.gov/chartbook2000; Centenarians in the United States -- Current Population Reports 1990

Which is more important to
perioperative morbidity and mortality?

Chronological age or co-morbid disease?

National Surgical Quality Improvement Program



Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23. (Review)

Relative Importance of Preoperative Health Status Versus Intraoperative Factors in Predicting Postoperative Adverse Outcomes in Geriatric Patients

**J.M. Leung & S. Dzankic. (2002).
Journal of American Geriatric Society**

- Prospective cohort study N = 544
- 70 years older undergoing noncardiac surgery
- 74.5% GETA
- 15.6% Regional anesthesia
- 9.9% Combination of general and regional

Table 1. Preoperative Chronic Health Conditions

Preoperative Conditions	Proportion of Patients (%)
Diabetes mellitus	14.9
Hypertension	58.1
History of angina pectoris	16.4
History of myocardial infarction	9.1
History of vascular disease	17.7
Coronary artery bypass graft	5.9
Percutaneous transluminal coronary angioplasty	3.7
History of congestive heart failure	7.8
History of dysrhythmias	19.6
History of valvular disease	5.7
Pulmonary disease	21.9
History of smoking	39.9
Current smoking	6.9
History of neurologic disease	22.4
History of renal disease	7.6
0 preoperative conditions	16
1 Preoperative condition	27.5
2 Preoperative conditions	26.9
≥3 Preoperative conditions	29.3

Table 3. Adverse Intraoperative Events

Intraoperative Events	Proportion of Patients with Events (%)
Heart rate > 100 bpm	7.5
Systolic blood pressure <80 mmHg	0.55
Systolic blood pressure >80 mmHg	14.7
Intraoperative desaturation (O ₂ saturation < 95%)	2
Use of neosynephrine or ephedrine	56
Use of other vasoactive agents*	4.2
Use of beta blockers	24
0 Intraoperative events	77.6
1 Intraoperative event	20.0
2 Intraoperative events	2.4
Total patients/total events	122/135

*Other vasoactive agents = calcium, dobutamine, dopamine or epinephrine.

Table 4. Adverse Postoperative Events

Types of postoperative adverse outcomes	Number (%) of patients
Death	20 (3.7)
Cardiac complications	56 (10.3)
Ischemic complications	29 (5.3)
Myocardial infarctions	10 (1.8)
Heart failure	18 (3.3)
Dysrhythmia	32 (5.9)
Hepatic/gastrointestinal	3 (0.5)
Infection	27 (4.9)
Neurological complications	42 (7.7)
Delirium	37 (6.8)
CVA/TIA	5 (0.9)
Pulmonary complications	30 (5.5)
Respiratory failure	18 (3.3)
Aspiration pneumonia	6 (1.1)
Pleural effusion	7 (1.2)
Renal complications	14 (2.6)
Reoperation	19 (3.5)
Surgical complications	21 (3.9)
Thrombo-embolic events	6 (1.1)
Others*	12 (2.2)
Total patients/total events	112/250
0 Postoperative adverse outcomes	432 (79.4)
1 Postoperative adverse outcome	61 (11.2)
2 Postoperative adverse outcomes	21 (3.9)
3 Postoperative adverse outcomes	30 (5.5)

Aging

Cardiovascular Changes

Elderly vs Young

HR =

BP >

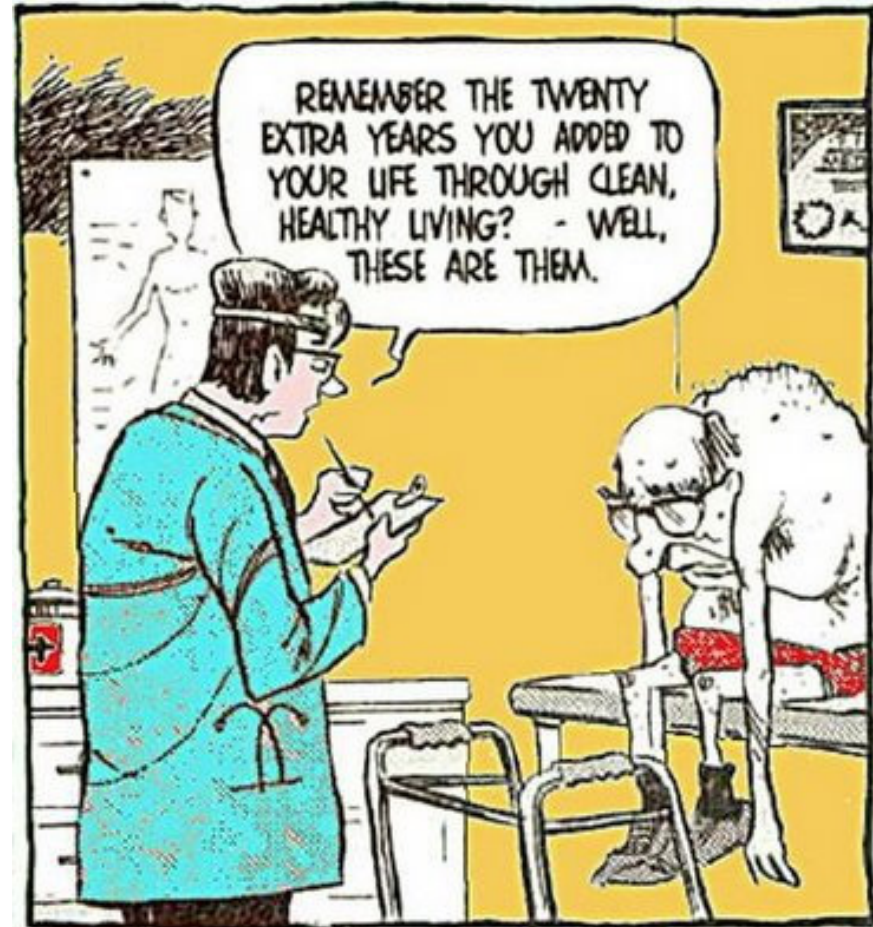
EF =

LVEDV <

SV <

CO <

CO ↓ 1% per year after 20 yrs



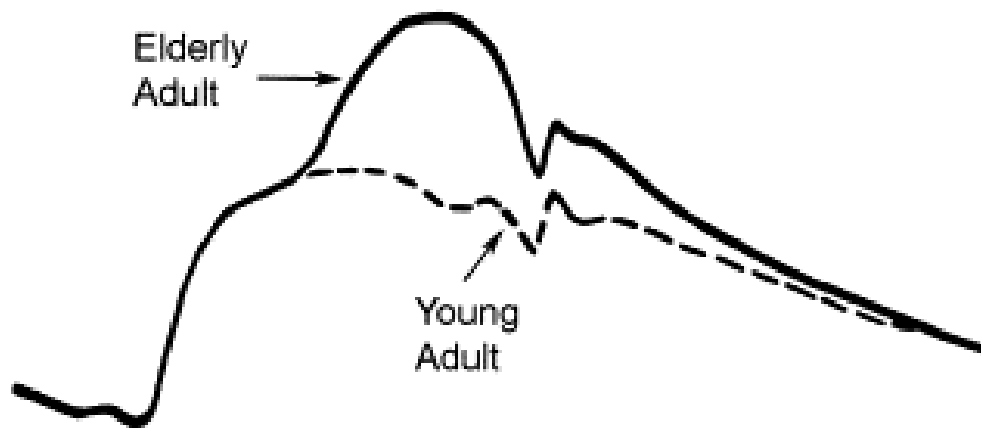
Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23.

Aging

Cardiovascular system

1. Stiffening of connective tissue
 - Systolic hypertension
 - Diastolic dysfunction
2. ↓ response to Beta stimulation
 - Overall decreased heart rate
3. ↑ SNS activity
4. ↑SVR
5. ↓basal vagal tone

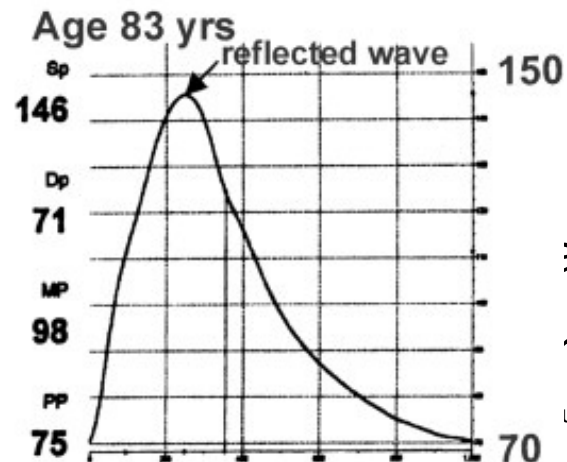
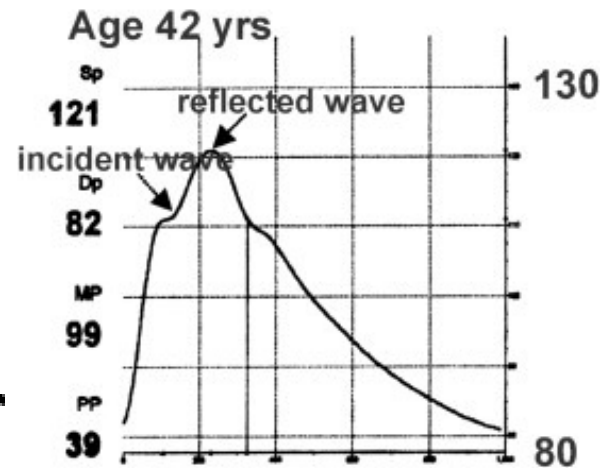
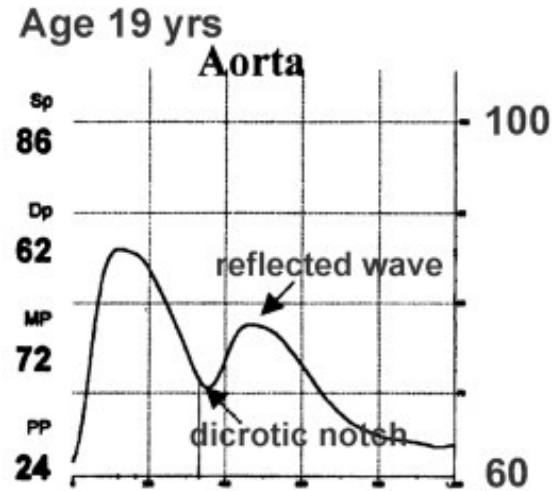
Aging A stiffer CV



Arterial stiffening--> Systolic HTN--> R...
 aorta--> increased myocardial stress-->
 dysfunction)--> increased atrial pressure

Venous stiffening--> less reservoir for
 lability to changes in preload

Rooke. (2003).
 and Vascular A



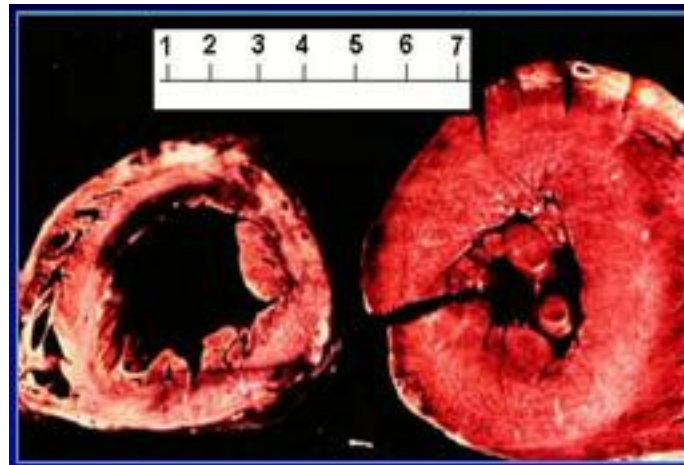
ic
 ation
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ournal of Cardiothoracic

Aging

Diastolic Dysfunction

- Systolic HTN
- Ventricular hypertrophy
- Increased left atrial volume



Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23.

Tonner, Kampen, & Scholz (2003). Pathophysiological changes in the elderly. *Best Practice & Research Clinical Anaesthesiology*, 17 (2), 163-177.

74 year-old woman in preoperative clinic before elective right shoulder arthroplasty.

PMH: HTN, osteoarthritis, +Tob history (quit 20 yrs ago), mild COPD. Denies CV problems, exertional dyspnea while walking dog up hill,

Medications: HCTZ, lisinopril

VS: 158/64, pulse 78 bts/min, RASPO₂ 98%

Exam: lungs clear, regular rhythm

ECG: NSR, non-specific S-T changes

Echo: EF 65%, impaired LV relaxation, moderate concentric LVH, and LAE

Aging

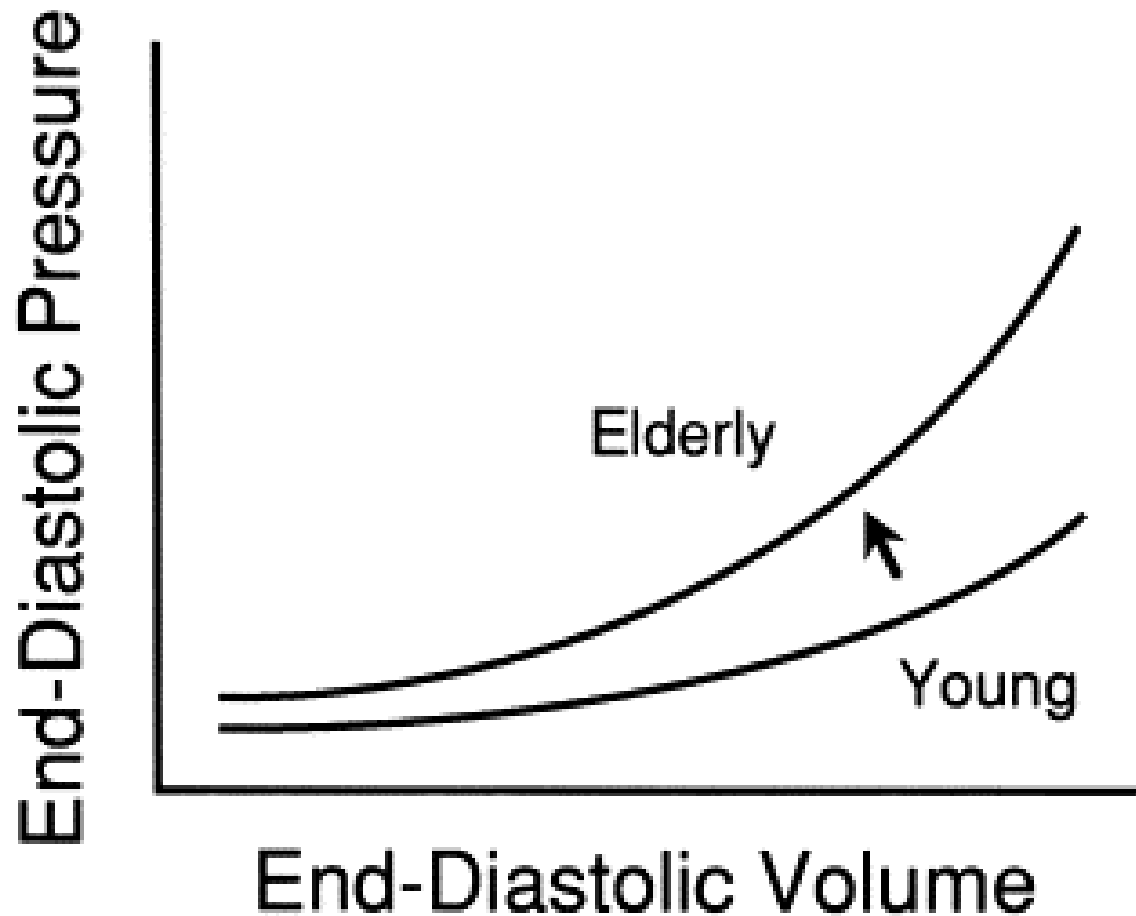
Risk factors for Diastolic HF

- Age > 70, HTN woman
- Systolic HTN, increased pulse pressure > 60 mmHg
- Diabetes, CRI
- Echo: Normal EF, delayed relaxation, LAE, LVH
- Recent weight gain
- Exercise intolerance
- B-type natriuretic peptide (BNP) >120 pg/mL

Sanders, Dudley, & Grobin. (2009). Diastolic dysfunction, cardiovascular aging. *Anesthesiology Clinics*, 27, 497-517.

Aging

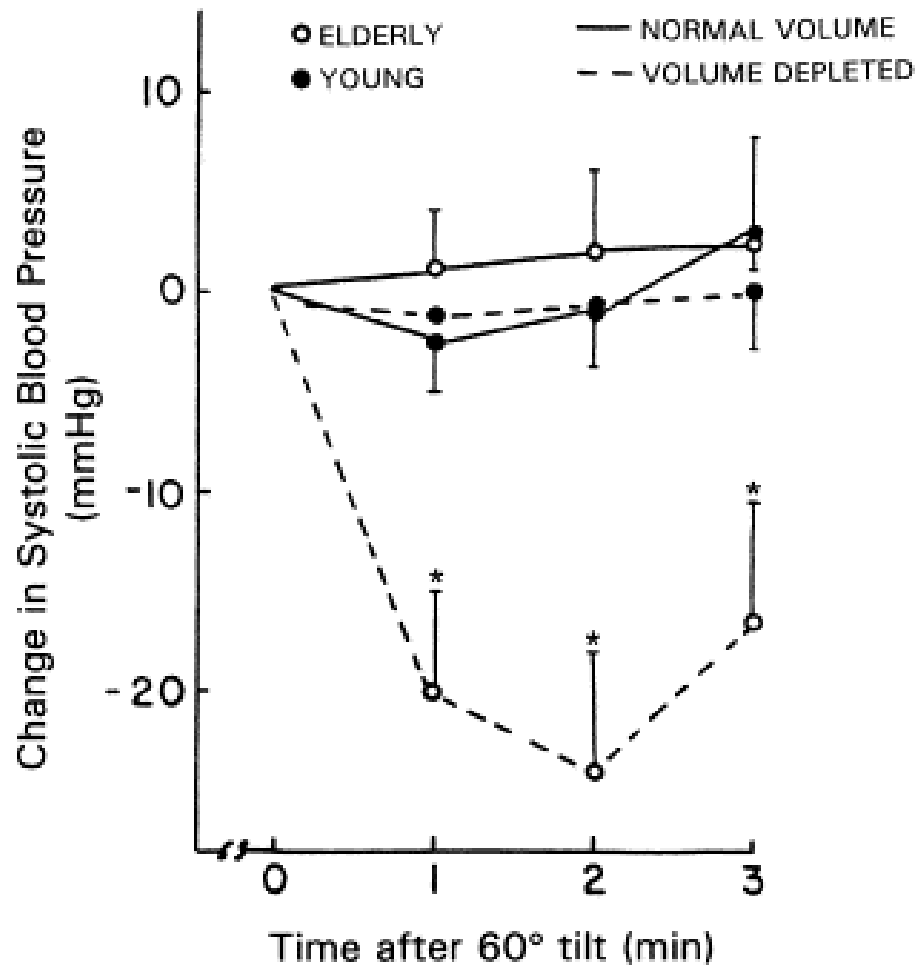
A stiffer CV system



Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23.

Aging

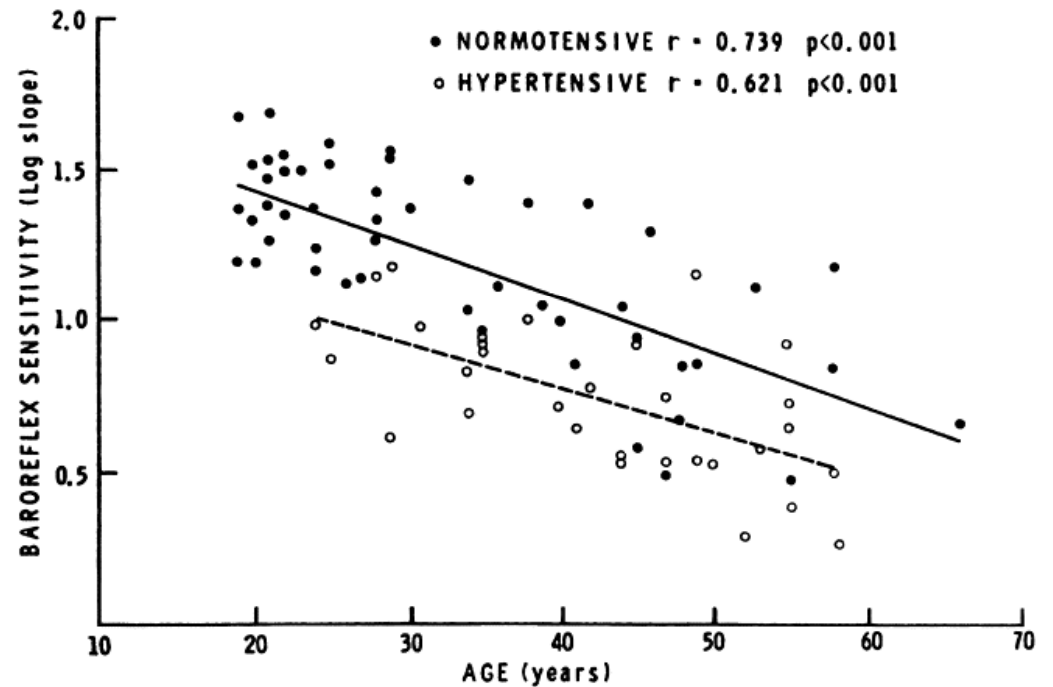
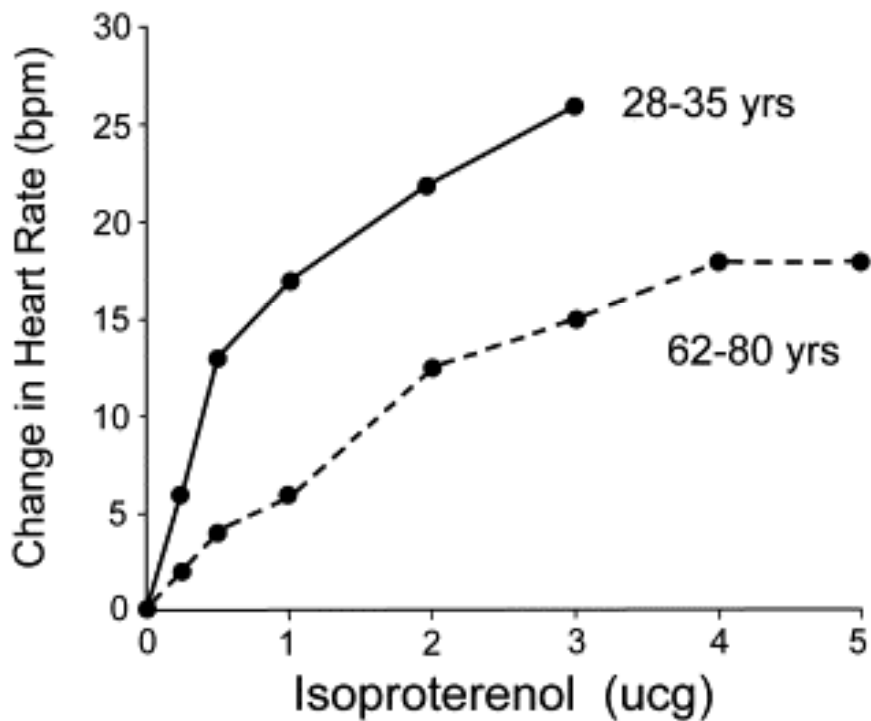
Changes in blood volume



Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23.

Aging

Decreased baroreceptor response



Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23.

Aging

Beta-blockers (BB)

- Continue throughout the perioperative period if high cardiac risk (IB)
- Continue through the perioperative period when used to treat angina (IC)
- BB “p”
 - ur
 - th
 - hi
- Uncer
no clinic

ACC/AHA Clinical risk factors

IHD

History of heart failure

History of cerebrovascular disease

Diabetes mellitus

Renal insufficiency

85 year-old man presents for nephrectomy for renal cell carcinoma

PMH: +tob history (150 pack yrs), COPD, O2 2L/NC nightly, stable infrarenal abdominal aneurysm, history of SVT, T2DM (well controlled).

Internal med:

beta

started on a

(daily).

Contraindications to beta blockade

Symptomatic bradycardia

2nd or 3rd degree AVB

Severe HF or EF < 30%

Hypotension

Cardiogenic shock

COPD with strong reactive component

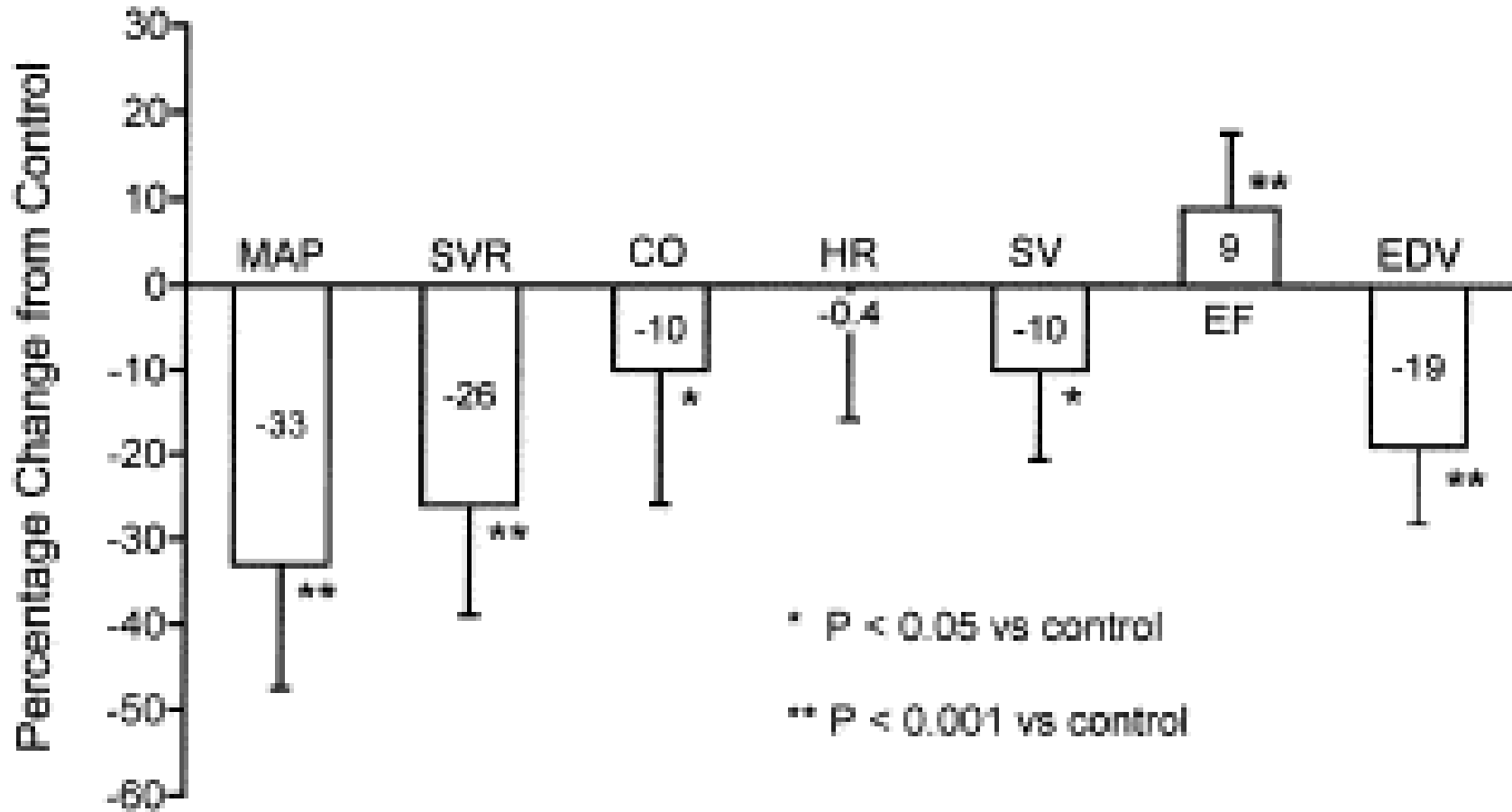
Severe asthma requiring steroids

Aortic valve stenosis

It w

Aging

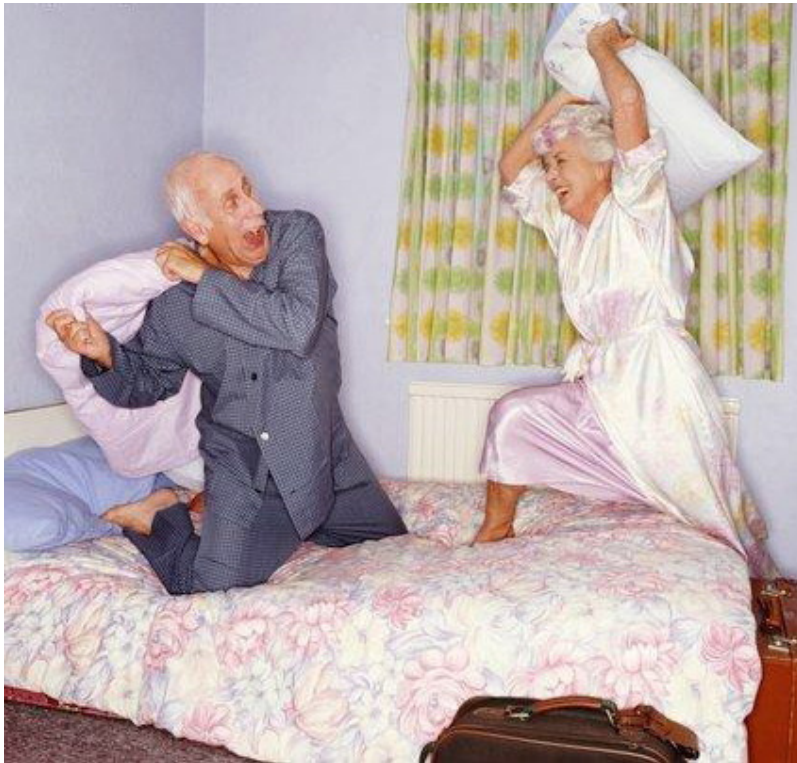
Response to anesthesia



Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23.

Aging

Functional status

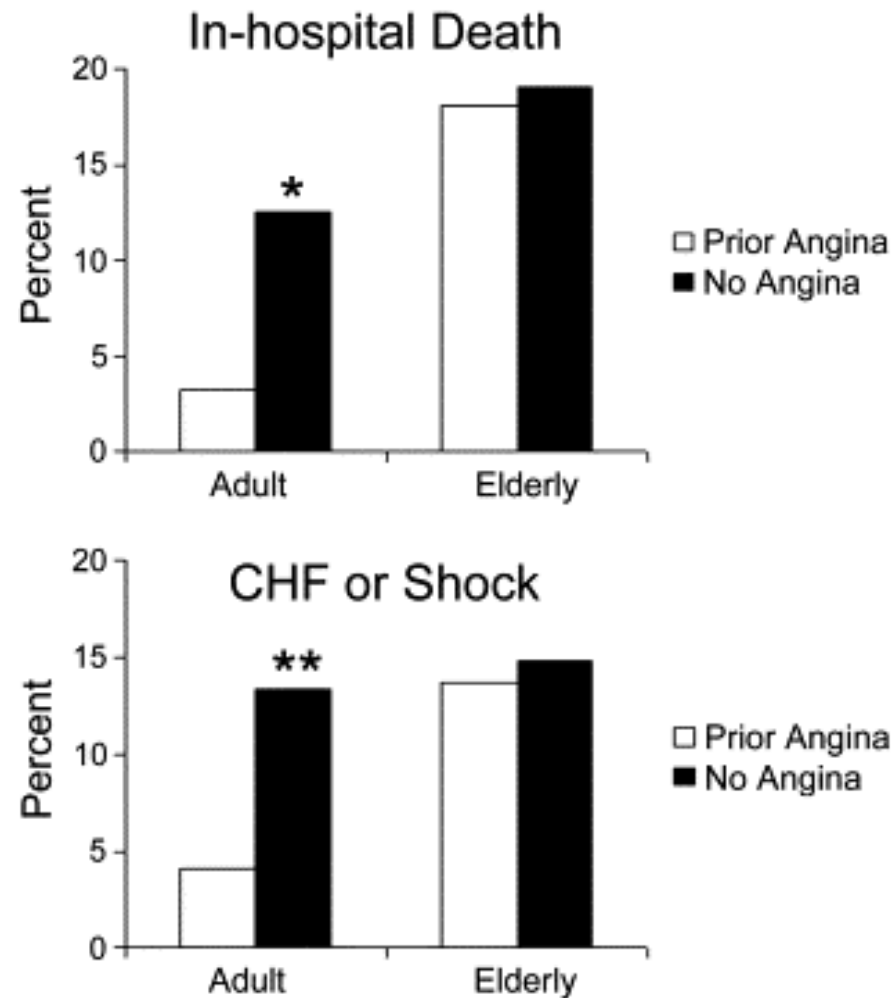


- Men: improved LV function, CO and SV with aerobic activity and beta stimulation
- Women: improved oxygen consumption, but no cardiac adaptation

Tonner, Kampen, & Scholz (2003). Pathophysiological changes in the elderly. *Best Practice & Research Clinical Anaesthesiology*, 17 (2), 163-177.

Aging

Angina Protection--Preconditioning



Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23.

Aging

Dysrhythmias

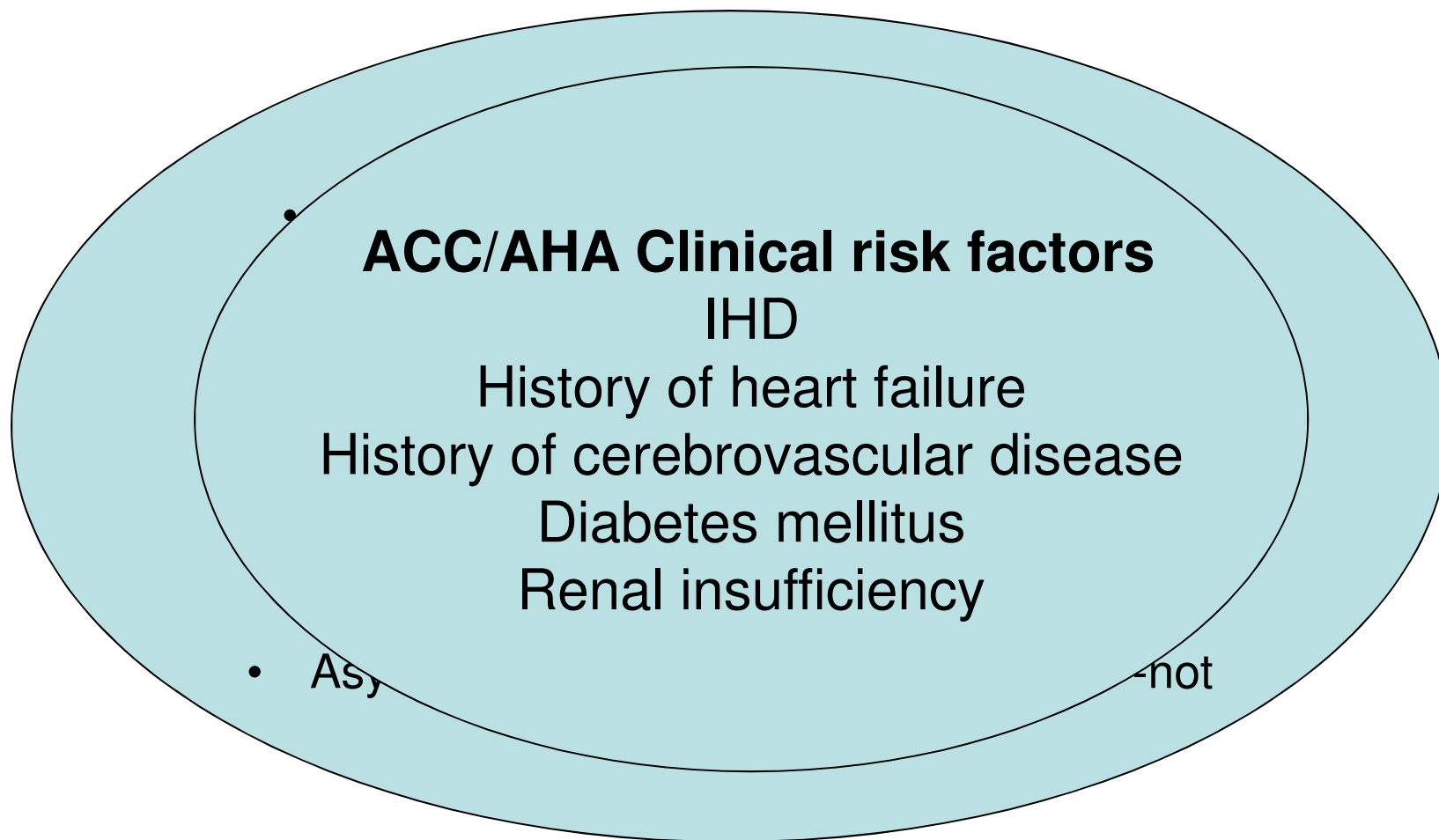
- Atrial fibrillation (most common)
 - Affects nearly 10% over 80 years
- SA node dysfunction
- AV slowed conduction
- Ventricular ectopy
- Heart block



Rooke. (2003). Cardiovascular aging and anesthetic implications. *Journal of Cardiothoracic and Vascular Anesthesia*, 17 (4), 512-23.

Aging

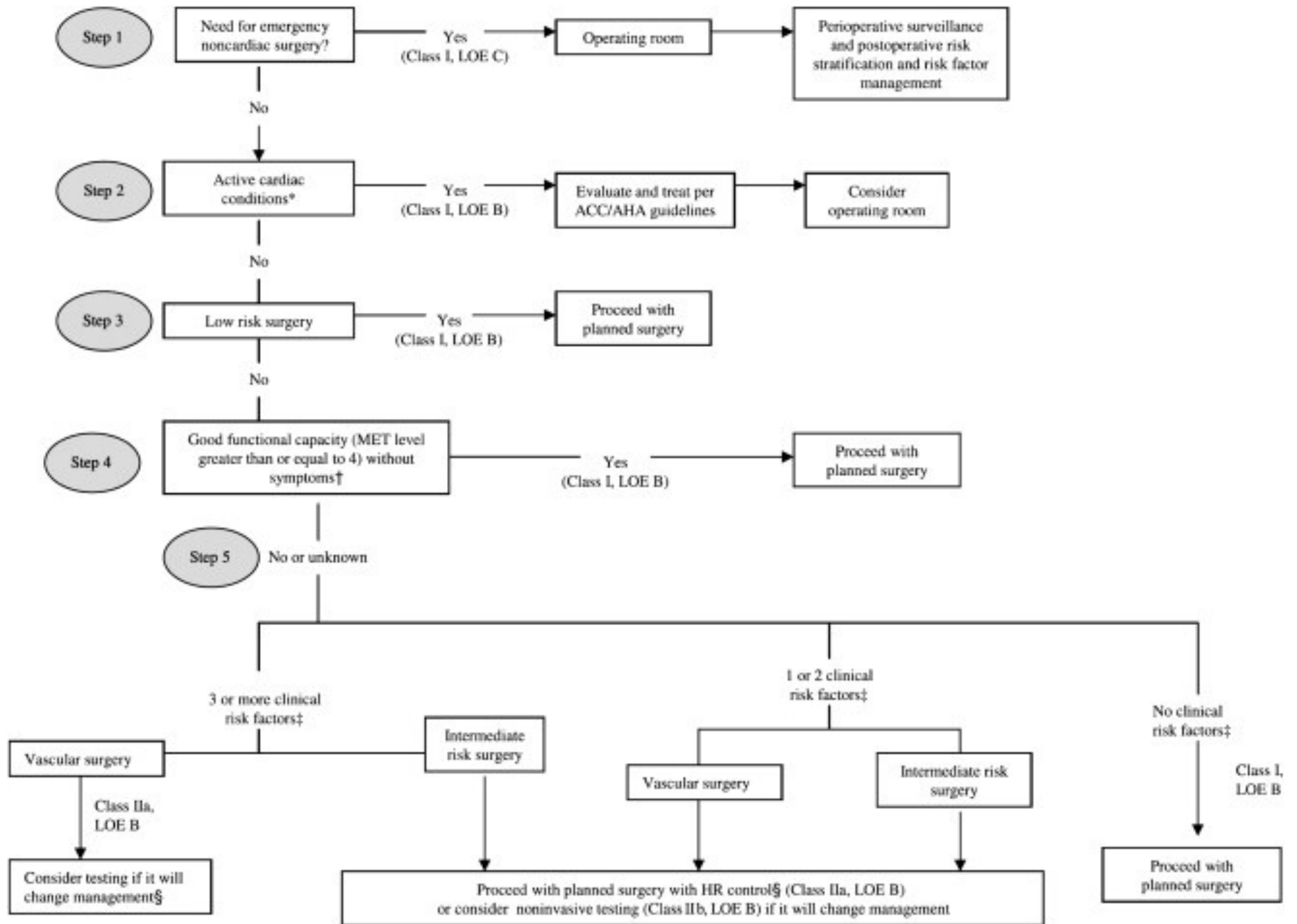
Dysrhythmias



Aging

Active CV Conditions Further Testing

- Unstable coronary syndromes (IB)
- Decompensated HF (IB)
- Significant dysrhythmias (IB)
 - 2nd or 3rd AVB
 - Ventricular dysrhythmias
 - Bradycardia
- Severe valvular disease (IB)



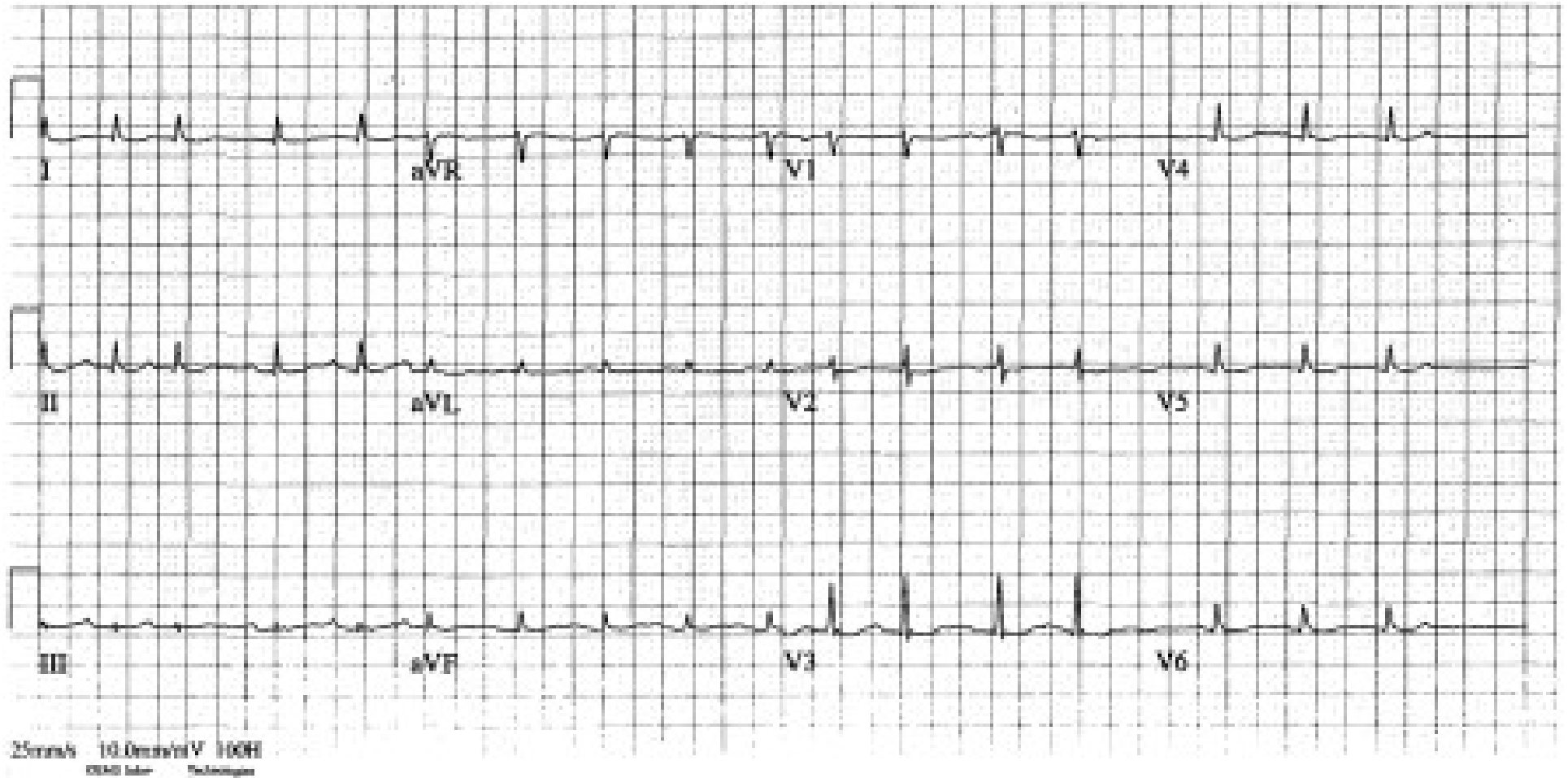
ACC/AHA Guidelines, 2007

Mr. W is admitted to hospital with a painful, ischemic leg and scheduled for a fem-pop bypass. His family is concerned that over the past 3 weeks, he has also become more confused. After neuropsychological testing it is deemed that his mental status is impaired by pain, and additional medications.

PMH: IHD, prior MI (5 years ago), CABG (5 years ago), poorly controlled T2DM, peripheral neuropathy, retinopathy, peripheral vascular disease, left-sided stroke (3 years ago), baseline AF, ADL's with no assistance

Medications: ASA, atorvastatin, clopidogrel, duoxetine, furosemide, metoprolol, potassium, warfarin, sliding scale insulin, gabapentin, hydrocodone, acetaminophen, tramadol and oxycodone

Preoperative 12-Lead



Revised Cardiac Risk Index

6 independent predictors of major cardiac complications

- High-risk surgery
- Preoperative treatment with insulin
- Preoperative Cr >2.0 mg/dL
- History of ischemic heart disease
- History of CHF
- History of cerebrovascular disease

0 factors= 0.4-0.5% risk

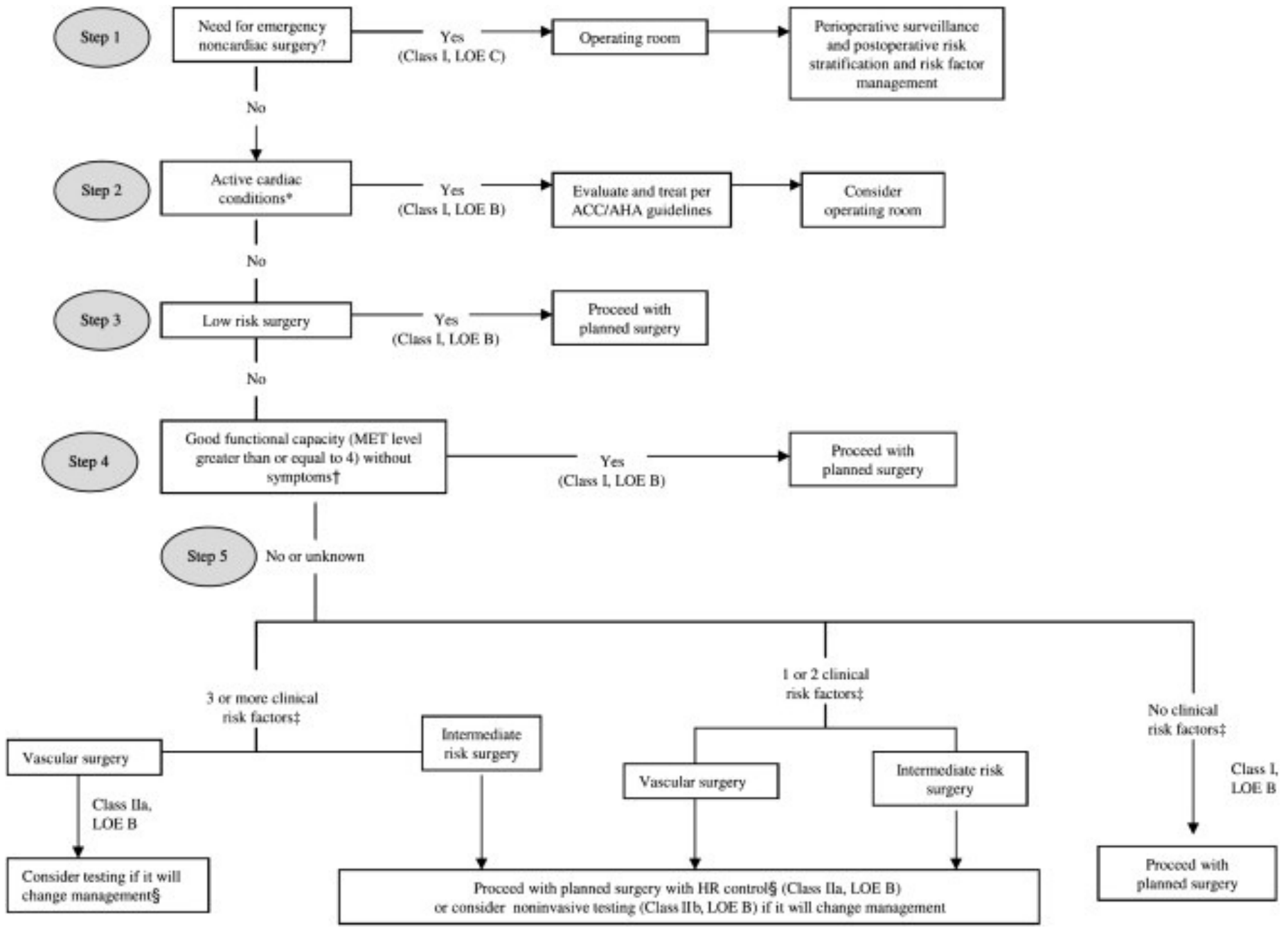
2 factors=4-7% risk

1 factor = 0.9-1.3% risk

3 or more factors=9-11% risk

Cardiac Risk Stratification for Non-cardiac Surgical Procedures

Risk Stratification	Procedure Examples
• Vascular (cardiac risk often > 5%)	Aortic and other major vascular surgery Peripheral vascular surgery
• Intermediate (cardiac risk 1% to 5%)	Intraperitoneal and intrathoracic surgery Carotid endarterectomy Head and neck surgery Orthopedic surgery Prostate surgery
• Low (reported cardiac risk generally less than 1%)	Endoscopic procedures Superficial procedure Cataract surgery Breast surgery Ambulatory surgery



ACC/AHA Guidelines, 2007

Aging

Pulmonary function changes

- ↓ Elastic recoil
- ↑ Static compliance
- ↑ Residual volume
- ↑ Anatomical and functional deadspace
 - ↓ Vital capacity
 - ↑ Small airway closure
- ↓ FEV₁ (Normal 70% at age 70)



Aging

Oxygenation changes

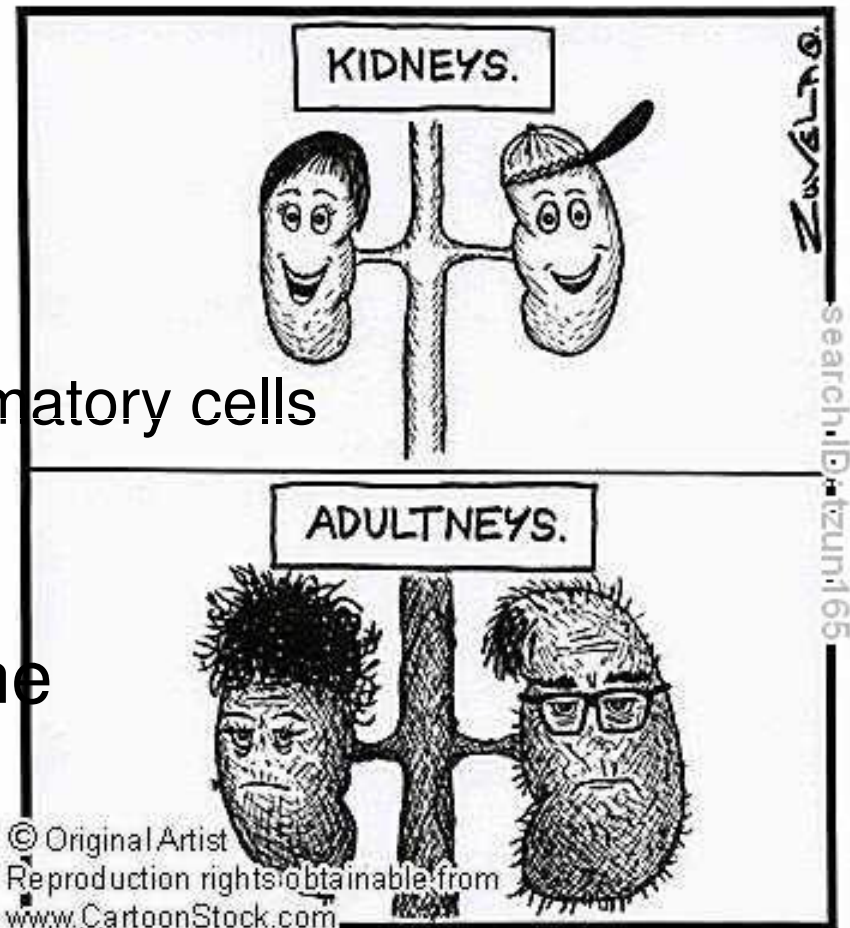
- PAO_2 (No change)
- $\downarrow PaO_2$
 - $(102 - 0.5 \times \text{age})$ or
 - $\downarrow .31 \text{ mmHg/yr}$ after 20
- $PaCO_2$ (No change)
- \downarrow CNS sensitivity to hypoxemia and hypercapnia



Aging

Renal function

- ↓ Renal mass
 - Glomerulosclerosis
 - Chronic infiltration by inflammatory cells
 - Fibrosis
- ↓ Creatinine
- ↓ Ability to concentrate urine
- ↓ Ability to conserve Na
- Comorbidities
 - HTN, T2DM, impaired glucose tolerance



Tonner, Kampen, & Scholtz. (2003). Pathophysiological changes in the elderly. *Best Practice & Research Clinical Anaesthesiology*, 17 (2), 163-177.

Aging

Co-medication

- >70% (over 70 years old) one drug
- CV drugs
 - Stopped for less than 48 hours (12%)
 - >48 hours 27% (p = .07)

Bruessel. (2003). Co-medications, pre-medication and common diseases in the elderly. *Best Practice & Research Clinical Anaesthesiology*, 17 (2), 179-192 (Review)

Kennedy, et al. (2000). Polypharmacy in a general surgical unit and consequences of drug withdrawal. *British Journal of Clinical Pharmacology*, 49, 353-362. (Retrospective, observational, IIbC)

Aging

Polypharmacy

The morning following admission he undergoes a lower extremity angiogram and receives fentanyl 50 mcg and midazolam 1.5 mg. Tolerates the procedure well, but becomes progressively more agitated later that evening.

Bleeding develops around the site and hematocrit drops from 34% to 24%, necessitating 2 units of PRBCs. There is further concern that he will have bleeding from the site and haloperidol is ordered and given. By morning he is extremely sedated and minimally responsive. VSS.

Labs are drawn at this point. Na 131, HCT 32%. All other electrolytes normal. He remains hospitalized for the next 10 days and is discharged to a rehab facility.

Surgery is scheduled in 4 weeks.

Aging

Polypharmacy

- Multiple comorbidities
- Drug-drug interactions
- Age related metabolism issues
- CNS increased sensitivity to sedation
- Complicated medication regimens
- Multiple providers

Barnett. (September 2009). Polypharmacy and perioperative medications in the elderly. *Anesthesiology Clinics*, 27 (3), 377-89. (Review)

Aging

Beer's Criteria

- **Inappropriate (always avoid)**
 - Flurazepam (Dalmane)
 - Pentozocine (Talwin)
 - Meperidine (Demerol)
- **Risky (avoid if possible)**
 - Long-acting benzodiazepines: diazepam (Valium)
 - Limit doses: intermediate acting benzodiazepines: lorazepam (Ativan)
- **Ineffective or a better alternative exists**
 - Diphenhydramine (Benadryl)
 - Chlorpheniramine (Chlor-trimetron)
 - Ketorolac (Toradol)
 - Clopidogrel (Plavix)

Barnett. (September 2009). Polypharmacy and perioperative medications in the elderly. *Anesthesiology Clinics*, 27 (3), 377-89. (Review)

Aging

Anticholinergic Risk Scale

- **1 point**
 - Haloperidol (Haldol)
 - Metoclopramine (Reglan)
 - Paroxetine (Paxil)
- **2 points**
 - Baclofen
 - Prochlorperazine (Compazine)
 - Cyclobenzaprine (Flexeril)
- **3 points**
 - Atropine-like medications
 - Chlorpheniramine (Chlor-trimeton)
 - Diphenhydramine (Benedryl)
 - Promethazine (Phenergan)
 - Fluphenazine (Prolixin)
 - Chlorpromazine (Thorazine)

Aging

Drug Issues

- **Meperidine** (delirium)
 - with MAOIs can induce serotonergic crisis
- **Diphenhydramine** (delirium)
- **MAOI's** (exaggerated responses to indirect-acting catecholamines, direct-acting exaggerated response to a lesser extent)
- **Levodopa** (orthostatic hypotension, hypovolemia)
 - Metoclopramide and phenothizines can worsen Parkinson symptoms
- **ACE inhibitors** (exaggerated hypotension)

Barnett. (September 2009). Polypharmacy and perioperative medications in the elderly. *Anesthesiology Clinics*, 27 (3), 377-89. (Review)

Pharmacokinetic Issues

- ↓Lean body mass
- ↓Water
- ↑Fat mass
- Plasma protein
 - ↓Albumin
 - ↑Alpha-1-glycoprotein



Aging

Anesthetic Drug Issues

- STP, Propofol ↓ dose 20%
- Etomidate (↓ VD)
- Midazolam (↑ potency)
- Opioids (↑ potency, ↓ clearance)
- Succinylcholine (prolonged duration)
- Non-depolarizers (variable action)
- Volatile agents (↑ potency)
- Local anesthetics (increased spread)

Sadean, & Glass. (2003). Pharmacokinetics in the elderly. *Best Practice & Research Clinical Anesthesiology*, 17 (2), 191-205 (Review)

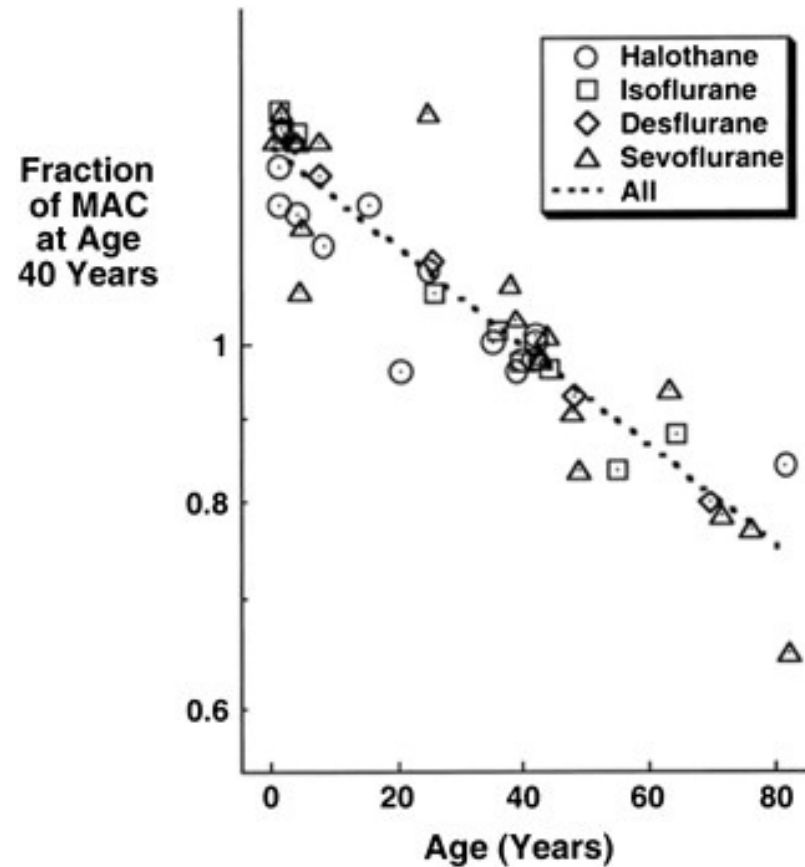
Aging

Pharmacological Assessment

- Pain meds
- OTC and herbal remedies
- Narrow therapeutic index
 - Oral hypoglycemics
 - Calcium channel blockers
 - TCA
 - Warfarin
 - Digoxin
 - Phenytoin
- Comorbidities

Aging *CNS*

- Loss of neuronal substance
- ↓brain weight
- ↓MAC
- ↓ epidural dose requirements



Tonner, Kampen, & Scholz (2003). Pathophysiological changes in the elderly. *Best Practice & Research Clinical Anaesthesiology*, 17 (2), 163-177.

CNS Dysfunction

Postoperative cognitive deterioration

- Dementia
- Delirium (10%)
- Mild neurocognitive disorder
 - Postoperative cognitive dysfunction (POCD)

Most common complication
in the geriatric population



Borgeat, & Ekatodramis (2003). Best Practice & Research Clinical Anaesthesiology, 17 (2), 235-44.

Bekker & Weeks. (2003). Cognitive function after anesthesia in the elderly, Best Practice & Research Clinical Anaesthesiology, 17 (2), 259 - 272.

CNS Dysfunction

Postoperative cognitive deterioration

- Dementia
- Delirium (10%)
- Mild neurocognitive disorder
 - Postoperative cognitive dysfunction (POCD)

Occurring most often between the
2nd and 7th POD

Increases risk

Advanced age (>75 years)

Physical status (> II);

Increased co-morbid conditions

Electrolyte disturbances (Na⁺⁺, albumin)

Previous history psychiatric illness

Nutritional deficiency

ETOH and benzodiazepine withdrawal

Incidence
Ortho > CV
surgery

CNS Dysfunction

Postoperative Delirium

- Impaired cognition
- Fluctuating levels of consciousness
- Memory and perception abnormalities
- Language difficulties
- Emotional lability (anxiety, fear, anger, depression)

CNS Dysfunction

Mechanisms of injury

Metabolic issues

- Electrolyte abnormalities
- Hypoglycemia/hyperglycemia
- Renal dysfunction
- Hypothyroidism
- Hypo-, hyperthermia
- Hepatic dysfunction

Neurological injury

- Hypoxia
- Low CPP
- Embolic/thrombotic stroke
- Cerebral edema
- Infection
- Seizures

CNS dysfunction

Perioperative issues



- Drug combinations
- Episodes of hypotension, hypoxemia, anemia, electrolyte imbalances, hypoglycemia, hypovolemia
- Type of anesthesia???

Bekker & Weeks. (2003). Cognitive function after anesthesia in the elderly, *Best Practice & Research Clinical Anaesthesiology*, 17 (2), 259 - 272.

CNS dysfunction

Perioperative issues



- Look for underlying cause
- Treat pain
- Pharmacological solutions: haloperidol
- ETOH w/d treat with benzodiazepines

Bekker & Weeks. (2003). Cognitive function after anesthesia in the elderly, *Best Practice & Research Clinical Anaesthesiology*, 17 (2), 259 - 272.

Relationship between pain and opioids analgesics on development of delirium following hip fracture

R. S. Morrison et al.

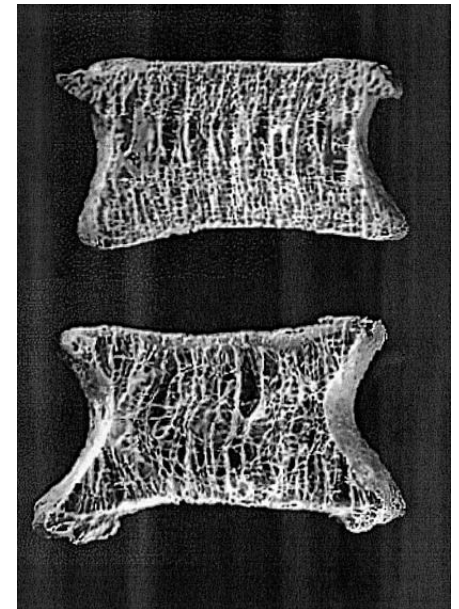
- Prospective study N = 541
- 65 years older with hip fractures
- 16% incidence of postoperative delirium
- Undertreated pain 9 times more likely to develop delirium

Gerontology Applied Biological Sciences, 2003

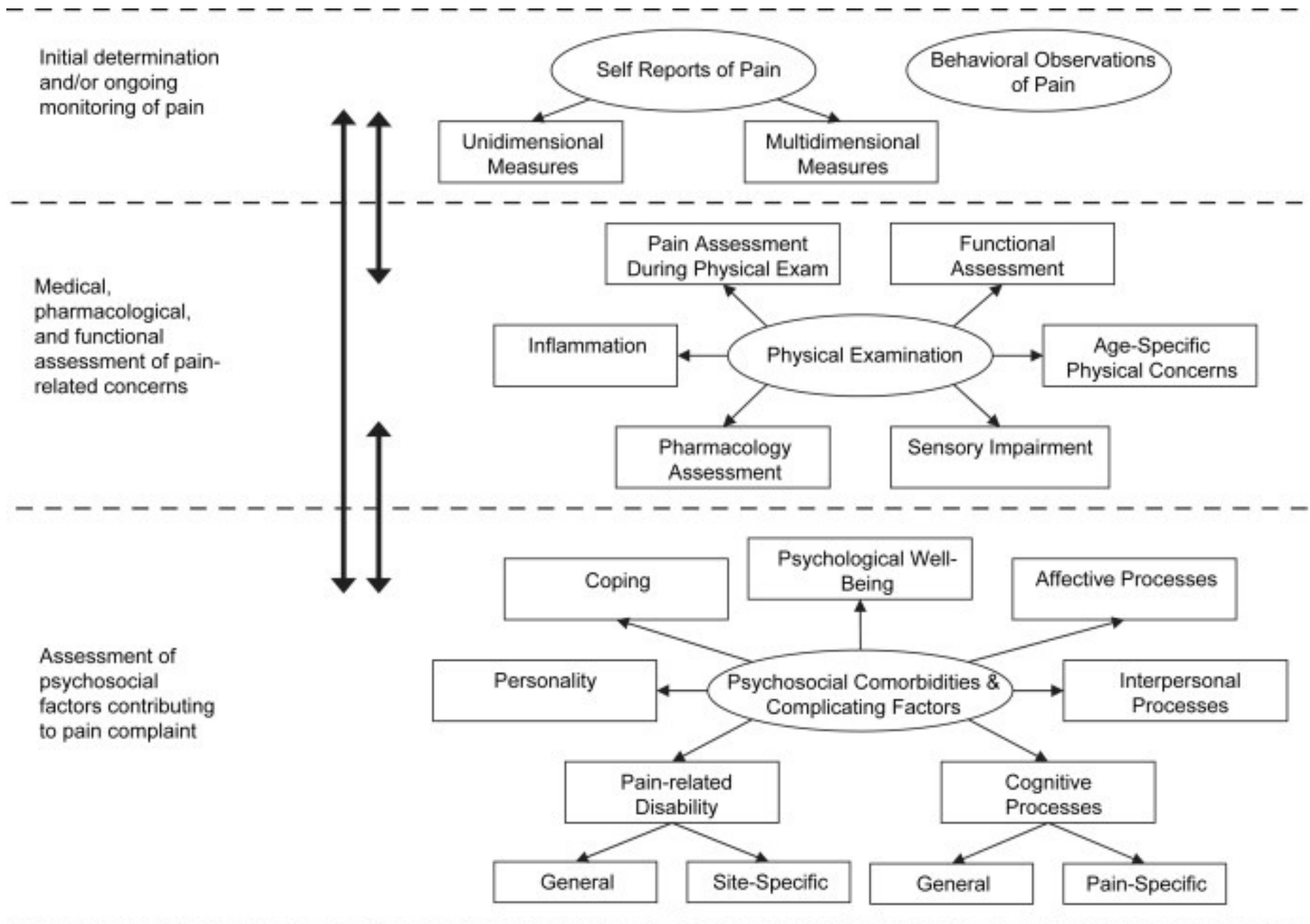
Aging

Neuropathic Pain

- Decreased CNS involvement
 - Brain atrophy
 - Increased peripheral sensitivity
- Degenerative changes of spine
 - Facet hypertrophy
 - Enlargement of ligamentum flavum
- Osteoporosis



Fine. (2009). Chronic pain management in older adults: Special considerations, *Journal of Pain and Symptom Management*, 38, 2S



Fine. (2009). Chronic pain management in older adults: Special considerations, *Journal of Pain and Symptom Management*, 38, 2S

CNS Dysfunction

Best Evidence for Treatment of Pain?

- Neuraxial techniques
 - Mixed improvement in morbidity/mortality
 - 2 large RCT's (Park, Thompson & Lee, Annals of Surgery, 2001; Rigg, Jamrozik, & Myles, Lancet, 2002)
 - Better analgesia/patient satisfaction
 - Meta-analysis (Block, Liu, Rowlingson, et al, JAMA, 2003)
- Parenteral opioids
 - Non-randomized, prospective studies (Aubrun, et al, Anesthesiology, 2002; Aubrun, et al., Anesthesiology, 2003)
- Multimodal approach
 - RCT (Du Manoir, et al, British Journal of Anaesthesia, 2003)

“Start low and go slow”

CNS Dysfunction

Mini-Mental Status Exam

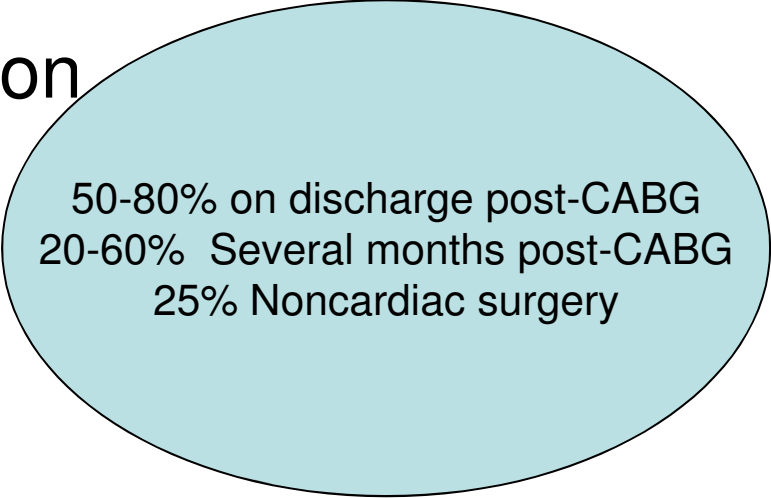
- What is your age?
- Please tell me the current time.
- Tell the patient an address and have them repeat it now and at the end of the test.
- What year is it?
- Where are you right now?
- What is the name of the hospital?
- Can you recognize (name) or (name)?
 - 2 people
- When were you born?
- Who is the current president?
- Count backwards down from 20.

A score of 6 or less suggests possible CNS dysfunction

CNS Dysfunction

POCD

- Impairment
 - Memory (decreased recall)
 - Concentration
 - Language comprehension
 - Social integration



50-80% on discharge post-CABG
20-60% Several months post-CABG
25% Noncardiac surgery

CNS Dysfunction

Factors associated with POCD

- Preoperative medication
- Hypothermia
- Hypotension
- Hypoxia
- Catecholamines
- Anticholinergics
- Glycemic control
- Carotid endarterectomy
- Cardiopulmonary bypass

Orthopedic Surgery

General vs Regional



- Mobility
- Pain
- Dementia

No evidence exists supporting one type of anesthesia to reduce morbidity and mortality, although continuous regional anesthesia appears promising (IIbC)

Ophthalmologic Surgery

Perioperative Issues

- Minimally invasive
- Presence of co-morbid disease
- Resting 12-lead not predictive of cardiac risk

AHAACC guidelines recommend resting 12-lead on only those with recent episodes of chest pain and asymptomatic diabetes patients, or worsening disease. Routine CXR not indicated in absence of pre-existing lung disease.

Aging

Anesthetic recommendations

- Thorough preanesthetic evaluation
 - Comorbidities, CNS function, CV functional status, polypharmacy
- Prepare for hypotension
 - Fluids, pressors
- Titrate anesthesia carefully
- Consider avoiding drugs that may contribute to POCD and delirium

“Start low and go slow”



Don't you wish everyone aged like a superhero?

Orthopedic Surgery

Distinctive Features

- Osteoarthritis
- Rheumatoid arthritis
- Hip fractures
 - 1 in 50 > 60 yrs old
- Fat/air embolism

Ophthalmologic Surgery

Perioperative Issues

- Remifentanyl (0.3 mcg/kg)
- Propofol (0.5 mg/kg)
- Fentanyl
- Midazolam