Geriatric Trauma
Core Concepts for Trauma Centers

AAST Geriatric Trauma Committee

Disclaimer

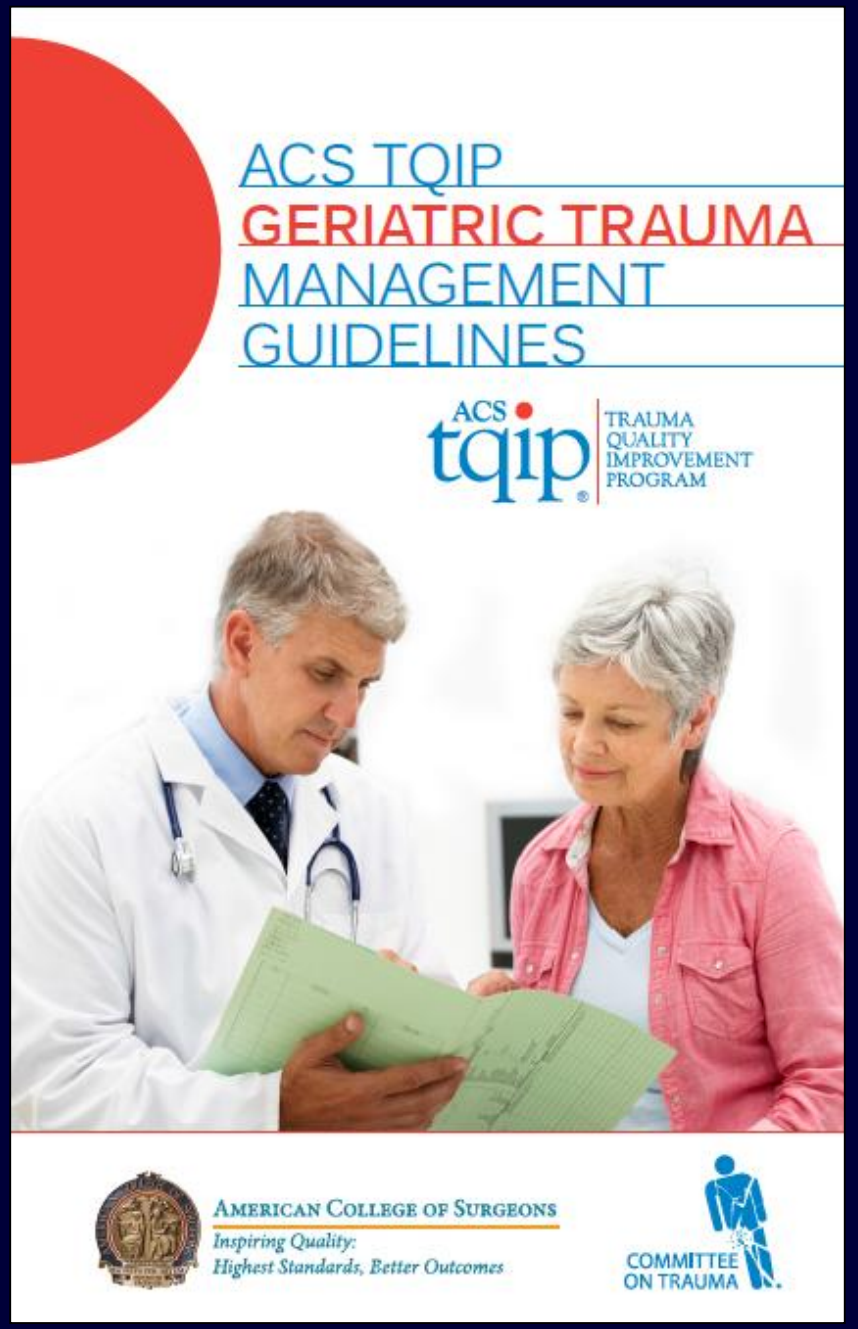
Slides contained herein represent general concepts of trauma care as defined by the members of the Education Subcommittee of the Geriatric Trauma Committee of the American Association for the Surgery of Trauma (AAST) and do not represent directives of the AAST itself. This educational program is not intended to dictate or establish the standard of care nor does it outline practice guidelines except where specified. This program is intended for educational use.

Objectives

1. Scope of the Problem
2. Outcomes of Elderly Trauma Patients
3. Frailty
4. Strategies to Improve Outcomes of Elderly Trauma Patients/Practice Guidelines

Definition of Geriatric

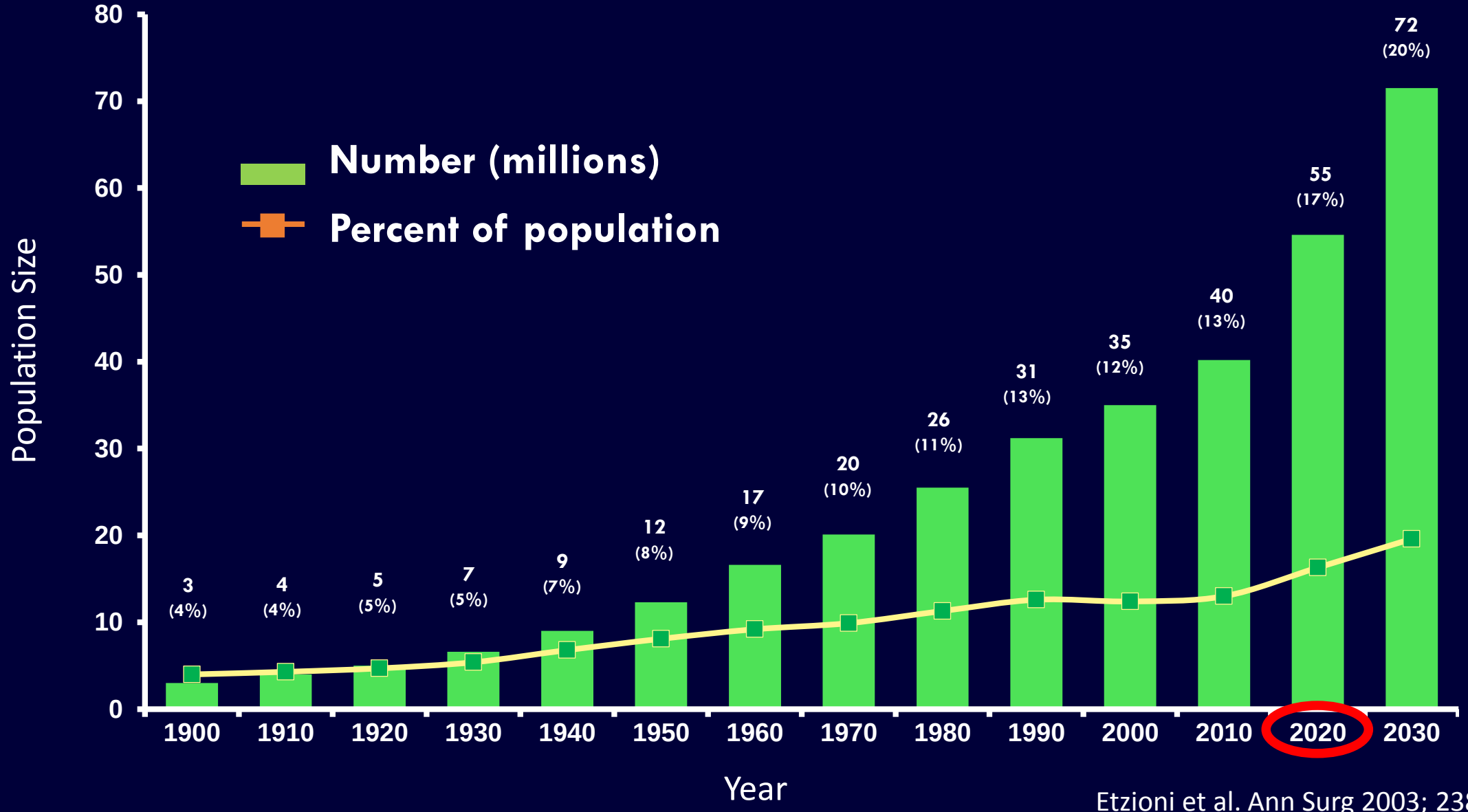
- Age 65 and over*
- Even ground level falls
- Hip fractures-some centers include



*Definition used in most studies

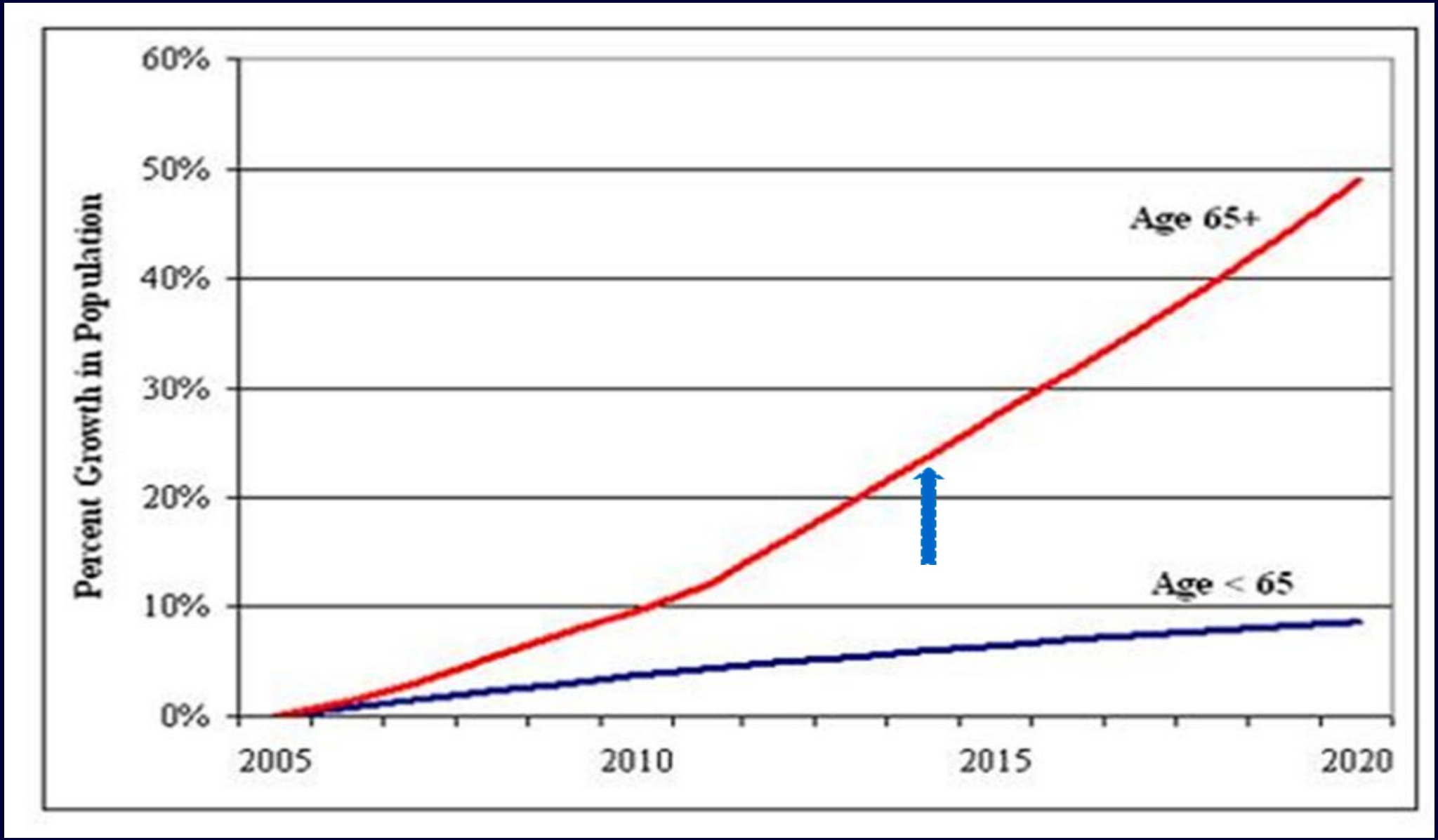
Demographics and Outcomes

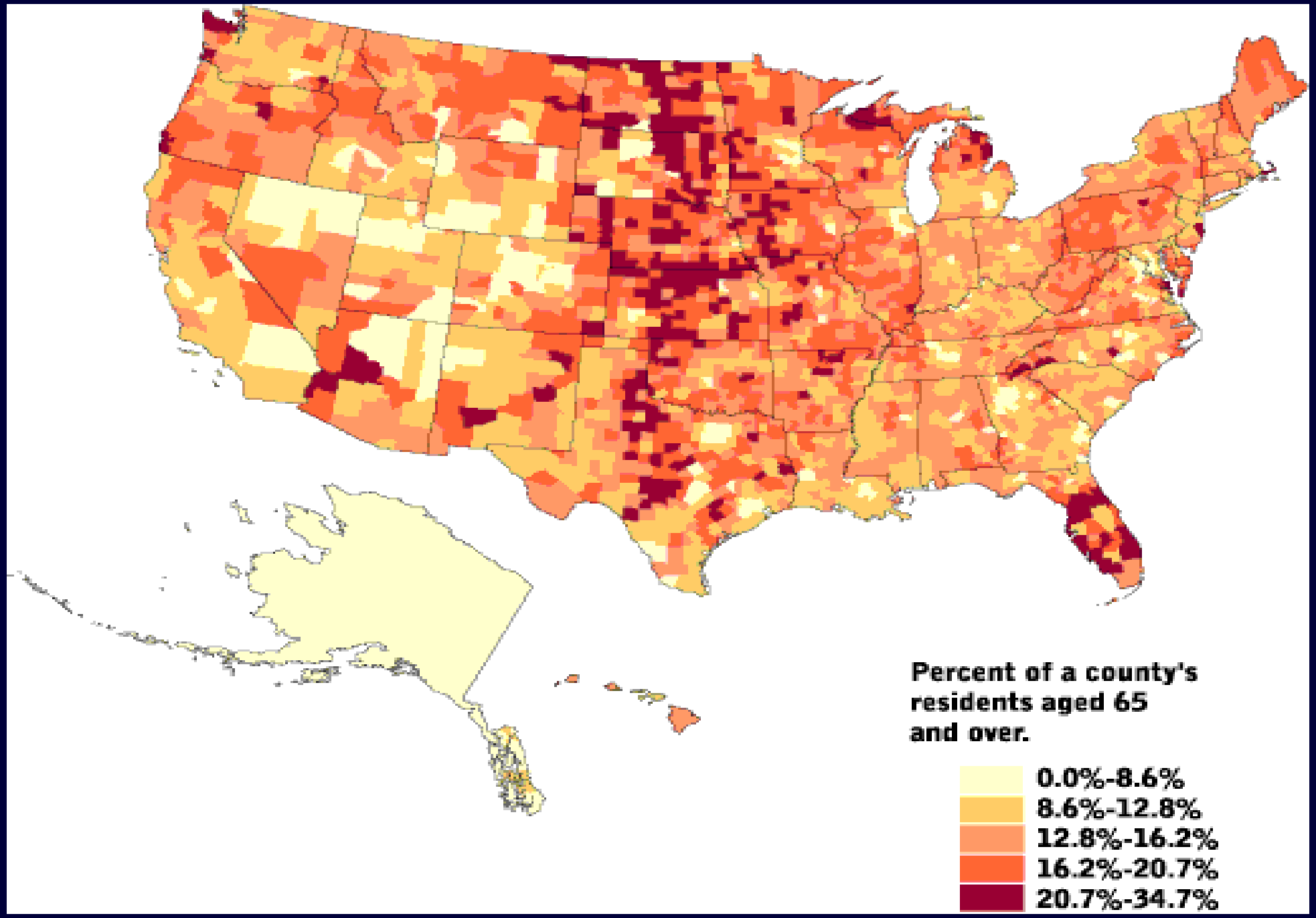
Increase in Number of Persons Aged 65+ in the US

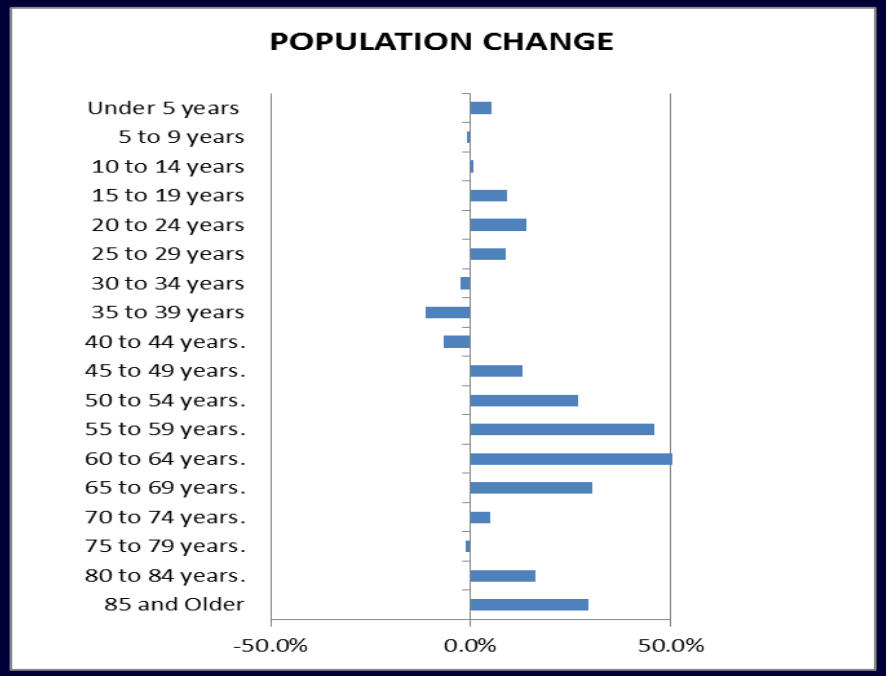


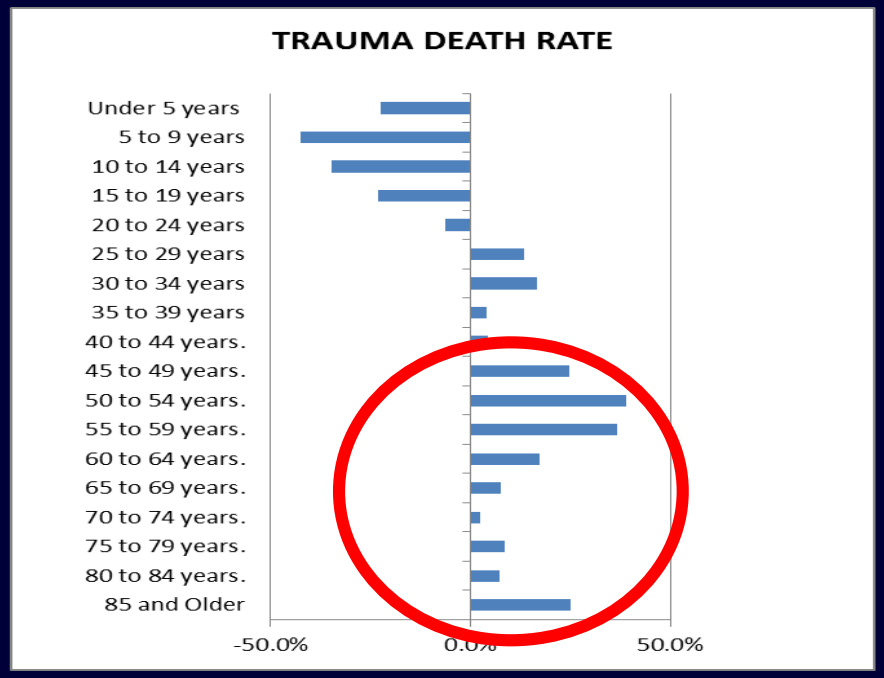
Etzioni et al. Ann Surg 2003; 238:170-177

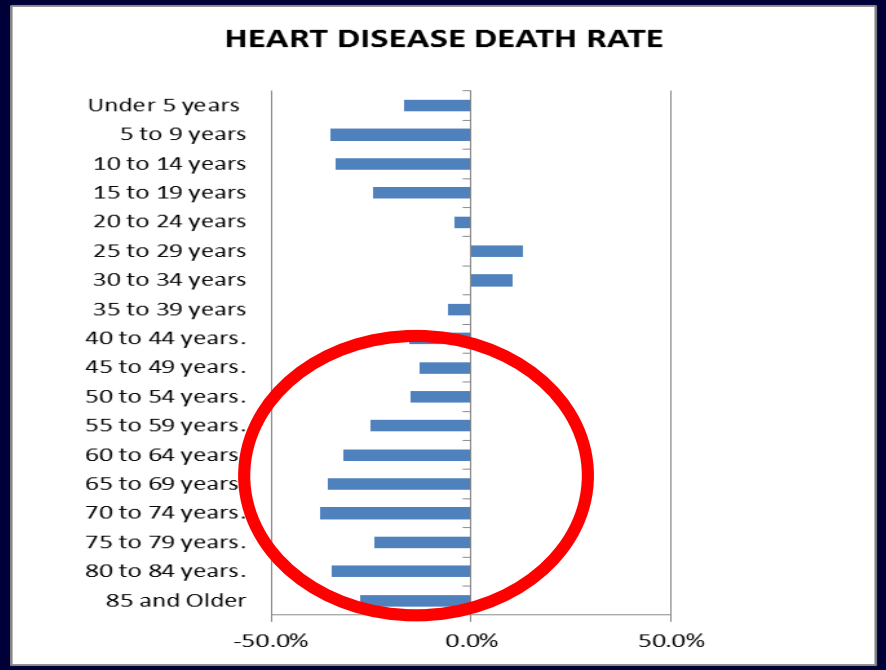
The Aging Tsunami




Percent of a county's residents aged 65 and over.
0.0%-8.6%
8.6%-12.8%
12.8%-16.2%
16.2%-20.7%
20.7%-34.7%


POPULATION CHANGE
Under 5 years
5 to 9 years
10 to 14 years
15 to 19 years
20 to 24 years
25 to 29 years
30 to 34 years
35 to 39 years
40 to 44 years.
45 to 49 years.
50 to 54 years.
55 to 59 years.
60 to 64 years.
65 to 69 years.
70 to 74 years.
75 to 79 years.
80 to 84 years.
85 and Older
-50.0%
0.0%
50.0%


TRAUMA DEATH RATE
Under 5 years
5 to 9 years
10 to 14 years
15 to 19 years
20 to 24 years
25 to 29 years
30 to 34 years
35 to 39 years
40 to 44 years.
45 to 49 years.
50 to 54 years.
55 to 59 years.
60 to 64 years.
65 to 69 years.
70 to 74 years.
75 to 79 years.
80 to 84 years.
85 and Older
-50.0%
0.0%
50.0%


HEART DISEASE DEATH RATE
Under 5 years
5 to 9 years
10 to 14 years
15 to 19 years
20 to 24 years
25 to 29 years
30 to 34 years
35 to 39 years
40 to 44 years.
45 to 49 years.
50 to 54 years.
55 to 59 years.
60 to 64 years.
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70 to 74 years.
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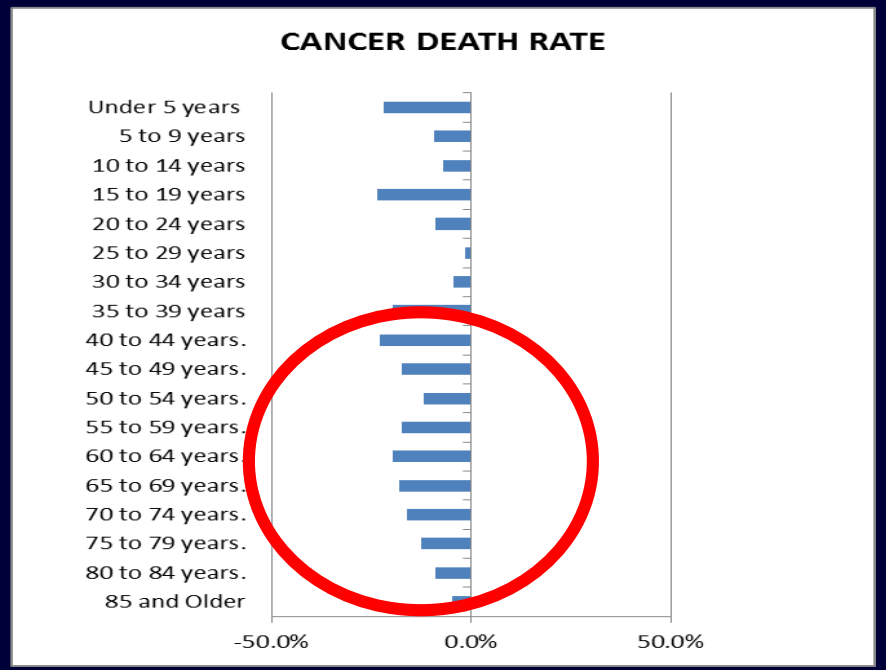
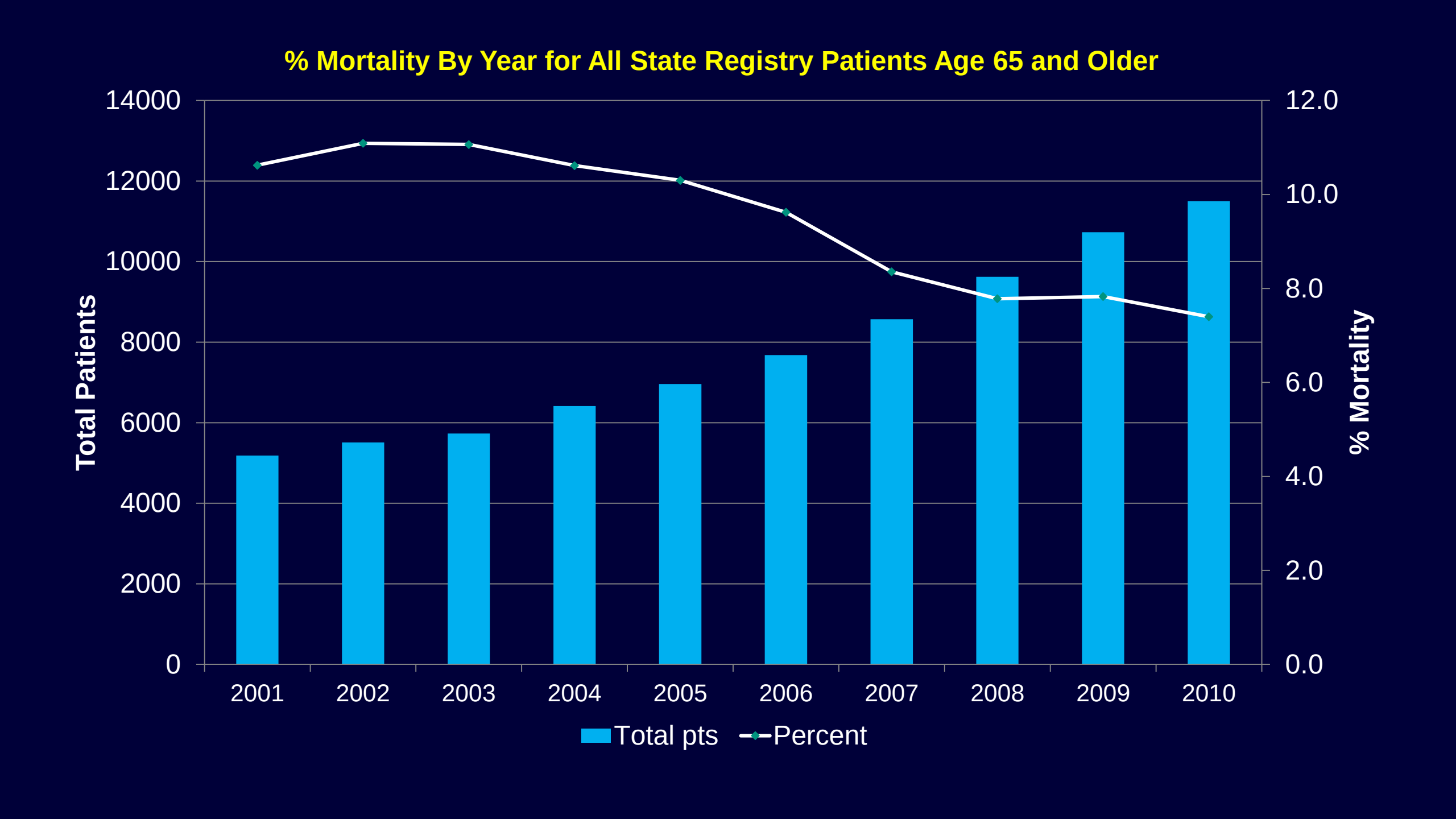
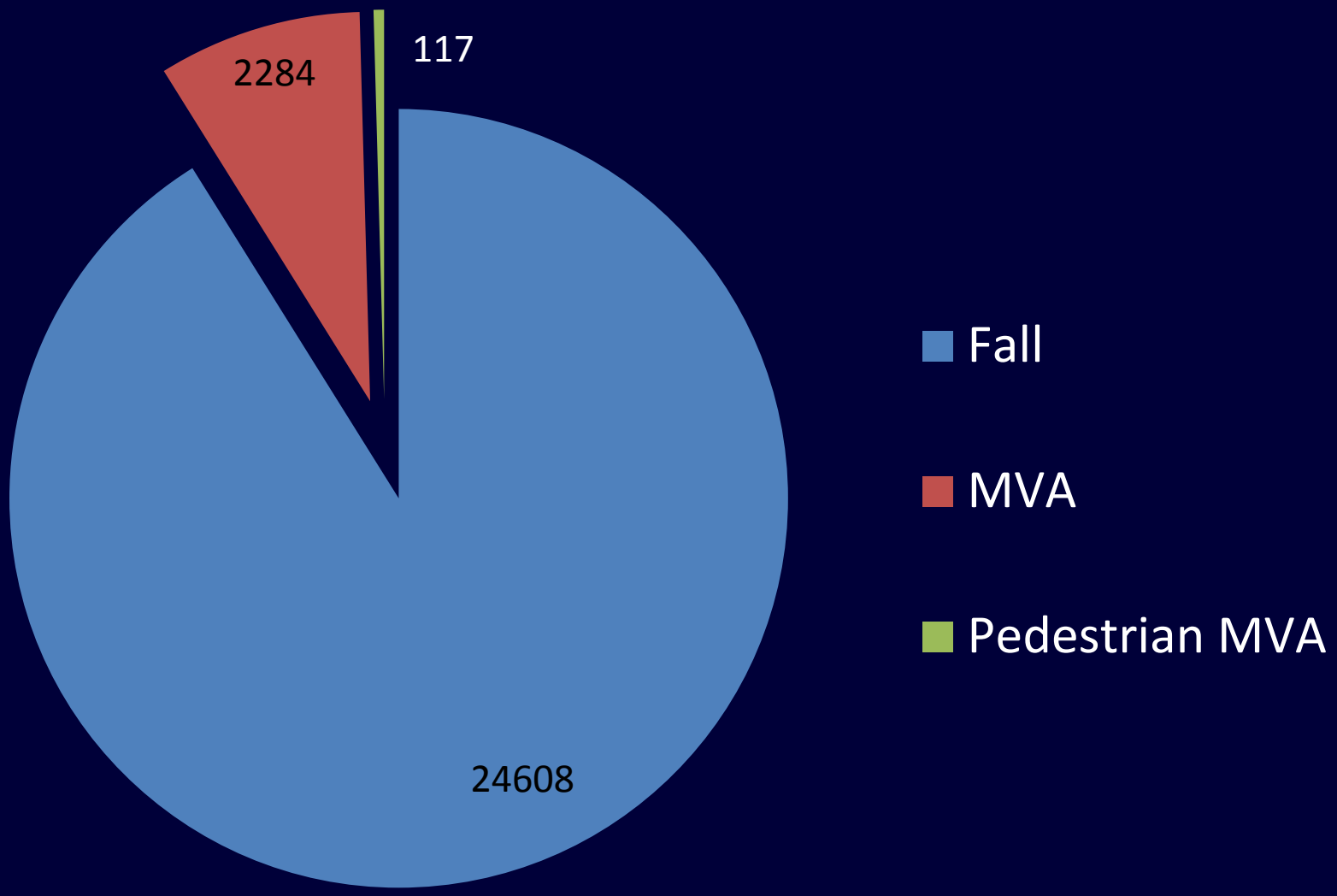
80 to 84 years.
85 and Older
-50.0%
0.0%
50.0%

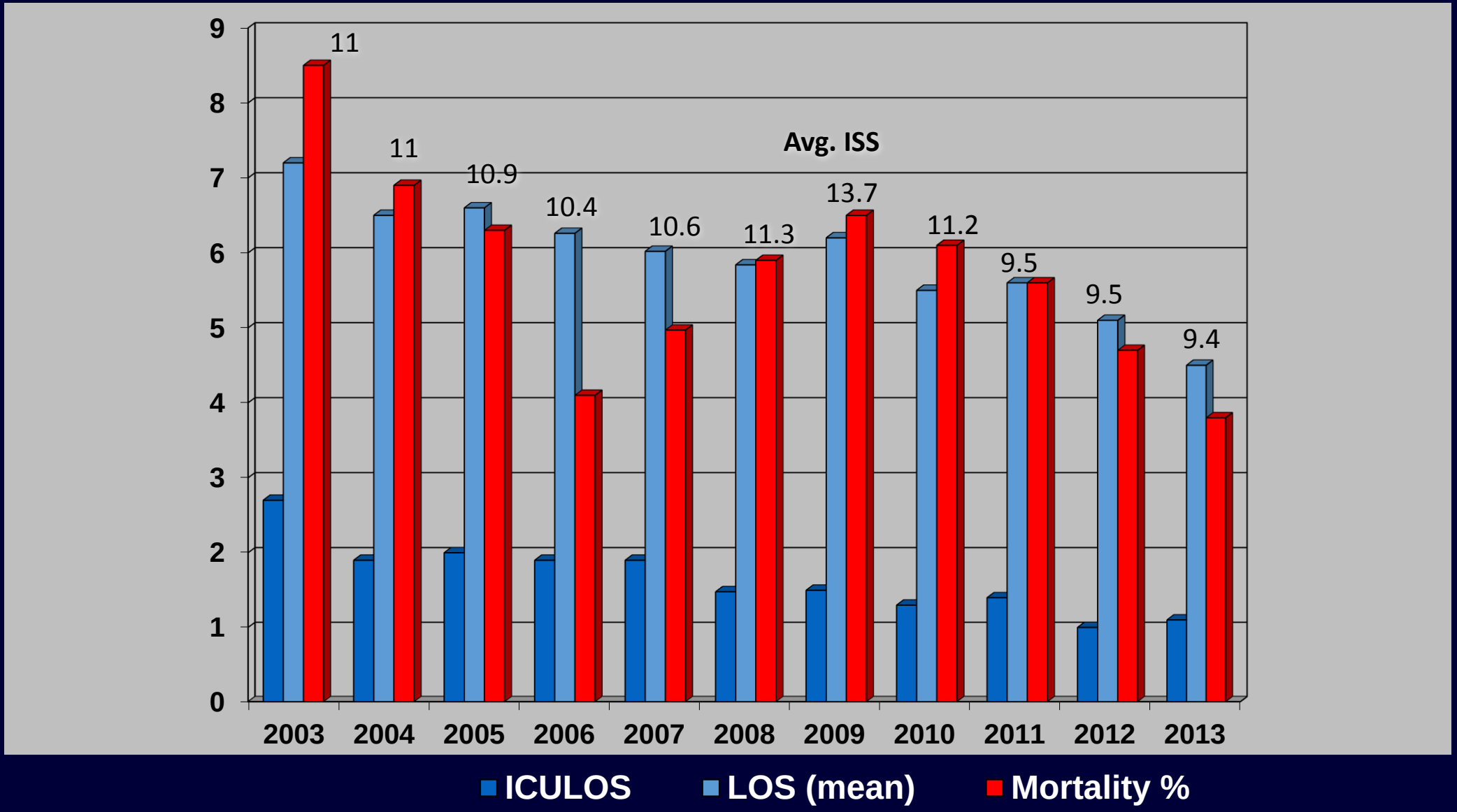

CANCER DEATH RATE
Under 5 years
5 to 9 years
10 to 14 years
15 to 19 years
20 to 24 years
25 to 29 years
30 to 34 years
35 to 39 years
40 to 44 years.
45 to 49 years.
50 to 54 years.
55 to 59 years.
60 to 64 years.
65 to 69 years.
70 to 74 years.
75 to 79 years.
80 to 84 years.
85 and Older
-50.0%
0.0%
50.0%

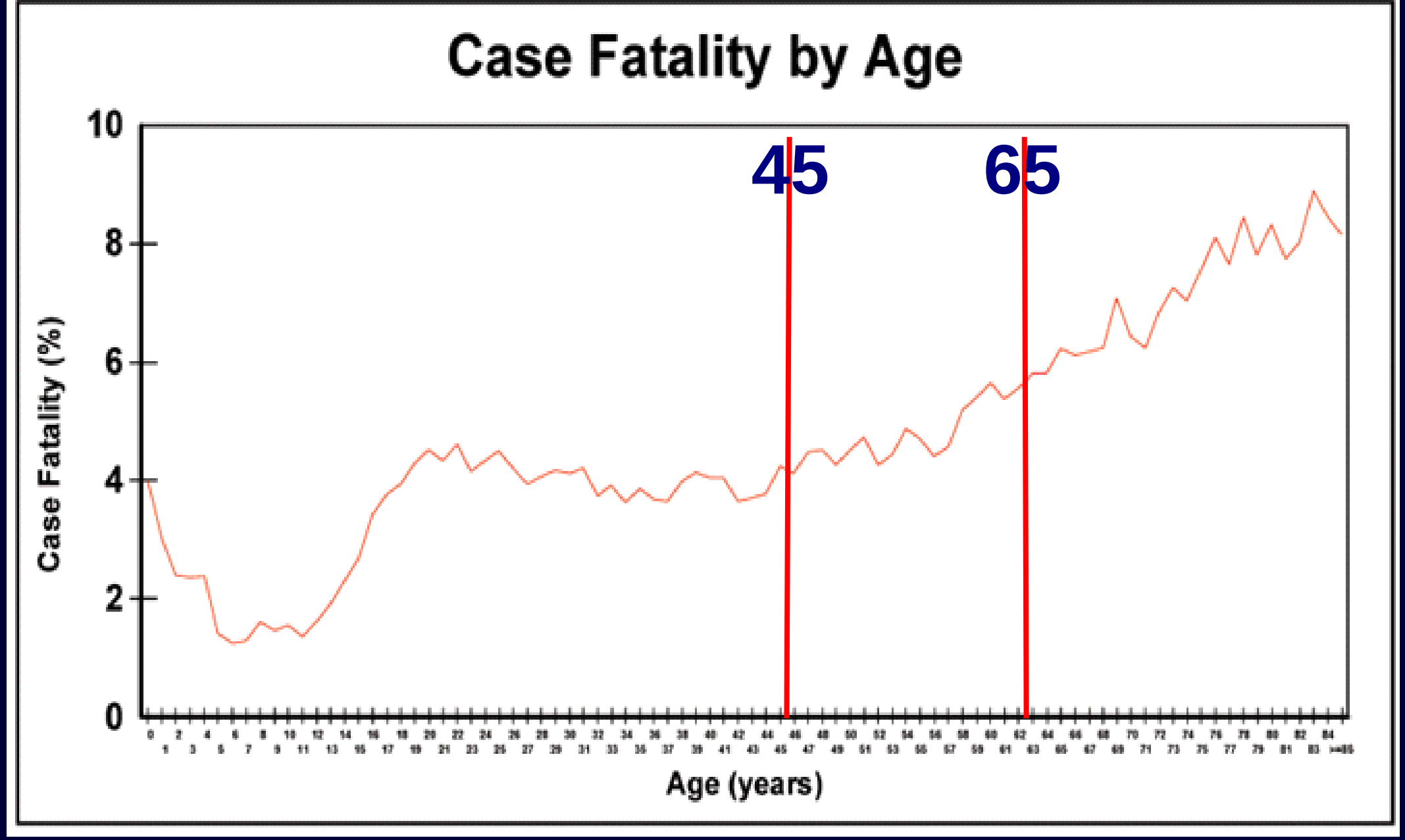

% Mortality By Year for All State Registry Patients Age 65 and Older
Total Patients
% Mortality
14000
12000
10000
8000
6000
4000
2000
0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Total pts
Percent

Cause of Injury Age 65 and over 1/11-8/11 in Pennsylvania

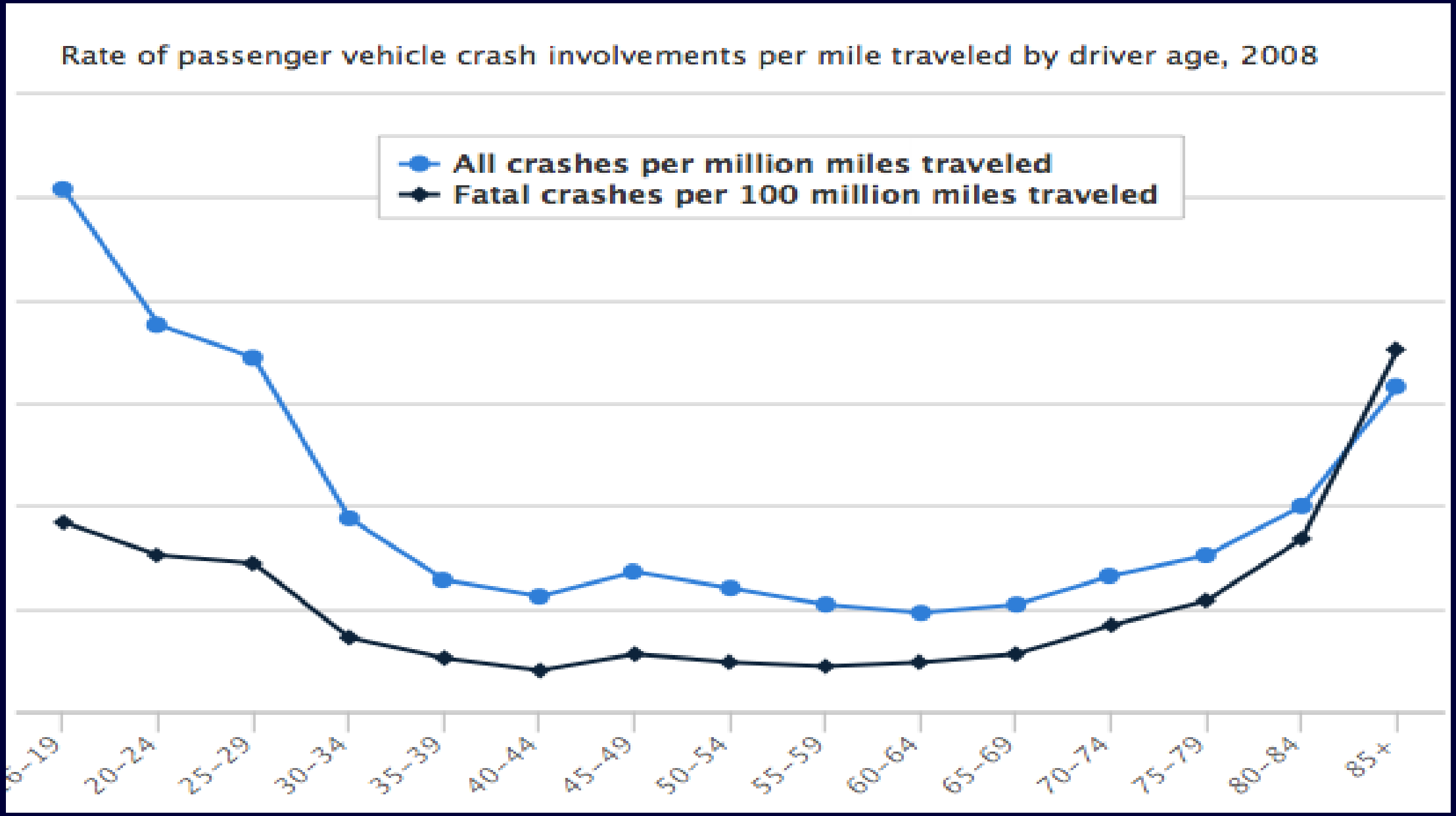


Geriatric Trauma Outcomes





Case fatality (number of deaths divided by the number of patients X 100) grouped by age. Total N= 41,821. JACS 2005.


Rate of passenger vehicle crash involvements per mile traveled by driver age, 2008
All crashes per million miles traveled
Fatal crashes per 100 million miles traveled
20–24
25–29
30–34
35–39
40–44
45–49
50–54
55–59
60–64
65–69
70–74
75–79
80–84
85+

Mechanisms of Injury

Mechanism of Injury

- Falls
  - Most common method of injury in the elderly
  - Most responsible for cause of death
  - By 2020, 54.9 billion dollars spent on the treatment of geriatric falls

http://www.cdc.gov/homeandrecreationalsafety/falls/fallcost.html

Disease processes that increase your risk of falling…

- Osteoporosis
- Arthritis
- Dementia or Confusion
- Parkinson's Disease
- Vision Problems
- Hearing Problems
- Diabetes
- Depression
- Heart Disease
- Blood Pressure Problems
- Bowel & Bladder Incontinence
- Foot Disorders

Mechanism of Injury-MVC

- MVC are #1 cause of trauma related death ages 65-74
- In accidents involving elderly patients
  - 80% were found to be at fault
  - 18% syncopal episode was the inciting event

Am.Surgeon 1995: 61(5) p. 935

Mechanism of Injury-Pedestrian

- 1 in 5 pedestrians killed and 1 in 10 pedestrians injured is an elder
- Causes
  - Confusion
  - Vision or hearing deficiency
  - Poor gait
  - Timing of traffic lights/crossing
  - Lack of audible traffic signal

http://www.iihs.org/research/qanda/pedestrians.aspx

Mechanism of Injury-Elder Abuse

- Key way of recognizing and preventing elder abuse: **awareness**

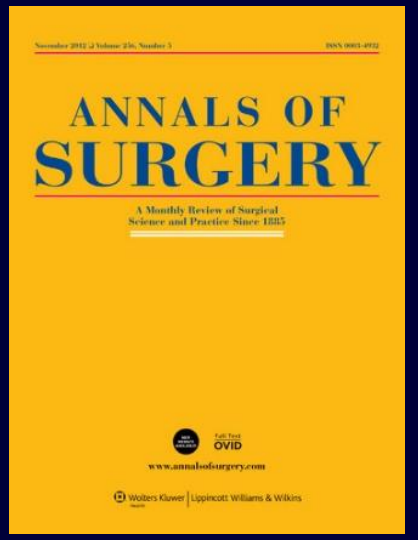
- Knowing the signs and symptoms of abuse, individuals can ensure that the older people do not fall victim to mistreatment
  - Family, friends and caregivers

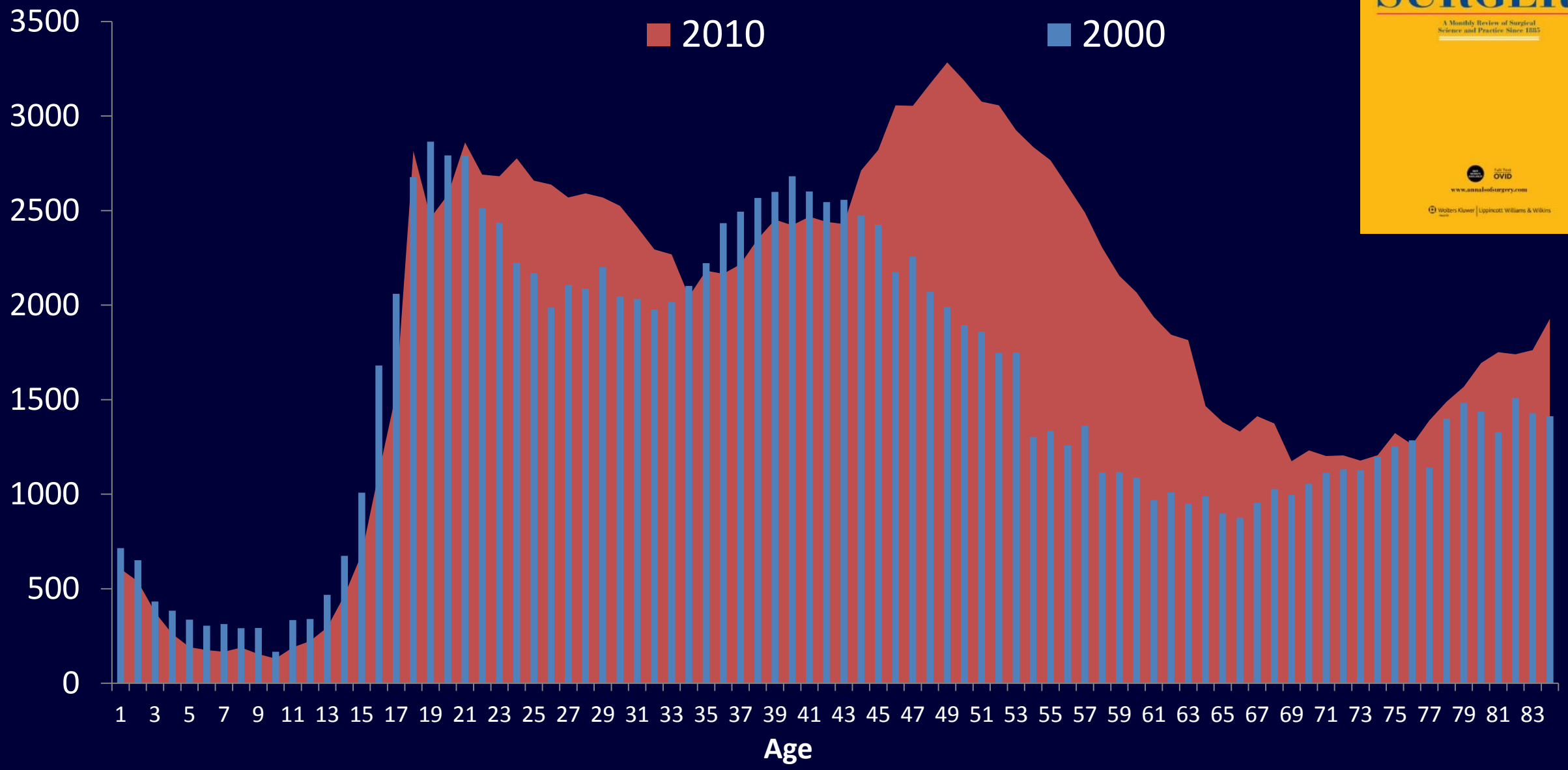
Elder Abuse More Common than You Think

- Pennsylvania, 2004-2005 fiscal year: 13,006 suspected situations of elder abuse
- Of these, 21% were so severe that they required state protective services.

Increasing Trauma Deaths in the United States

Peter Rhee, MD, MPH, Bellal Joseph, MD, Viraj Pandit, MD, Hassan Aziz, MD, Gary Vercruysse, MD, Narong Kulvatunyou, MD, and Randall S. Friese, MD





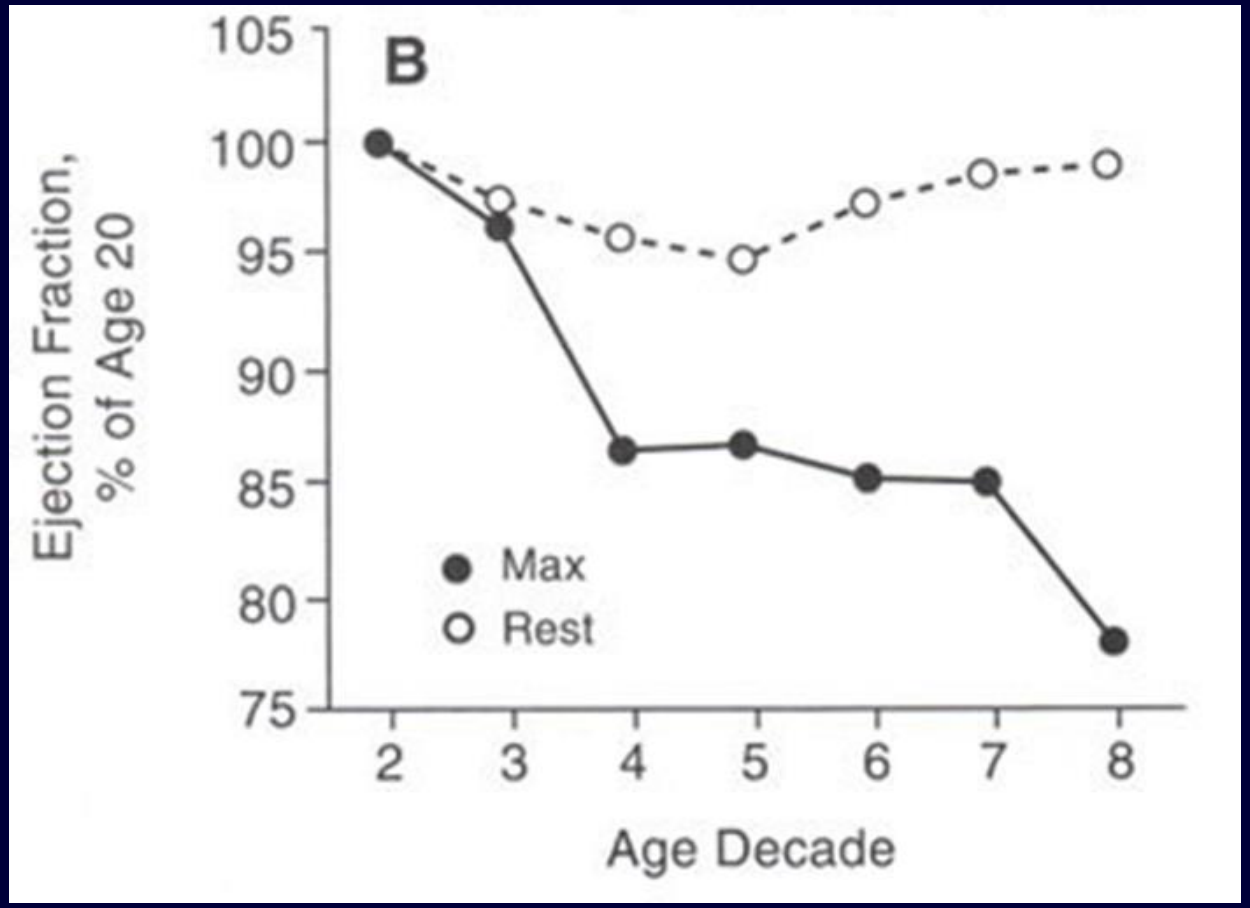
Physiologic Changes of Aging

Cardiovascular Changes with Aging

- Loss of connective tissue elasticity, change in compliance
  - Increased SBP (and widened PP)
  - Increased afterload
  - Decreased diastolic filling, depends on atrial kick
    - Tachycardia and atrial fibrillation poorly tolerated
  - Stiff veins less able to “buffer” changes in volume
    - Volume shifts have exaggerated changes in cardiac filling pressure
  - Peripheral vasoconstriction remains intact

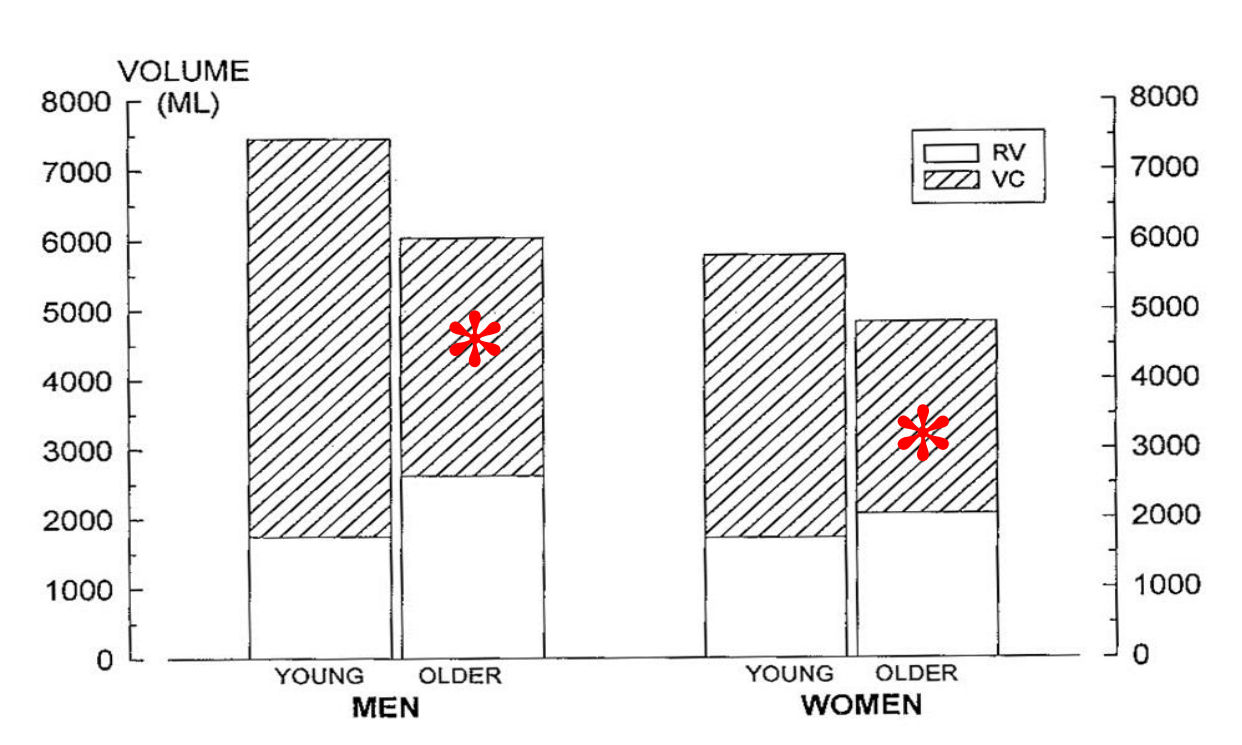
Cardiovascular Changes with Aging

- Loss of SA node cells, slowed conduction
  - Conduction and rhythm abnormalities
- Myocyte death without replacement
  - Decreased relaxation in diastole
- Decreased responsiveness to β receptor stimulation
  - Maximum heart rate decreased: 220-age



Pulmonary Changes with Aging

- Increased chest wall stiffness
- Decreased lung compliance and elasticity
- Decreased strength and endurance of respiratory muscles



Pulmonary Changes with Aging

- Decreased alveolar surface area
- Impaired gas exchange
- Increased non-functional or closed airways (dead space)
  - Increased V-Q mismatch

TABLE 62-3 -- Normal values for arterial P_{O_2}

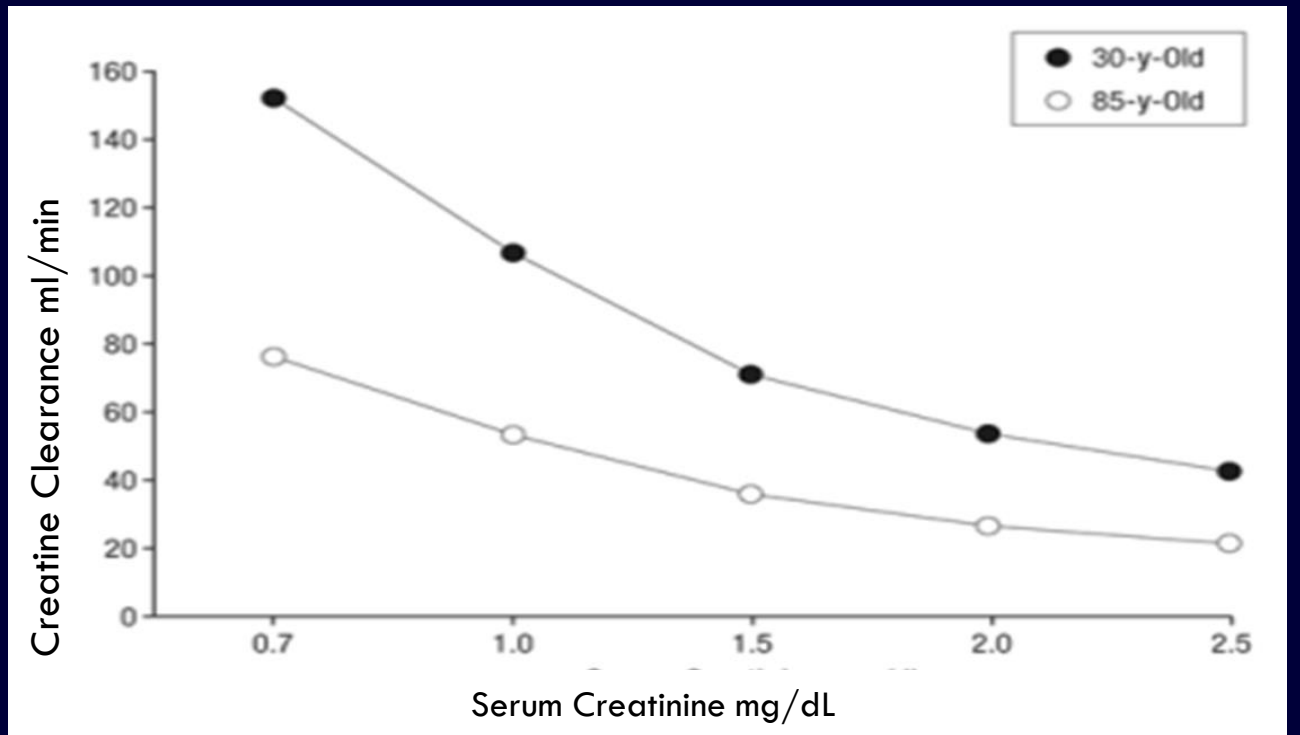
Age (yr)	Mean and Range (mm Hg)
20–29	94 (84–104)
30–39	91 (81–101)
40–49	88 (78–98)
50–59	84 (74–94)
60–69	81 (71–91)

From Nunn J: Nunn's Applied Respiratory Physiology, 4th ed. Oxford, Butterworth-Heinemann, 1995, p 269.

Renal Changes with Age

↓ GFR

- Decreased functioning neurons by 1%/yr >40 years
- Decreased concentrating ability (↓ renin, ↓ aldosterone, ↑ANP)
- Decreased free water clearance (↑ADH)
- Decreased thirst drive



Renal Changes with Age

- Often asymptomatic

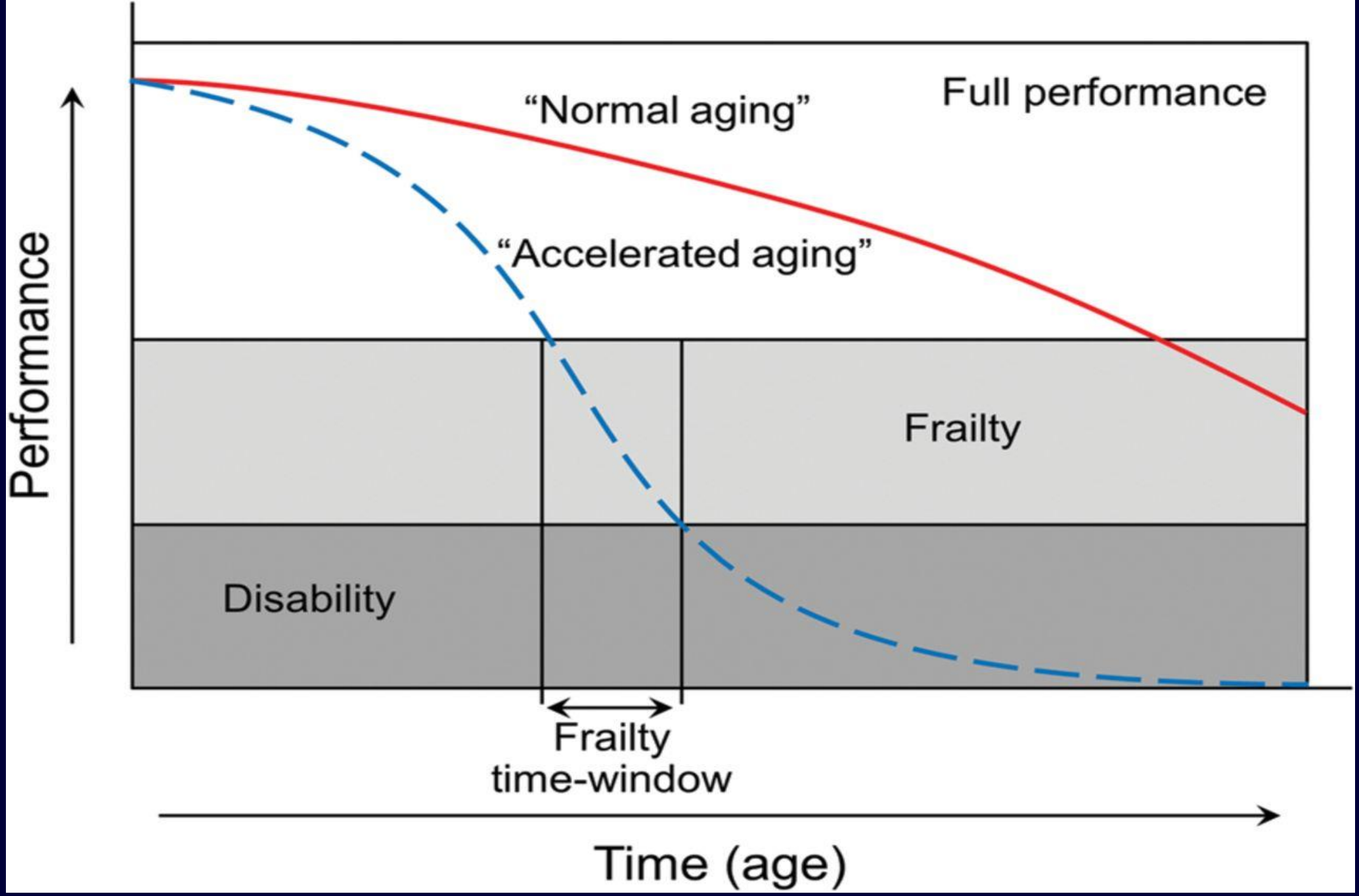
- Loss of solute excretion (K and H) and resorption (Na)
- Exacerbated by diuretic use
- Higher risk of volume & electrolyte abnormalities
- More susceptible to drug toxicity
  - Higher incidence of ATN and acute renal failure

- Preop renal insufficiency is a strong predictor of peri-operative cardiac and pulmonary morbidity, as well as renal failure.

Cognitive and Behavioral Disorders

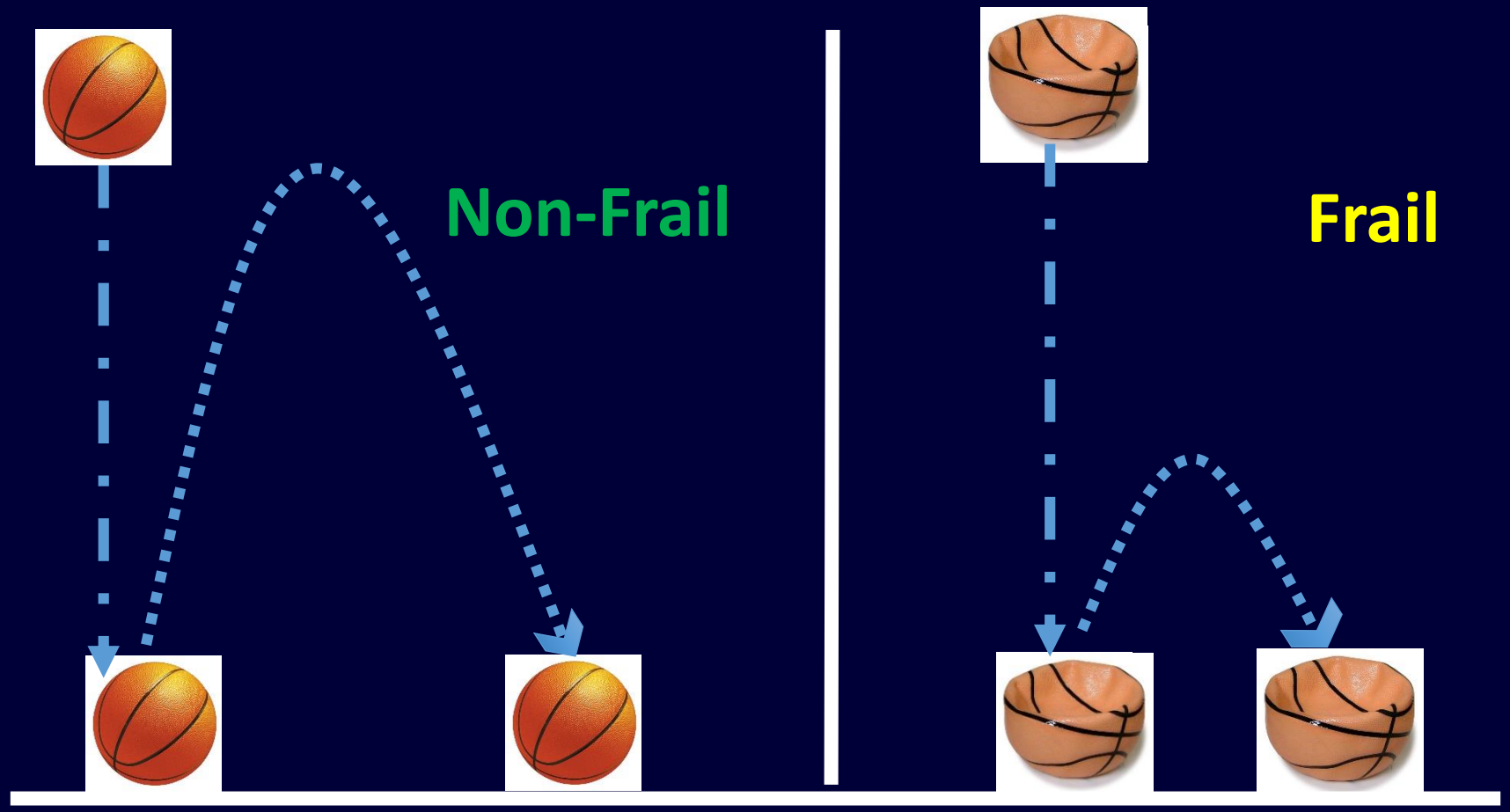
- “Geriatric Syndromes”
- Cognitive impairment and dementia
- Decision-making capacity
- Depression
- Risk factors for post-operative delirium
- Alcohol and substance abuse

Frailty



eurheartj.oxfordjournals.org/content/35/26/1726

Frailty – Loss of Ability to Rebound



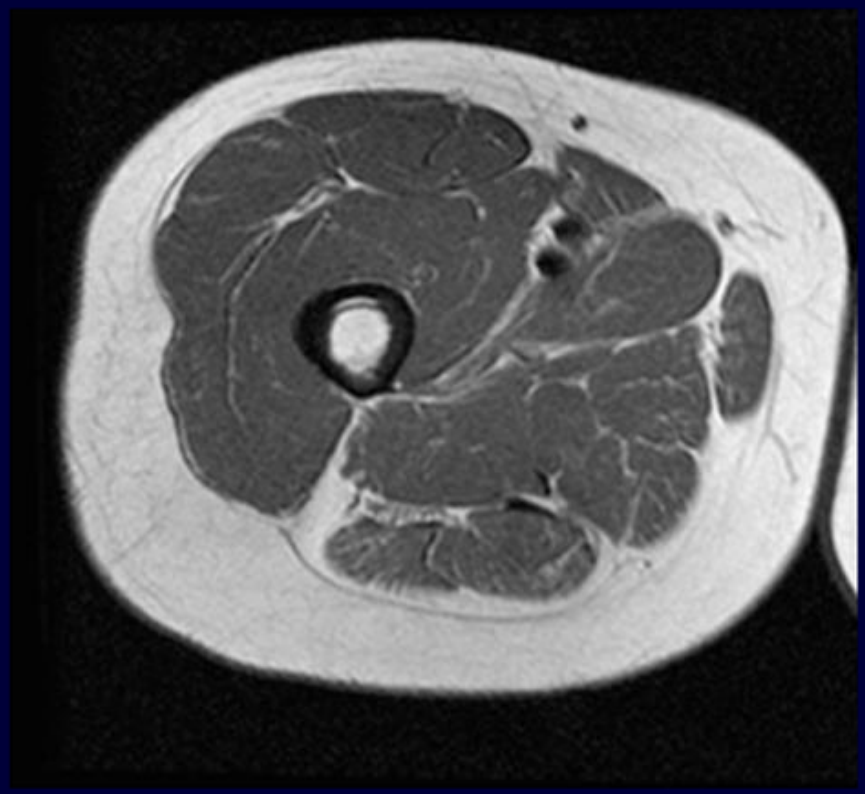
Understanding Frailty

Alternative Working Definition	
Woodhouse et al	Those > 65 years of age who depended on others for the activities of daily living and were often under institutional care
Campbell and Buchner	Condition or syndrome which results from a decline in the reserve of multiple systems and is a state of "unstable disability"
Lipsitz et al	Loose complexity in resting dynamics and show maladaptive responses to perturbations
Bortz	Concept of symmorphosis "an insidious and relentless thief of energy and vitality"
Hougaard	A random effects model for time variables, where the random effect (frailty) has a multiplicative effect on hazard

physiological decline that affects all organ systems

Sarcopenia

Age 25



Age 63

SARCOPENIA

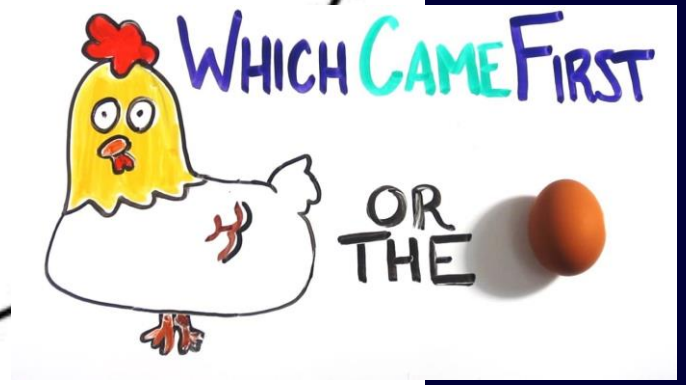
- Skeletal muscle loss
- Poor muscle quality

PHYSICAL FUNCTION IMPAIRMENT

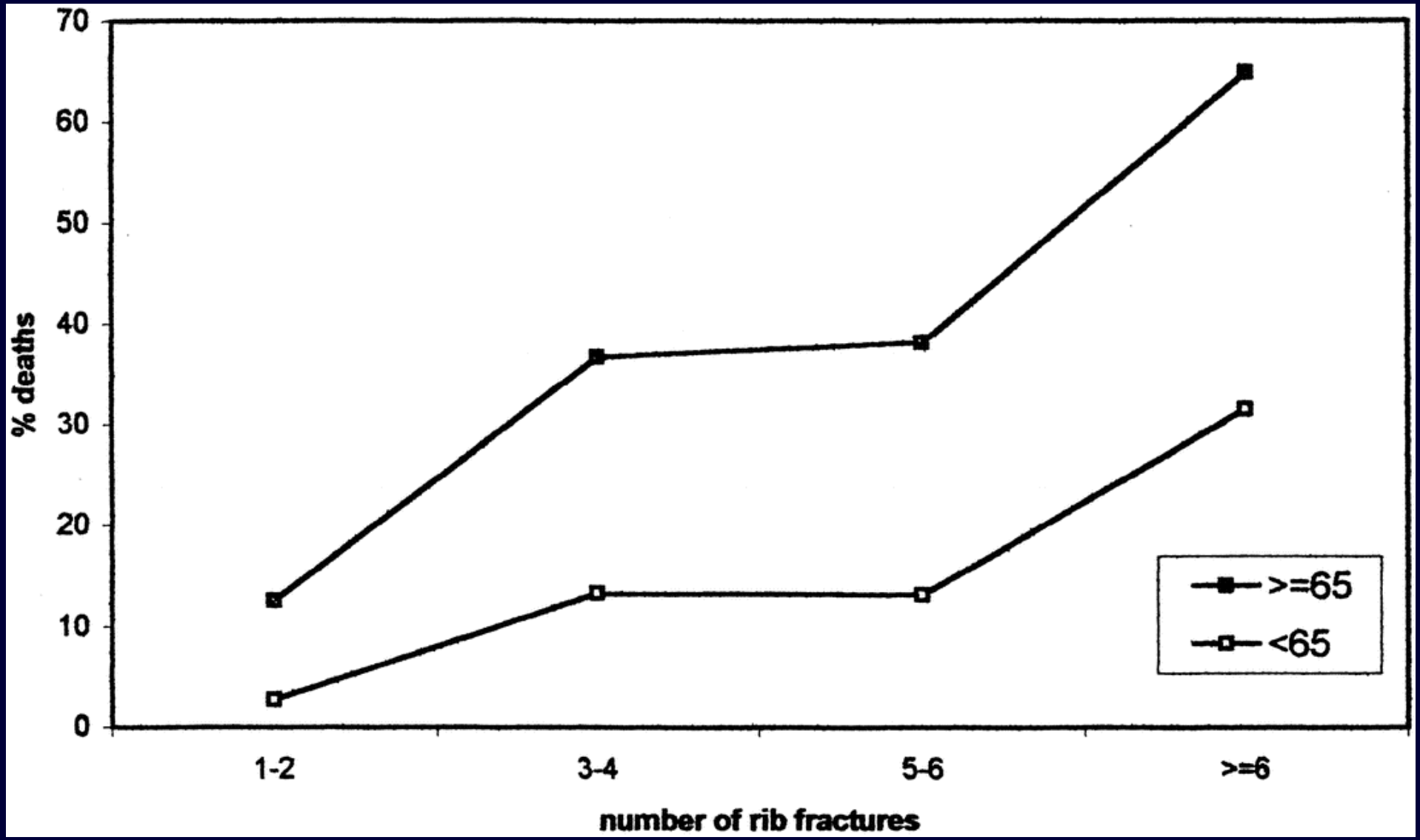
- Weak muscle strength
- Slow gait speed
- Poor balance

FRAILTY

- Deficits accumulation
- Fatigue
- Sedentary behaviour
- Weight loss
- Cognitive impairment
- Social isolation



Age and Rib Fractures

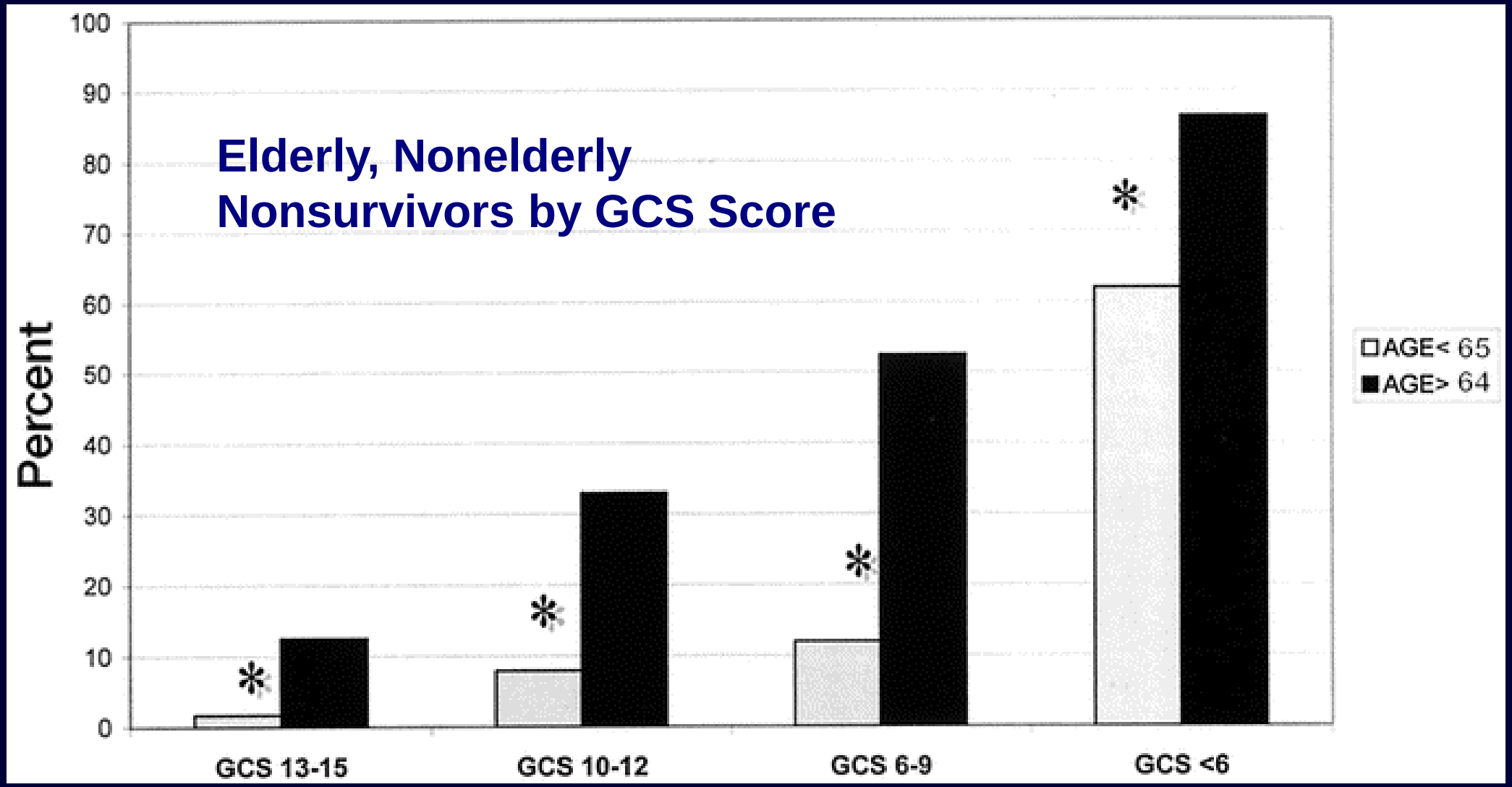


Bergeron E et al, J Trauma 2003; 54:478

Specific Injuries

Age and Brain Injury

New York State Trauma Registry 1994-95 (n=11,772 Head-Injured Patients)



Susman M, J Trauma 2002; 53:219

Cervical Spine Injuries

- Incidence of c-spine injury is 2x that of younger cohort
- Underlying arthritis may obscure fx lines
- Be aware of central cord syndrome with hyperextension injury

Role of the Trauma System and Center

Under-triage Increases Mortality

- 4534 Pts Age ≥65, 2000-2010
- Undertriage = ISS >15 w/o Trauma Team activation

- Findings:
- 15% undertriage rate
- 2X more likely to die

Rogers A et al, Am Surg 2012; 78:711

Geriatric Trauma Strategies for Pre-Hospital

- "Normal" vital signs might not be normal
- Over-triage is better than under-triage
- Designated trauma center

Pracht et al, J Trauma 2011; 71:69

Geriatric Trauma Strategies for ED

- Give IV fluid in small boluses
- Truncate and tailor evaluation
- Monitor / assess early and often (Hgb, ABG, INR)
- Medical & medication history

Geriatric Trauma Strategies for Inpatients

Close Monitoring, Frequent Assessments

Mental Status

- Identify pre-Existing cognitive impairment
- Look for causes of delirium
- Avoid polypharmacy

Cardiovascular

- Assess / monitor for occult hypoperfusion and myocardial ischemia

Geriatric Trauma Strategies: Inpatient (Cont'd)

Functional Status

- Physical Therapy
- Occupational Therapy
- Geriatrics Consultation
- Clinical Pathways

Vidan et al, J Am Geriatr Soc 2005; 53:1476
Fallon et al, J Trauma 2006; 61:1040
Friedman et al, J Am Geriatr Soc 2008; 56:1349
Leung et al, J Trauma 2011; ePub

Geriatric Trauma Strategies: Inpatient

Pulmonary

- Assess Function – Serial Spirometry
- Assess Swallowing, Aspiration Risk
- Avoid Oversedation, Supine Position
- Pain Management

Pain Control

- Over medication can lead to delirium
- SO CAN under-treated pain
  - Up to 45% of elderly patients say pain is undertreated in the hospital

- Comparison of 43 patients and incidence of delirium looking at delivery of “as needed” (PRN) analgesic medications
  - 26% vs 48% of “allowed” analgesia given in delirious vs non patients.

Ely JAMA 2001
Robinson Medsurg Nurs 2010

Sleep Disruption

- Sleep disorder affects 50% of elderly patients at baseline

- Hospitalization increases the morbidity of sleep deprivation
  - Poor wound healing
  - Decreased resistance to infection
  - Immune suppression
  - Disrupted nitrogen balance

- Multiple disruptors
  - Lights, noise, patient care

Parthasarathy Intens Care Med 2004

Delirium Prevention Measures

- Optimize light/dark & sleep/wake cycle
- Decrease disruptions at night
- Re-orient regularly, minimize restrains
- Minimize sedatives, especially benzodiazepines and benadryl
- Treat pain appropriately
- Mobilize!

Surgical Problems that Develop in the ICU

- In addition to surgical issues that necessitate ICU care, elderly patients are more susceptible to surgical problems developing while in the ICU
  - Ogilvie's syndrome
  - Acalculous cholecystitis
  - Toxic Megacolon / Clostridium difficile colitis
  - Peri-rectal abscess
  - Decubitus ulceration
  - Wound infection
  - Post pneumonia empyema

Beers Criteria

- Criteria for safe med use in adults (>65)
- First issued 1991, repeatedly revised and updated.
- Named for Dr. M.H. Beers, principal author of original 1991 criteria.

J Am Geriatr Soc 63:2227–2246, 2015

Table 4. 2015 American Geriatrics Society Beers Criteria for Potentially Inappropriate Medications to Be Used with Caution in Older Adults

Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation
Aspirin for primary prevention of cardiac events	Lack of evidence of benefit versus risk in adults aged ≥80	Use with caution in adults aged ≥80	Low	Strong
Dabigatran	Increased risk of gastrointestinal bleeding compared with warfarin and reported rates with other target-specific oral anticoagulants in adults aged ≥75; lack of evidence of efficacy and safety in individuals with CrCl <30 mL/min	Use with caution in in adults aged ≥75 and in patients with CrCl <30 mL/min	Moderate	Strong
Prasugrel	Increased risk of bleeding in older adults; benefit in highest-risk older adults (e.g., those with prior myocardial infarction or diabetes mellitus) may offset risk	Use with caution in adults aged ≥75	Moderate	Weak
Antipsychotics Diuretics Carbamazepine Carboplatin Cyclophosphamide Cisplatin Mirtazapine Oxcarbazepine SNRIs SSRIs TCAs Vincristine	May exacerbate or cause syndrome of inappropriate antidiuretic hormone secretion or hyponatremia; monitor sodium level closely when starting or changing dosages in older adults	Use with caution	Moderate	Strong
Vasodilators	May exacerbate episodes of syncope in individuals with history of syncope	Use with caution	Moderate	Weak

The primary target audience is the practicing clinician. The intentions of the criteria are to improve selection of prescription drugs by clinicians and patients; evaluate patterns of drug use within populations; educate clinicians and patients on proper drug usage; and evaluate health-outcome, quality-of-care, cost, and utilization data.

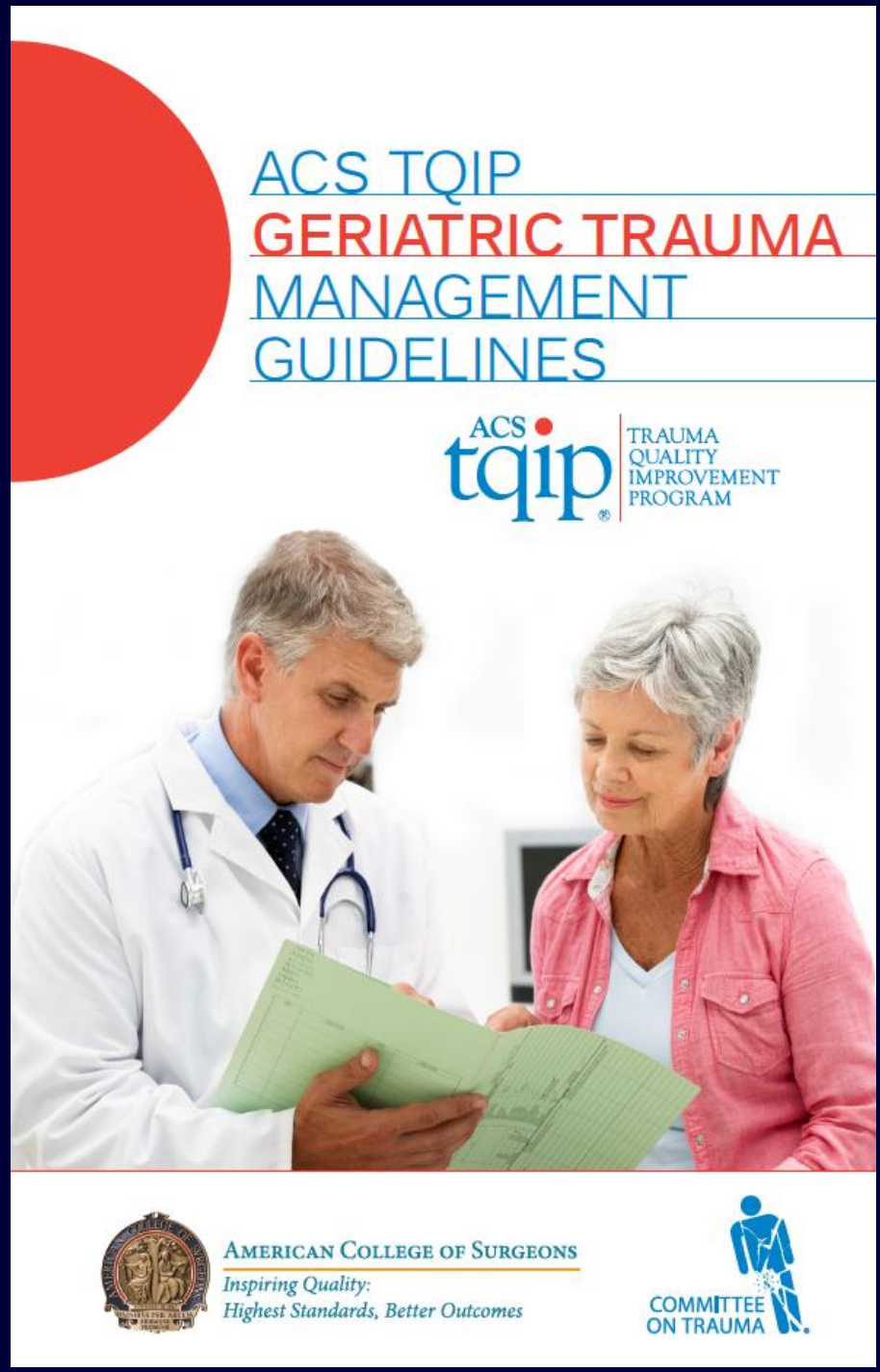
CrCl = creatinine clearance; SNRIs = serotonin-norepinephrine reuptake inhibitors; SSRIs = selective serotonin reuptake inhibitors; TCAs = tricyclic antidepressants.

Models of Geriatric Trauma Care

1. Acute Care of the Elderly (ACE) unit
   - More home-like environment
   - Patient-centered care preventing disability and iatrogenic illness, and comprehensive discharge planning and management
2. Geriatrician-led interdisciplinary team approach
   - Goals to improve functional status, reduce acute care hospital days and readmission, and lower mortality rate
3. Comprehensive geriatric assessment
4. NICHE (Nurses Improving Care for Hospitalized Elders)
5. Geriatric Resource Nurses: relatively low-cost option for putting geriatric knowledge across units and clinics.
6. Geriatric consultation

Your Guidebook

- Background
- Trauma Team Activation
- Initial Evaluation
- Specializing Inpatient Care
- Decision-Making Capacity
- Beers Criteria
- Substance Use/Abuse
- Depression
- Frailty
- More



Advance Directive

How much is the patient willing to go through,
for what chance,
of what outcome?

Palliative Care Goals

- Palliative care is a transition from care with curative intent, to care with a goal of comfort and preservation of dignity
- Honest communication about prognosis and goals of care is essential
- Often this conversation is delayed beyond of the patient's inability to participate

What Palliative Care is Not…

- End-of-Life Care
- Withdrawal of Care
- ‘Do not Treat’
- Giving up

Interdisciplinary model for palliative care in the trauma and surgical intensive care unit: Robert Wood Johnson Foundation Demonstration Project for Improving Palliative Care in the Intensive Care Unit

Anne C. Mosenthal, MD, FACS; Patricia A. Murphy, RN, PhD, FAAN

The Journal of **TRAUMA**® *Injury, Infection, and Critical Care*

Changing the Culture Around End-of-Life Care in the Trauma Intensive Care Unit

Anne C. Mosenthal, MD, FACS, Patricia A. Murphy, PhD, Lyn K. Barker, MA, Robert Lavery, MA, Angela Retano, MA, and David H. Livingston, MD

Model of Palliative Care in the ICU

1. Bereavement and psychosocial support within 24 hrs of admission

2. Interdisciplinary palliative care assessment within 24 hrs of admission

3. Family meeting with MD and nurse within 72 hrs of admission

Model of Palliative Care in the ICU

4. Comprehensive palliative care plan by 72 hrs

5. Palliative care standing order set for patients identified as imminently dying

6. Integration of palliative care performance measures into M&M and peer review

Summary

- Elderly trauma population is growing
- Elderly suffer worse outcomes compared with younger adults
- More Research is needed to identify reasons for worse outcomes, and interventions that improve outcomes

Summary

- Elderly patients require ICU care more often than younger injury/illness matched patients
- Outcomes in elderly patients requiring ICU care are often worse than younger patients
- Some poor outcomes are from reversible insults within the ICU
- Clarity of goals for care and expectations for prognosis are important, and end of life discussions should be held earlier

Slide Credit

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