

## The Silver Tsunami: Are You Prepared?

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Disclosures: NONE



## Objectives

- Better understand the “geriatric imperative.”
- Review basic physiology of the aging patient
- Review the current data for anesthesia in hip fracture patients and how we can impact outcomes.

## What is the Silver Tsunami?

- 1950-2005: 8-12% increase in Seniors
- 2013: 13% of population (40 million)
- 2011-2030: Baby boomers!!!
- “Old” old is fastest growing:
  - 2010: 5 mil over 85
  - 2050: 21 million!



-Data from US Census Bureau

## Geriatric Imperative’s Healthcare Impact

- ≥65 year olds made up 13% of the population in 2013, but
  - 25% of medications
  - 33% of hospital admissions
  - 44% of hospital bed days
  - Majority of nursing home beds

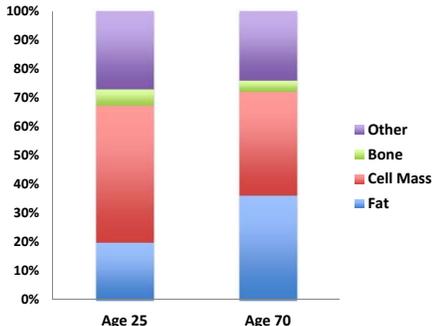
**What will happen in 2030 when % of population doubles!?!?!?**

## The Effects of Time . . .

### Weight

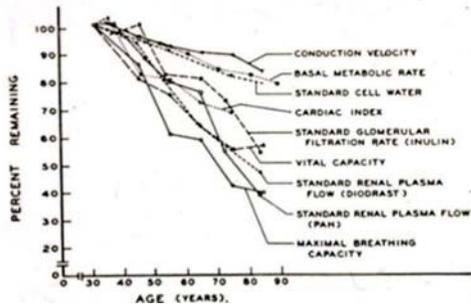


## The Effects of Time . . . Body Composition



Age	Fat (%)	Cell Mass (%)	Bone (%)	Other (%)
Age 25	20	45	5	30
Age 70	35	35	5	25

### Physiologic Decline with Aging



### CNS Changes

- Decrease in number of nerve cells in the CNS
- Accumulation of metabolic products that may play a role in increased sensitivity to sedatives
- Decreased dopamine and increased muscular rigidity
- Increased reaction time
- Increased risk for postoperative delirium
- **Decrease in MAC (6% per decade after age 40)**

### Musculoskeletal System

- Osteoarthritis
- Osteopenia

### Renal System

- GFR decreased 30-46%
- Not always manifested in creatinine (dependent on muscle mass and body weight)
- Decreased renal plasma flow by about 50%

### Pulmonary System

- Loss of elastic recoil and collagen matrix (increased compliance)
- **Prolonged expiratory phase, decreased maximal expiratory flow**
- Decreased diffusion capacity
- Increased dead space
- Decreased FRC
- Increased alveolar-arterial gradient (A-a)
- Increased work of breathing

### Cardiovascular System

- Maintenance of resting LV function
- Less cardiomyocytes → less myocardial contractility
- Decreased response to beta-receptor stimulation → lower max heart rate (requires compensatory increase in stroke volume to increase CO)
- Increased vessel stiffness → higher systolic pressure and increased LV afterload.
- Decreased VO<sub>2</sub> Max

### Summary of Physiologic Changes

Loss of functional reserve capacity

Loss of ability to compensate in the face of stress

**Surgery=Stress**

### When Should We be Operating?

Predictors of Mortality in Elderly Patients With an Intertrochanteric or a Femoral Neck Fracture

*Hayrettin Kenmezacar, MD, Egemen Ayhan, MD, Mehmet C. Unlu, MD, Ali Seker, MD, and Saffet Karaca, MD*

The effect of early surgery after hip fracture on 1-year mortality

*Paola Colais<sup>1</sup>, Mirko Di Martino<sup>1</sup>, Danilo Fusco<sup>1</sup>, Carlo Alberto Perucci<sup>2</sup> and Marina Davoli<sup>3</sup>*

### When Should We be Operating?

Clin J Anesth. 2008 Mar 25(3):148-54. doi: 10.1007/s001400800086.  
**Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression.**

Shen J<sup>1</sup>, Hsu J, Chen Y.

- Meta-analysis of 16 observational studies
- Delays >48 hours associated with increase in 30-day mortality and 1-year mortality

### Hip Fractures in the Elderly

- 1-year mortality is estimated to be 14-58%
- Most studies on morbidity/mortality done in Scandinavia
- In US: White men most likely to die
- Morbidity
- Loss of independence
- \$\$\$\$\$\$

Jacobsen SJ et al. Race and sex differences in mortality following fracture of the hip.

### Comparative Effectiveness of Regional versus General Anesthesia for Hip Fracture Surgery in Adults

Mark D. Neuman, M.D., M.Sc.,\* Jeffrey H. Silber, M.D., Ph.D.,† Nabil M. Elkassabany, M.D.,‡ Justin M. Ludwig, M.A.,§ Leo A. Fleisher, M.D.¶

- 2012 Retrospective cohort of 18,000 hip fracture surgery patients in NY state.
- Lower odds of in-hospital mortality & pulmonary complications with regional anesthesia.

2014 AAOS: "Doesn't Matter!"



2014 UK/Ireland Anesthesia Association: "Try to do neuraxial!"



### Mode of Anesthesia in Hip Fracture: Does it Matter?

- Clinical/administrative databases lack specific info—type of block, amount of sedation, or meds used for GETA.
- Outcomes are also limited—no patient centered outcomes.

### REGAIN

- Regional vs. General Anesthesia for Promoting Independence after Hip Fracture Surgery
- University Pennsylvania, Enrollment Spring '16
- 1600 patient multicenter randomized trial
- Primary outcome: Recovery of ambulation
- Secondary outcomes: Chronic pain, ability to return to prefracture residence, overall health, cognitive function

[www.clinicaltrials.gov](http://www.clinicaltrials.gov) ID # NCT02507505

### Hip Fractures in the Elderly

Osteoporosis Int (2007) 18:1583–1593  
DOI 10.1007/s00198-007-6903-3

ORIGINAL ARTICLE

#### Increased mortality in patients with a hip fracture—effect of pre-morbid conditions and post-fracture complications

P. Vestergaard · L. Rejnmark · L. Moskilde

- Denmark 1977-2001
- >169,000 fracture cases compared with >500,000 controls followed for 20 years.
- Excess mortality of 19% within first year and then 1.8% per year for every additional year following the fracture .
- Major causes longitudinally were **due to complications to the fracture event**, not premorbid conditions

### Hip Fractures in the Elderly

- Retrospective study; 2009-2013; patients with proximal femoral fracture
- follow-up for at least 1 year
- 115 patients after exclusions
- Things relating to mortality: **type** of surgery—THAs & hemiarthroplasty mortality >60% vs 24% in proximal femoral nail

Karademir G, Bilgin Y, et al. Hip fractures in patients older than 75 years old: Retrospective analysis for prognostic factors. Int J Surg. 2015 Dec; 24: 101-4.

### Hip Fractures in the Elderly

#### Sedation Depth During Spinal Anesthesia and the Development of Postoperative Delirium in Elderly Patients Undergoing Hip Fracture Repair

FREDERICK E. SIEBER, MD; KHWAJ J. ZAKRIYA, MBBS; ALLAN GOTTSCHALK, MD, PhD; MARY-RITA BLUTE, RN; HOCHANG B. LEE, MD; PAUL B. ROSENBERG, MD; AND SIMON C. MEARS, MD, PhD

- 114 patients age 65+ undergoing hip fracture repair with SAB and propofol.
- Excluded severe dementia and preop delirium
- BIS of ~50 for deep sedation group, BIS of 8+ for light sedation group. Standardized postop analgesia.
- Prevalence and mean days of delirium significantly greater in deep sedation group.

### Controversies in anaesthesia for noncardiac surgery in older adults

S. Murthy<sup>1,\*</sup>, D. L. Hepner<sup>2</sup>, Z. Cooper<sup>3</sup>, A. M. Bader<sup>2</sup> and M. D. Neuman<sup>1</sup>

- 2015 Review of most recent hip fracture data
- Reviews info and risk factors of postop delirium
- Discusses frailty & impact on outcome