Biological and Clinical Aspects of Aging

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Let’s Think About…

• What aging is
  • Physiological changes of aging
  • Normal, usual, successful aging
  • What is frail?

• Chronic conditions

• Policy implications
What is Aging?

Politics, funding, industry

Normal Physiologic Outcome

• Wear and tear
• Part of living and being

Pathologic Outcome

• Cumulative interplay of diseases – influence of genes, environment, & time
What is Aging?

- **Aging is a process** that converts fit adults into frailer adults with progressively diminished reserves and increased vulnerability to illness, injury, and death.

-Occurs at all levels:
  - Molecule to cell to organ to organism

- Inevitable and universal

- All organisms have finite life span
Normal Aging

• Universal age related changes
  • Puberty
  • Menopause
  • Death

• Loss of *homeostatic* reserve - loss of ability to buffer insults
Quiz

• What birthday should you celebrate to recognize that you are now “over the hill?”
  a. 21?
  b. 35?
  c. 50?
  d. 65?
  e. 80?
Which Birthday to Celebrate?
Usual Aging

Age-related changes that commonly occur – not necessarily universal or age determined
Features of Usual Aging

Early Rapid Growth

Decline Without Plateau

Cardiac Index
GFR
FEV1
Features of Usual Aging – Variability in Decline

Variability from organ to organ, individual to individual
Implications of Usual Aging

• Increased differentiation and variation between and within individuals – central feature of aging

• Atypical presentations of disease

• However, aging is influenced significantly by lifestyle circumstances
  – smoking, exercise, nutrition, SES

• Increased vulnerability to stressors
Usual Aging - Limitations

- Implication of harmlessness or unmodifiability
  - “What do you expect at your age…”
  - “What should I expect at my age…”
Successful Aging

- Meaning unclear
  - Beyond health and longevity
  - Capacity to function across many domains – cognitive, social, emotional

- Influence of other factors
  - MacArthur studies: importance of exercise, social network, social support, and income
What is Frail?

- Increased vulnerability
- More than disease, more than just disability
- Critical to define for research and for health planning needs
One Research Definition of Frail

• Clinical syndrome (≥3 factors):
  – unintentional weight loss (>10 lb yr)
  – weakness - grip strength
  – slow walking speed
  – self report exhaustion
  – low physical activity
• Prevalence in community 7%, 4 year incidence 7%
• ↑ with age, women, AA, low educ & income, comorbidity, and disability
• Overlap, but not concordance in frailty, comorbidity, disability
• Predicts falls, disability, hospitalization, death
Process of Aging - Quiz

• What has happened to the average and maximum life span over the last century?

A. Increased average, increased maximum
B. Increased average, decreased maximum
C. Increased average, unchanged maximum
Survival Curves - Max and Mean Survival

- 1900
- 1990
- Ideal