# Normal Aging Changes & Geriatric Syndromes

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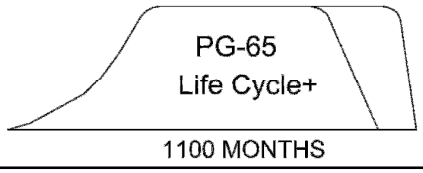


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## Disclosures of Potential Conflict

| Source | Honoraria | Expert Witness | Consultant |
|---|---|---|---|
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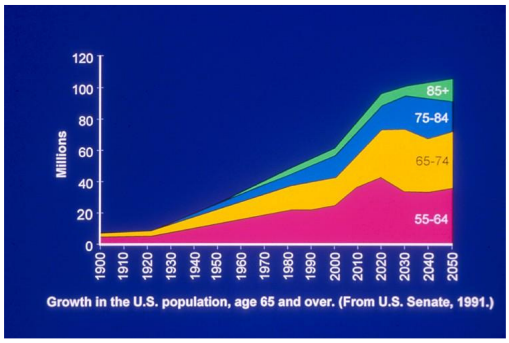


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## Objectives

- Describe the ways that a normal aging body is different from a young body.
- Be familiar with and appreciate the impact of diseases that affect >50% of the elderly.
- Understand how many adverse changes can be prevented.

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## Trajectories of Dying

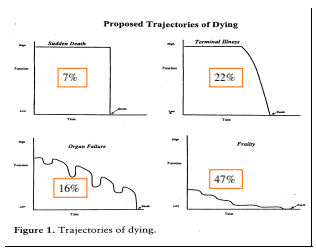


Figure 1. Trajectories of dying.

Lunney, JR, Lynn J, Hogan, C. Profiles of Older Medicare Decedents. JAGS 50:1108-1112, 2002

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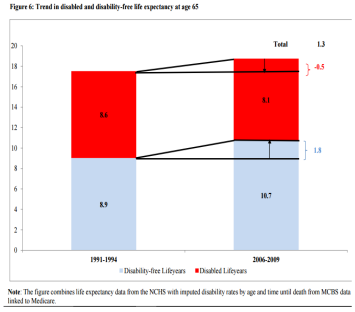
## Better Quality

↑ in Disability free years in 1992, the life expectancy of the average 65-year-old was 17.5 years, 8.9 of which were free from disability. By 2008, total life expectancy had risen to 18.8 years. In addition to the overall increase, the number of disability-free years increased, from 8.9 to 10.7, while the number of disabled years fell, from 8.6 to 8.1.

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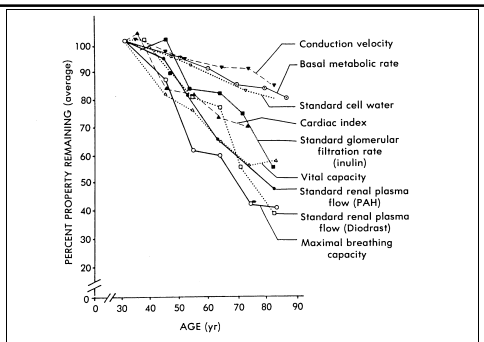


Decline in major functional capacities in the aged patient. From Timiras, P.S.: Developmental physiology and aging, New York, 1972, Macmillan Publishing Co., Inc.

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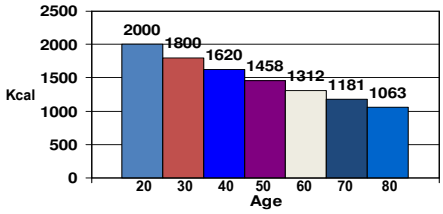
For every decade our caloric needs decrease by 10%

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## Question 1

1. What is the reason for decreasing caloric needs as we age?
   A. We eat less due to decreased taste
   B. We have fewer family and friends to eat with
   C. We have less muscle mass
   D. We have more adipose tissue

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9

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## Body Composition Changes

- Muscle mass decreases
  - Body water decreases
    - Females 35-45%
    - Males 45-55%

    Mentes 2006 Journal of Gerontological Nursing 32:13–19
- Adipose tissue increases
  - Lipid soluble drugs hang around longer

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## Theories of Aging

- Apoptosis of cells
- Mitochondrial membrane leakage
- Telomere shortening
- Oxygen radicals
- Crosslinking of elastin and collagen

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## Skin

- Fewer, less efficient sweat glands
- Dryer
- Thinner
- Less elastic

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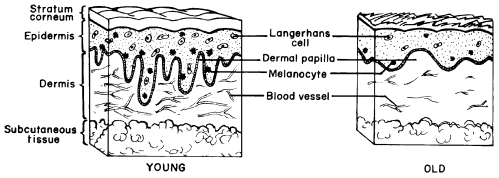
## Skin




Timiras, Paola S. editor, Physiological Basis of Aging and Geriatrics, 2nd ed, 1994, CRC Press, page 274

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## Pressure Ulcers

- Often unpreventable
- Difficult to heal

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## Illnesses in Elderly

More than 50% of 80-year-olds have:

- Dementia
- Hypertension
- Osteoarthritis
- Osteoporosis
- Hearing loss
- Vision loss

www.DrHamrickMD.com

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## Eyes

- Presbyopia: decreased near vision
- Clouding of the lens
- Retina: nerve cell, neuronal atrophy

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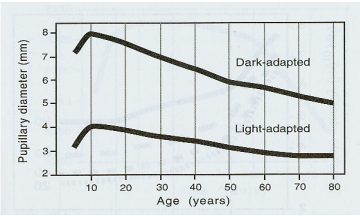
## Vision Changes

- Decreased pupillary response
- 1/3 of light gets to retina




Timiras, Paola S. editor, Physiological Basis of Aging and Geriatrics, 3rd ed, 2003, CRC Press, page 147, based on the data of Verriest, Bull Acad. R. Med. Belg., 11, 527, 1971

18

## Question 2

- Cataracts are the most common cause of blindness in:
  A. The United States
  B. The world
  C. African Americans
  D. Caucasians

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## Question 2

- Cataracts are the most common cause of blindness in:
  A. The United States, macular degeneration
  B. The world
  C. African Americans, glaucoma
  D. Caucasians, macular degeneration

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## Causes of Blindness

- Worldwide
- Over age 50
  – Caucasian
  – African American

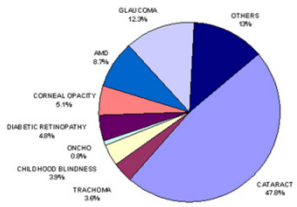


Figure reference: WHO 04.138 Global causes of blindness as a proportion of total blindness in 2002

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## HEENT

- Ears
  – Continue to grow
  – Cerumen impaction
  – High frequency hearing loss
  – Presbycusis (high-frequency hearing loss) results from stiffness of tympanic membrane and loss of hair cells in the organ of Corti

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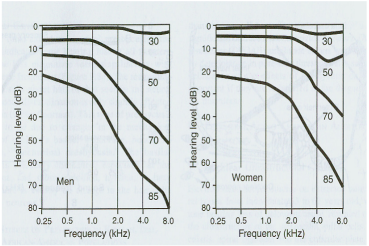
## Hearing Loss With Age




Marsh, G., Perceptual Changes With Aging, in Handbook of Geriatric Psychiatry, Busse, E.W. and Blazer, D.G., Eds., Van Nostrand, New York, 1980, p 147

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## Question 3

- What is an effective way to communicate with older adults with hearing loss?
  A. Speak louder
  B. Speak through a cupped hand to amplify the sound
  C. Vary the pitch and volume of speech to emphasize content
  D. Speak slower

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  C. Vary the pitch and volume of speech to emphasize content
  D. Speak slower, to give time to process, think foreign language

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## Communicating with Patients who have Hearing Loss

- Face Patient
  – Don't cover face or mouth
- Slow down, e.g. foreign language
- Separate words
- Don't trail off or run words together

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## Communicating with Patients who have Hearing Loss

- Turn off background noise, e.g. TV
- Close door
- Get person's attention first
- Announce change of subject

http://www.fammed.wisc.edu/our-department/media/690/hearing-loss-elderly

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## Mouth

- Nose
  – Decreased smell
- Mouth
  – Decreased taste
  – Dryness
  – Encourage denture wearing to prevent alveolar ridge atrophy

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## Olfactory, Smell Impairment

Olfactory impairment increases with age and is high.

| Age | Prevalence % |
|---|---|
| 53-59 | 3.8% |
| 60-69 | 11.2% |
| 70-79 | 20.8% |
| 80-97 | 59.4% |

Murphy, C. 2002 JAMA 288 (18); 2307-2312 PMID: 12425708 DOI: 10.1001/jama.288.18.2307

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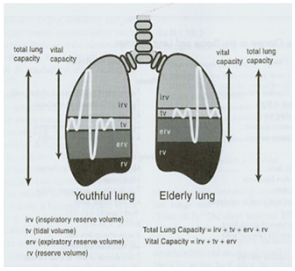
## Lungs

- Decreased elasticity leads to decreased airflow by 0.3L per decade.
- $pO_2$ = 100 - age/3
- Less reserve at old age.




Timiras, Paola S. editor, Physiological Basis of Aging and Geriatrics, 3rd ed, 2003, CRC Press, page 324
Figure 18.1: exchanges in lung volumes with aging. With aging decrease in vital capacity and increase in residual volume.

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## Heart

- 60-80% of persons >65yo have murmur.
- Blunted response to catecholamines.
- Decreased contractility
- Decreased elasticity

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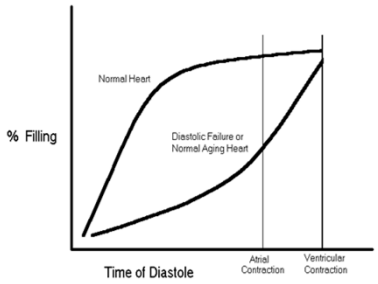
## Max Heart Rate

- (220- age) x 85%
- (220- 90) x 0.85= 110

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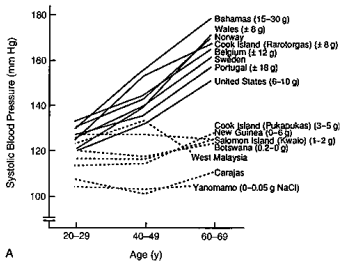
## Blood Pressure in Aging: Cross-cultural Differences

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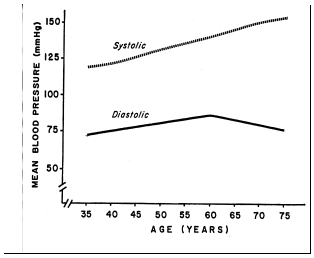
## Blood Pressure Levels




Timiras, Paola S. editor, Physiological Basis of Aging and Geriatrics, 2nd ed, 1994, CRC Press, page 270

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## MIND Study

Mediterranean-DASH (Dietary Approaches to Stop Hypertension) Intervention for Neurodegenerative Delay

1,545 participants, 58-98 yo, followed 4.5 years

semi-quantitative food frequency questionnaire

- ↓ risk for Alzheimer's by 53% w rigorous adherence
- ↓35% in those who followed it moderately well

Morris MC, et al. MIND diet associated with reduced incidence of Alzheimer's disease. Alzheimer's Dement. 2015;11:1007-1014. 923 participants

Morris MC, et al. MIND diet slows cognitive decline with aging. Alzheimer's Dement. 2015;11:1015-1022. 960 participants


https://nutritionconsabor.com/plant-based-diet/

35

## MIND Diet 15 Components

10 brain-healthy food groups

- 3 daily servings of whole grains
- 1 green leafy and 4 other vegetable servings every day
- 1 glass of wine daily
- Snack mostly on nuts
- Beans every day
- Poultry and berries at least twice per week
- Fish at least once per week
- Olive oil daily

5 unhealthy groups:

- Red meat
- Butter and margarine
- Cheese
- Pastries and sweets
- Fried or fast food
- Sodium <2400 mg/d

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## GI

- Decreased
  - Absorption
  - Gut transit speed
  - Motility

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## Liver

- Decreased
  - blood flow through liver 1% per year > 25y
  - # of hepatocytes
  - liver mass and volume 1%/year > 40y
  - Phase 1 metabolism, oxygenation
    - Avoid drugs with metabolites:
      - Benzodiazepines

Chutka DS, et al 1995 Mayo Clin Proc 70:685-93
AGS 2023 Beers Criteria, J Am Geriatr Soc. 71(7):2052-81 DOI: 10.1111/jgs.18372

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## Pancreas

- Choosing Wisely: HgA1c not <7.5%
  - http://www.choosingwisely.org/wp-content/uploads/2013/02/AGS-5things-List_Web.pdf
- Higher after meals, postprandial (pp) blood glucose levels for longer than in younger patients.
- After meals glucose contributes relatively more than basal glucose to hyperglycemia

Munshi M, et al. 2013 JAGS 61:535-41

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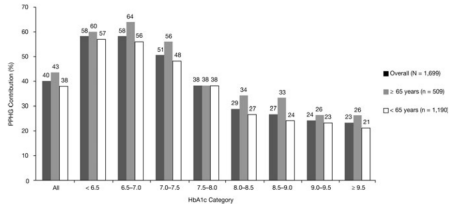


Relative Contribution of postprandial hyperglycemia to overall hyperglycemia in young and old ≥65 patients.

Munshi 2013 J Am Geriatrics Society 61(4); 535-41

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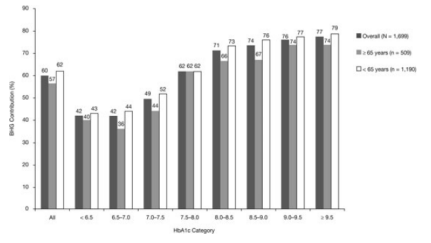
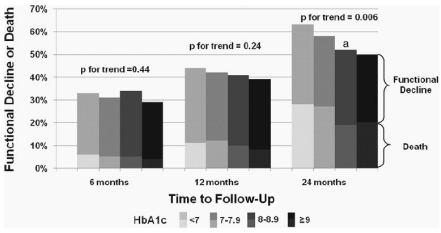



Relative Contribution of basal hyperglycemia to overall hyperglycemia in young and old ≥65 patients.

Munshi 2013 J Am Geriatrics Society 61(4); 535-41

41




The higher the HgA1c the less functional decline and death in nursing home eligible patients avg age 80.

Yau 2012 J Am Geriatr Soc 60:1215–1221

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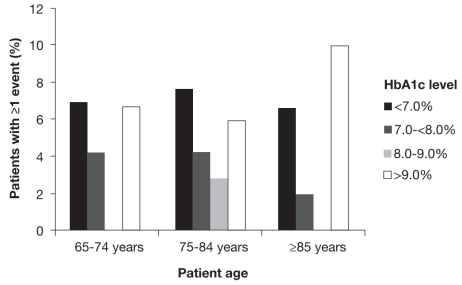


**Fig. 4.** Prevalence of falls according to age category and HbA1c level.

Davis KL, et al. 2014 J Am Med Dir Assoc 15;757-62

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## Kidneys

- Decreased
  - # of nephrons, esp long ones
  - Ability to concentrate urine
  - Ability to make vitamin D
  - Response to renin- angiotensin
  - Creatinine clearance

Male CrCl= (140-age) x weight in kg / 72 x serum Cr

Female= x 85%

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## Changes of Aging that Contribute to Dehydration

**Increased:**

- Fluid shifts to legs upon arising
- Urine output later in the day
- Fluid drainage upon reclining

**Decreased:**

- Thirst sensation
- Anti-diuretic hormone (ADH) production
- Ability to concentrate urine bec. apoptosis of long nephrons

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## Bladder

- Decreased strength of pelvic support muscles
- Atrophic urethra
- Increased involuntary bladder contractions
  - Caffeine
  - Tobacco
  - Alcohol
  - Artificial sweeteners
  - Concentrated urine from dehydration

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## Question 4

- As we age sleeps gets:
  A. More fragmented
  B. Longer
  C. Deeper
  D. More REM

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## Question 4

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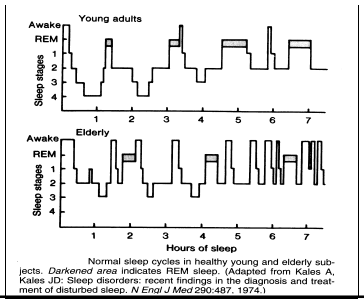
## Changes in Sleep: Young vs Old




Normal sleep cycles in healthy young and elderly subjects. *Darkened area* indicates REM sleep. (Adapted from Kales A, Kales JD: Sleep disorders: recent findings in the diagnosis and treatment of disturbed sleep. *N Engl J Med* 290:487. 1974.)

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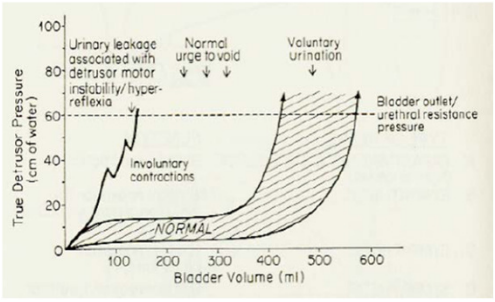
## Urge Incontinence

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## GU Male

- Benign prostatic hypertrophy (BPH)
  - 50% of all men have BPH
  - 90% men > 85 yo
  - 50% of men with BPH have urinary Sx
- Decrease in # sperm and testosterone
- Increase in chromosomal abnormalities
- Prostate cancer in 70% men > 80 yo

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## GU Female

- Atrophy of
  - Vagina
    - Thinning of epithelium
    - Dryness
    - Increase of pH
  - Ovaries
    - 20g to 2.5g, should not be palpable
  - Uterus
    - Fibroids atrophy

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## Hidden Illnesses in the Elderly

- Incontinence
- Vision
- Hearing
- Dentition
- Sleep Disorders
- Constipation
- Dementia
- Foot problems
- Dizziness
- Depression
- Falls
- Sexual Dysfunction

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## Musculoskeletal

- Decreased
  - Muscle mass ?
  - Muscle strength ?
  - Bone mass

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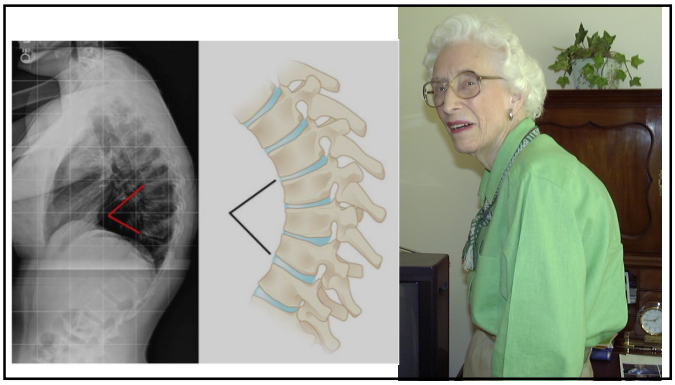

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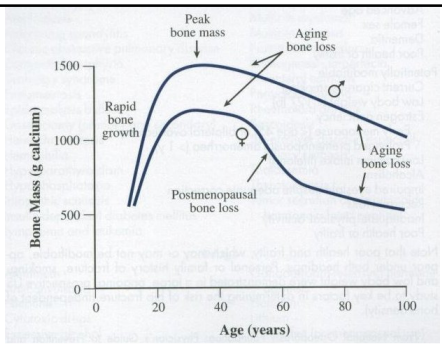


Kassem, Melton, Riggs. Involutional osteoporosis. In Feldman, Kelsay (eds). Osteoporosis. New York. Academic Press 1996. pp 691-702

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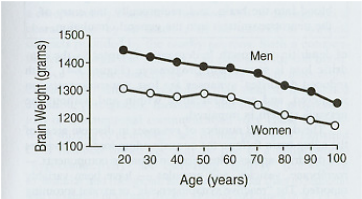
## Changes in Brain Weight




Timiras, Paola S. editor, Physiological Basis of Aging and Geriatrics, 3rd ed, 2003, CRC Press, page 101

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## Nervous System

- Brain tissue atrophy
- Decline in neurotransmitters
- Slowed nerve conduction

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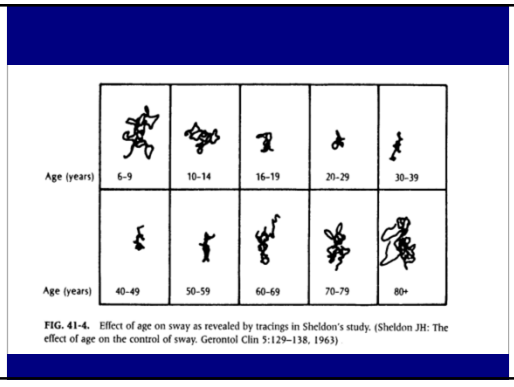


FIG. 41-4. Effect of age on sway as revealed by tracings in Sheldon's study. (Sheldon JH: The effect of age on the control of sway. Gerontol Clin 5:129–138, 1963)

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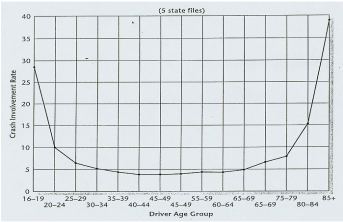
## Get Up and Go Test

- Have patient get up from a straight back chair and walk to the door, 10 feet, turn around and sit back down.
- This should take 16 seconds or less.

Mathias S, Nayak US, Isaacs B. Balance in elderly patients: The "get up and go" test. Arch Phys med Rehabil 1986;67:387-9

60

## Accidents Per Millions of Miles Traveled, by Age




Schick, F and Schick, R. Statistical Handbook of Aging Americans. Phoenix, AZ: Onyx Press, p 106, Table 86-7

Williams AF, Carsten O 1989. Am J Public Health 79:326m

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## Agreement with My Family about Driving

To My Family:

The time may come when I can no longer make the best decisions for the safety of others and myself. Therefore, in order to help my family make necessary decisions, this statement is an expression of my wishes and directions while I am still able to make these decisions.

I have discussed with my family my desire to drive as long as it is safe for me to do so.

When it is not reasonable for me to drive, I desire _____ (person's name) to tell me I can no longer drive.

I trust my family will take the necessary steps to prohibit my driving in order to ensure my safety and the safety of others while protecting my dignity.

Signed _____ Date _____

https://www.alz.org/care/alzheimers-dementia-and-driving.asp

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## Depression

- Often presents differently in elderly
  - Less energy
  - Hopelessness
  - Worthlessness
  - Rarely sadness
- Suicide attempts are very successful and lethal, therefore address aggressively

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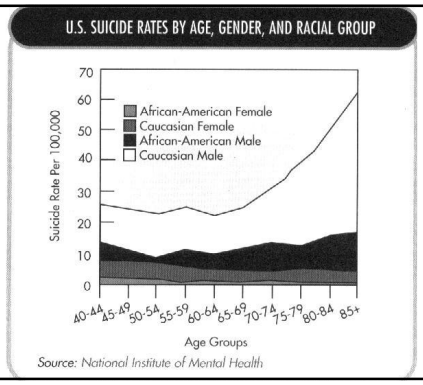


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## Memory loss

- Age associated memory impairment
  - Patients complain of memory loss
- Mild cognitive impairment
  - Loss of IADLs, intact ADLs, normal cognitive testing
- Dementia

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## Dementia

- Alzheimer's
- Multi-infarct dementia
- Mixed dementia
- Screen with Clock Test or MOCA, SLUMS
- Contact Alzheimer's Association or Alliance for resources, information, support groups, etc.

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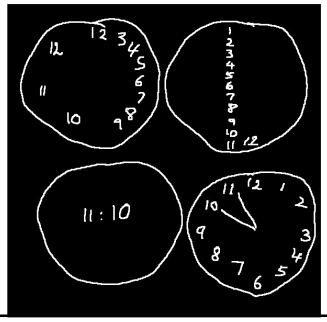
## Clock Test




Tuokko H, et al. The Clock Test.... J Am Geriatr Soc 1992; 40:579-584

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## Acetylcholine decline

- Avoid anticholinergic meds:
  - Benadryl, Tylenol PM
  - Meds for overactive bladder
- Bring all meds, including over the counter
  - Meds to treat side effects of other meds?
- Beers Criteria

AGS 2023 Beers Criteria, J Am Geriatr Soc. 71(7):2052-81 DOI: 10.1111/jgs.18372

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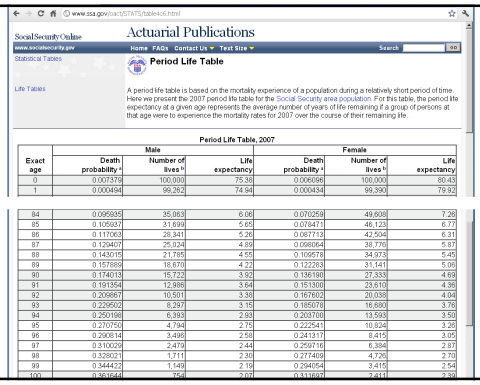


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## Long Term Care (LTC)

- 2.8% of elderly live in NH at any point in time
- 68% of elderly spend some time in NH (rehab)
- Nursing Home (NH)
  - 24 hr nursing coverage
  - Doctors see patients in facility
- Home Care
  - For every patient in the NH 3 equally sick patients are cared for at home
- Assisted Living Facilities (ALF, RH)
- Continuing Care Retirement Communities

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## Geriatric Functional Assessment

**IADLs**
(Instrumental activities of daily living)

Transportation
Phone use
Shopping
Preparing Meals
Housework
Taking Medication
Personal Finances

- **Executive Function Loss**

IADLs

| | |
|---|---|
| age 65-74 | 21% |
| age 75-84 | 35% |
| age > 85 | 58% |

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## Geriatric Functional Assessment

**ADLs**
(Activities of daily living)

Bathing
Ambulation
Dressing
Grooming
Transferring
Toileting
Eating

- **Functional Loss**

ADLs

| | |
|---|---|
| age 65-74 | 17% |
| age 75-84 | 29% |
| age >85 | 45% |

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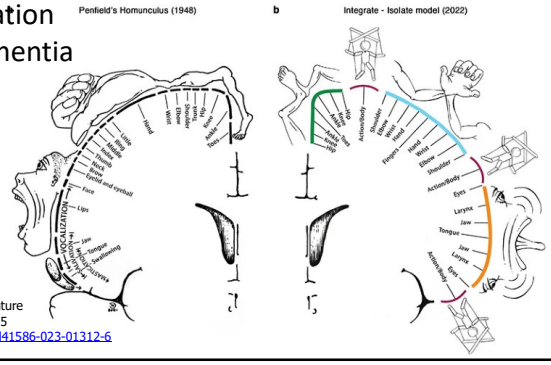
## Agitation in Dementia




Kozlov 2023 Nature
PMID: 37076715
DOI: 10.1038/d41586-023-01312-6

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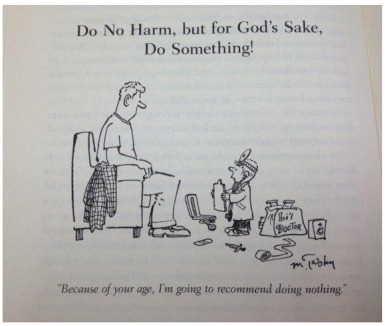


From Dr. Mark Lachs' book "Treat me, not my Age"

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## 6 Assets of Aging

The Six Assets of Aging:

1. Broader experience, sharper skills, and greater wisdom
2. Greater individuation and diversity
3. Closer proximity to mortality gives older adults the advantage of savoring moments as the precious gifts they are
4. Different motives and life purpose, based on the 8 developmental stages by Erickson, wisdom is the outcome of "Ego Integrity vs. Despair"
5. The corpus callosum, doesn't fully mature until a person reaches about 50 years old, and this helps explain why older adults are able to solve problems from a greater number of perspectives
6. Strength in numbers- "silver tsunami"

Jeanette Leardi https://changingaging.org/elderhood/the-six-assets-of-aging/

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## Aging Resources

- Sages of Aging https://www.pbs.org/video/sages-of-aging-0HEdtd/ PBS video
- Resilience https://pubmed.ncbi.nlm.nih.gov/35842754/?s=09

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http://www.brookings.edu/blogs/up-front/posts/2014/03/27-happiness-economics-employment-graham

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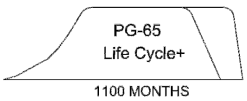
## Conclusion

- Slower nerve conduction leads to falls
- Decreased body water content, when in trouble think dehydration
- Document baseline cognitive status
- Compose a letter with your family
- Call your friendly neighborhood geriatrician:
  - E-mail: irene.hamrick@uc.edu
  - Website: www.DrHamrickMD.com

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