Geriatric Health Care

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EPIDEMIOLOGY OF AGING

Population over 65

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent of Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>4 %</td>
</tr>
<tr>
<td>1980</td>
<td>11 %</td>
</tr>
<tr>
<td>2000</td>
<td>13 %</td>
</tr>
<tr>
<td>2020</td>
<td>17 %</td>
</tr>
<tr>
<td>2040</td>
<td>22 %</td>
</tr>
</tbody>
</table>

Among the elderly, rates of growth have not been the same for all age groups.

*Age
65-74 years of age, Doubled
75+84 years old, Increased 3.5x.
*≥85 years, Increased 5-fold

*the fastest growing segment of the US population.

The frequency of common chronic conditions in the elderly* is:

<table>
<thead>
<tr>
<th>Chronic Condition</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>49</td>
</tr>
<tr>
<td>Hypertension</td>
<td>37</td>
</tr>
<tr>
<td>Hearing Impairment</td>
<td>32</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>30</td>
</tr>
<tr>
<td>Cataracts</td>
<td>17</td>
</tr>
</tbody>
</table>

* Non institutionalized, aged 65 years and older
**Epidemiology of Aging**

Causes of death in the elderly from most to least frequent include:
1. Heart disease
2. Cancer
3. Cerebral vascular disease
4. Chronic Obstructive Pulmonary Disease
5. Accidents

*Falls constitute two-thirds of all accidental deaths*

**Activities of Daily Living (ADL’s)**

- Bathing
- Dressing
- Toileting
- Transferring
- Walking
- Continence
- Feeding

**Instrumental Activities of Daily Living (IADL’s)**

- Cooking
- Cleaning
- Telephoning
- Reading
- Writing
- Shopping
- Managing medications
- Climbing stairs
- Managing money
- Traveling out of town
- Holding down a paying job
- Using public transportation

**Aging, Disuse, and Disease**

Functional decline is in fact due to a complex interaction of:
1. true genetically determined *aging*,
2. *disease* (often subtle and subclinical),
3. and *disuse* (deconditioning).
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PHARMACOLGY

- Of those 65 and older 24 to 38% take 3 or more drugs. Use appears to increase with age, and the use of OTC's is significant.
- On average, older nursing home patients are on 7 different drugs.

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PHARMACOLGY

Adverse Drug Reactions

ADR's occur most commonly in the elderly.

<table>
<thead>
<tr>
<th>Age</th>
<th>Risk of ADR</th>
</tr>
</thead>
<tbody>
<tr>
<td>41-50 years</td>
<td>11.8 %</td>
</tr>
<tr>
<td>&gt; 80 years</td>
<td>24.9 %</td>
</tr>
</tbody>
</table>

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PHARMACOLGY

Adverse Drug Reactions

- The risk factors for ADR's in older patients:
  1. multiple medications,
  2. increased number of illnesses,
  3. severity of illness,
  4. altered drug elimination,
  5. misprescription when doses are calculated on a basis of mg/kg of body weight,
  6. increased sensitivity to drug effects.
  7. living alone,
  8. women,
  9. hospitalization or institutionalization.

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AGE RELATED CHANGES IN BODY COMPOSITION AND PHYSIOLOGY

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Body Water</td>
<td>Decreased</td>
</tr>
<tr>
<td>*Lean Body Mass</td>
<td>Decreased</td>
</tr>
<tr>
<td>Total Body Potassium</td>
<td>Decreased</td>
</tr>
<tr>
<td>*Total Body Fat</td>
<td>Increased</td>
</tr>
<tr>
<td>Serum Albumin</td>
<td>Decreased?</td>
</tr>
<tr>
<td>Splanchnic Blood Flow</td>
<td>Decreased</td>
</tr>
<tr>
<td>Liver Mass</td>
<td>Decreased</td>
</tr>
<tr>
<td>Renal Plasma Flow</td>
<td>Decreased</td>
</tr>
<tr>
<td>Creatinine Clearance</td>
<td>Decreased</td>
</tr>
<tr>
<td>Renal Tubular Function</td>
<td>Decreased</td>
</tr>
</tbody>
</table>
Renal Elimination of Drugs

- There is a 1-2% decrease in RBF per year of aging between age 40-90. This data is derived from cross-sectional population studies. Newer, longitudinal studies show certain individuals have minimal or no decline in RF with aging.

- Renal mass is decreased by approximately 30%, and there is a significant loss of functional nephrons resulting in an overall decline of RF of 35-50% with respect to both GFR and tubular secretion.

DEMENTIA

Definition

Five percent of people over the age of 65 and 15-30% of those patients older than 80 are demented.

Dementia is defined by the DSM-IVR as the development of multiple cognitive deficits that include memory impairment and at least one of the following cognitive disturbances: aphasia, apraxia, agnosia, or a disturbance in executive functioning.
**DEMENTIA**

**Differential Diagnosis**

1. Normal Aging

With aging, people become increasingly likely to report **subjective memory loss**; the rate of such reports is 25 to 50 percent in community studies of persons over the age of 65.

2. Mental Retardation

Generally present since birth and nonprogressive.

3. Delirium

Like dementia, a global disturbance in cognitive function. Unlike dementia whose primary disturbance is memory, the primary defect in delirium is an inability to maintain attention.

<table>
<thead>
<tr>
<th>Delirium</th>
<th>Dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rapid onset</td>
<td>1. Onset usually insidious</td>
</tr>
<tr>
<td>2. Usually lasts a few hours to days and weeks</td>
<td>2. Usually lasts months to years</td>
</tr>
<tr>
<td>3. Decreased awareness and usually attentiveness</td>
<td>3. Awareness and attention usually intact (except for advance stages)</td>
</tr>
<tr>
<td>4. Orientation almost always impaired</td>
<td>4. Orientation frequently intact in early stages</td>
</tr>
<tr>
<td>5. Thought content confused</td>
<td>5. Thought content impoverished</td>
</tr>
<tr>
<td>6. Thought process slow</td>
<td>6. Thought processes normal in early stages</td>
</tr>
<tr>
<td>8. Global and reversible</td>
<td>8. Focal and irreversible</td>
</tr>
</tbody>
</table>
DEMENTIA
Differential Diagnosis
4. Depression
It can be difficult to differentiate between dementia accompanied by some reactive depression and depression with some cognitive loss secondary to the depression.

5. Mild Cognitive Impairment (MCI)
Patients with profound memory loss without other cognitive impairments and patients with minor impairments in numerous cognitive domains but no functional impairments at work or home do not meet the criteria for dementia.
DEMENTIA Evaluation
The American Academy of Neurology has published practice parameters for the diagnosis of dementia. (American Academy of Neurology Practice Guidelines Diagnosis of Dementia. May 2001 - www.AAN.com). A careful history, physical examination, neuroimaging, and a variety of laboratory tests are recommended as proposed guidelines.

DEMENTIA Potentially Reversible Causes
- Depression 4.5
- Normal Pressure Hydrocephalus 1.6
- Drugs 1.5
- Neoplasia 1.5
- Metabolic 1.5
- Infections 0.6
- Subdural hematoma 0.4
- Total 11.6

DEMENTIA Probable Irreversible Cause
- SDAT 56.8
- Lewy Body 15.25
- Multinfarct 13.3
- Alcohol 4.2
- Parkinson’s disease 1.2
- Huntington’s disease 0.9
- SDAT and MiD 0.8
- Trauma 0.4
- Anoxia 0.2
- Total 77.8

Why evaluate the Demented Patient?
1. Approximately 11% of dementias are reversible, three percent completely and eight percent partially.
2. 15-20% of AD patients have a coexistent reversible cause.
3. Experimental and approved medications are available.
4. Educate and Council Family.
5. Genetic implications.
DEMENTIA Evaluation
Why evaluate the Demented Patient?

DEMENTIA Evaluation
History
Medication history
Drugs with anticholinergic properties should be used judiciously if at all.

DEMENTIA Evaluation
Cognition Screening
MMSE
Norms for age and level of education for the MMSE are available at http://www.nemc.org/psych/mmse.asp

DEMENTIA Evaluation
Cognition Screening
Depression is a common, treatable comorbidity in patients with dementia and should be screened for (Guideline).
DEMENTIA
Evaluation
1. Non-contrast-enhanced CT or MRI.
2. Blood assays
   • electrolyte levels,
   • hepatic, renal, and thyroid function,
   • vitamin B12 level

ALZHEIMER’S DISEASE
Pathological Findings
Neurofibrillary tangles:
1. Intracellular
2. Correlate more strongly with the degree of dementia.
3. Less specific for SDAT.
4. Associated with tau-protein

Amyloid plaques:
1. Extracellular
2. Correlate less strongly with the degree of dementia.
3. More specific for SDAT.
4. Associated with bAPP.
ALZHEIMER’S DISEASE
Pathological Findings
There is a loss of nerve cells in certain regions of the brain, such as the hippocampus, a center for memory, and the cerebral cortex, which is involved in reasoning, memory, language and other important thought processes. Many of these dying neurons are cholinergic.

Neurotransmitter deficits
• 1. Reduction of cortical choline acetyltransferase is associated with cell loss in the cholinergic basal forebrain, and nucleus basalis of Meynert.

ALZHEIMER’S DISEASE
Clinical Course
The total duration of AD from symptom onset to death is highly variable but averages 8 to 10 years.
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DEPRESSION

Epidemiology

- Major depressive disorder (MDD) is the most common of the affective disorders in the elderly.
- Depression, particularly MDD, is less common in late life than at other ages.

Geriatric depression can be difficult to diagnose:

1. Pseudodementia
2. Absence of a mood disturbance
3. Masked depression- predominance of somatic symptoms

DEPRESSION

Therapy

The elderly may take longer to respond to antidepressant therapy than younger patients, although they do achieve a comparable final outcome.
**SUICIDE**
- Twenty-five percent of all suicides occur in those over age 60.
- Suicide is more common in elderly white males than in any other age group.
- Suicide attempts in the elderly should not be dismissed as gestures.
- Older adults who attempt suicide often do so impulsively and don’t give a clear message of increased distress or particular desperation.

**The loss of a spouse** is a major risk factor and the risk may last for weeks or months.
- Seventy-five percent of geriatric suicides may have visited their physician within one month of death, and one-third to one-half commit suicide within a week of seeing their doctor.
- The presence of dementia or other organic mental impairments increases the suicide risk, as does the abuse of alcohol or other drugs.

**DELIRIUM**
**Diagnosis**
The characteristic features of delirium are the rapid onset of fluctuating behavioral dysfunction, including global cognitive deficits. *The hallmark of delirium is an alteration in level of attention.*
Two-thirds of patients with delirium are either misdiagnosed or underdiagnosed.

One prominent feature of imprecise diagnostic evaluation relates to the frequent co-existence of dementia and Delirium in the elderly.

Disorders of attention and vigilance are differential points between delirium and dementia.

Demented patients who develop delirium often lack agitation and overt hallucinations, and they may simply sink into an unresponsive state.
DELIRIUM

Presentation

1. If the mood or behavior changes rapidly, that is over hours to days rather than over weeks to months, or
2. If the patient has at any time been described as confused or disoriented, strongly suspect Delirium.

The following guidelines should be remembered:

1. Delirium need not mean agitation.
   Delirium may manifest as withdrawn behavior along with global cognitive deficits.

2. Delirious patients can be lucid.
   Lucid periods are frequently part of the course of delirium.

3. Delirious patients can be tearful or irritable.
   Delirious patients frequently have a depressed or irritable mood, or a labile affect which is often misdiagnosed as a depression.
4. Delirium is a common presentation of medical illness.

- Up to one-third of demented hospitalized geriatric patients are likely to have Delirium superimposed upon their dementia.
- Fifty percent of postop hip patients may manifest delirium.

**Causes**

- By definition, the disorder requires cerebral dysfunction due to systemic or central nervous system disease, to exogenous physical or chemical agents, or to withdraw from certain substances of abuse (for example alcohol or sedative-hypnotics).

**Osteoporosis**

- In 1990, there were approximately 250,000 hip and 500,000 vertebral fractures in American women.
- Men suffer rates of approximately one-third this.
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Osteoporosis

- Osteoporotic fractures cost the American health care system $14 billion in 1997, with a $50 billion projected cost by 2040.
- This is more than the projected costs of either stroke, breast cancer, diabetes, or chronic lung disease.

Disease-a-Month 1999; 45:23-49

Prevalence of Osteoporosis in Women

<table>
<thead>
<tr>
<th>Age, years</th>
<th>NHANES III*</th>
<th>EPIDOS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-84</td>
<td>42%</td>
<td>46%</td>
</tr>
<tr>
<td>85-89</td>
<td>51%</td>
<td>56%</td>
</tr>
<tr>
<td>≥ 90</td>
<td>57%</td>
<td>60%</td>
</tr>
</tbody>
</table>

*J Bone Miner Res 1995;10:796-802
**Osteoporosis Int 1998;8:247-254

Osteoporosis

Lifetime fracture risk in a 50 year old Caucasian woman

<table>
<thead>
<tr>
<th>Location</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spine</td>
<td>32</td>
</tr>
<tr>
<td>Hip</td>
<td>16</td>
</tr>
<tr>
<td>Distal radius</td>
<td>15</td>
</tr>
</tbody>
</table>

Arch Intern Med 1989;149:2445-2448

Osteoporosis

These risks exceed her risk of developing endometrial or breast cancer.


For men, the risk of similar fractures is 13%, equivalent to that of prostate cancer.

**Hip Fractures**

- Incidence is approximately 250,000 cases per year in the US.
- Eighty-five percent occur in patients older than 65 years.
- This number is expected to double by 2025.
- Seventy-five percent occur in women.


**Advancing age is a powerful risk factor:** by 90 years of age, one-third of women and one sixth of men will have experienced a hip fracture.


**Prevalence and Morbidity of Falls**

- In 1948, Sheldon performed a landmark review study on a random sample of elderly residents in England. Included in a larger series of health-related items was the question, “Are you liable to fall?”
- Forty-three percent of the women and 21% of the men answered yes.

Prevalence and Morbidity of Falls
- Since 1948, numerous studies have confirmed that each year, one-third of community-dwelling persons who are 65 and older fall; of these, one half suffer multiple episodes of falling.

In the United States, the fifth leading cause of death in persons older than 65 is accidents, and falls constitute two-thirds of these accidents.

Prevalence and Morbidity of Falls
- 1% Hip fracture
- 5% Other fractures
- 5% Serious soft tissue injuries
- 50% Abrasions or contusions
- 2% Hospitalization
  - 50% one year mortality
  - Hip fractures a prime cause

Etiology of Falls
The majority of falls are multi-factorial in origin, resulting from the accumulated effect of multiple impairments of the sensory, central integrative, and musculoskeletal components, any one of which alone might not have caused falling.
RISK FACTORS

Environmental Hazards

Drugs

Weakness

Impaired ADL

Vertigo Age-related frailty

Medical illness

Sensory deficit

Gait/balance impairment

Sensory deficit

Fall Causes

syncope

drop attack

instability

dizziness

Rubenstein LZ, et. al. Archstone Foundation

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Causes of Falls in the Elderly

<table>
<thead>
<tr>
<th>Mean Percent</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident/Environment-related</td>
<td>31</td>
</tr>
<tr>
<td>Gait/Balance problems or muscle weakness</td>
<td>17</td>
</tr>
<tr>
<td>Dizziness/Vertigo</td>
<td>13</td>
</tr>
<tr>
<td>Drop attack</td>
<td>9</td>
</tr>
<tr>
<td>Confusion</td>
<td>5</td>
</tr>
<tr>
<td>Postural hypotension</td>
<td>3</td>
</tr>
<tr>
<td>Visual disorders</td>
<td>2</td>
</tr>
<tr>
<td>Syncope</td>
<td>0.3</td>
</tr>
<tr>
<td>Other specified causes*</td>
<td>15</td>
</tr>
<tr>
<td>Unknown</td>
<td>5</td>
</tr>
</tbody>
</table>


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The Multi-factorial Approach to Preventing Falls

Three large Meta-analyses have reviewed approximately 15 year of fall research:

-Cochrane Review

-RAND Review
RAND-HCFA, Evidence Monograph, HCFA Publication #HCFA-500-98-0281, Baltimore, Maryland.

-Chang Review

20 to 40 percent reduction in fall risk

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INCONTINENCE

Anatomy and Physiology

Storage of urine is mediated by:

1. detrusor relaxation
   CNS inhibition of parasympathetic tone (S2-S4),

2. sphincter closure
   Reflex increase in alpha adrenergic (T11-L2). and somatic activity (S2-S4).
INCONTINENCE

Anatomy and Physiology

Voiding is mediated by:
1. detrusor contraction
   - parasympathetic nervous system (S2-S4)
2. sphincter relaxation
   - somatic (S2-S4) and sympathetic nervous systems (T11-L2)

Changes associated with Aging

1. Decline in bladder capacity
2. Decline in the ability to postpone voiding
3. Decline in bladder compliance
4. Decline in urinary flow rate
5. Decline in maximal urethral closing pressure in women
6. Decline in urethral length in women
7. Possible increase in post-void residual but to no more than 25 to 50 cc
8. Alteration in pattern of fluid excretion

Transient Incontinence

Common causes can be recalled by the pneumonic DIAPPERS:

- Delirium, confusional state
- Infection - urinary (symptomatic)
- Atrophic urethritis /vaginitis
- Pharmaceuticals
- Psychological, especially depression
- Endocrine (hypercalcemia, hyperglycemia)
- Restricted mobility
- Stool impaction

None of these age-related changes causes incontinence.
Each of these physiologic changes predisposes to incontinence.
Urinary Incontinence is not a part of normal aging.
INCONTINENCE

Causes of Established Incontinence
The lower urinary tract can only malfunction in four ways:
The bladder either contracts when it should not (detrussor overactivity) or fails to contract when or as well as it should (detrusor underactivity), or the outlet resistance is high when it should be low (obstruction) or low when it should be high (outlet incompetence).

1. Detrusor Overactivity
   - Neurogenic causes (UMN)
     Stroke, Parkinson's disease, Alzheimer's disease
   - Non-neurogenic causes
     Bladder carcinoma / carcinoma in situ, cystitis, urethral obstruction/incompetence

2. Detrusor Underactivity
   - Neurogenic (LMN)
     Disc compression, plexopathy, surgical damage (anteroposterior resection), autonomic neuropathy (eg., diabetes mellitus)
   - Non-neurogenic
     Sequelae of outlet obstruction, idiopathic

3. Outlet Incompetence
   - Neurogenic
     Surgical lesion - rare
   - Non-neurogenic
     Urethral hypermobility due to pelvic floor laxity, sphincter damage (Type 3 stress incontinence) due to fibrosis from prior suspension operations
INCONTINENCE
4. Outlet obstruction
• Neurogenic
  Detrusor - sphincter dyssynergia in suprasacral spinal cord disease
• Non-neurogenic
  Prostatic enlargement / urethral stricture in men; large cystourethrocéle / distal urethral stenosis in women (uncommon).

PRESSURE ULCERS
Stage 1
• Nonblanchable erythema of intact skin, the heralding lesion of skin ulceration.
• In individuals with darker skin, discoloration of the skin, warmth, edema, induration, or hardness may also be indicators.

Stage 2
Partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.

Stage 3
Full thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.
PRESSURE ULCERS
Stage 4
Full thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (e.g., tendon, joint capsule).

PRESSURE ULCERS
• Pressure ulcers rarely if ever occur in the absence of immobility.
• Other risk factors include: incontinence, nutritional factors, and altered levels of consciousness.

PRESSURE ULCERS
Four factors have been implicated in the pathogenesis of pressure ulcers:
1. Pressure
2. Shearing forces
3. Friction
4. Moisture

PRESSURE ULCERS
• The most common sites of involvement of pressure ulcers are those where bony prominences underlie the skin.
• These most commonly include the sacral prominence in the supine position, the greater trochanter when lying on one's side, and the tuberosities of the ischium in the sitting position.