



# FRONTIERS IN GERIATRIC MEDICINE

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# Disclosures

I have no relevant financial conflicts of interest

# Objectives

At the conclusion of the session, participants will be able to  
:

1. Perform an assessment for frailty, delirium, and fall risk and initiate appropriate management
2. Select appropriate goals of diabetes management in different populations of older adults

FRAILTY

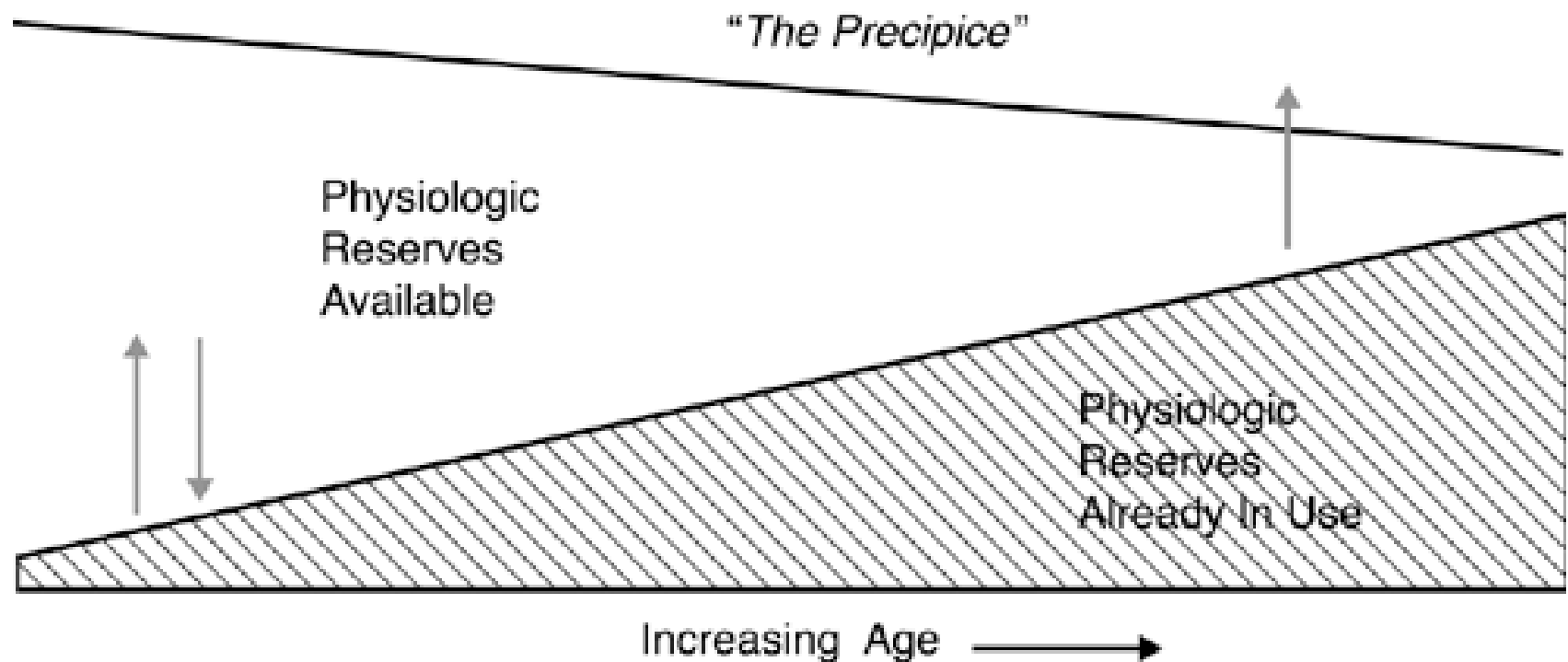
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**FRAILITY;**  
**New syndrome**  
**Old problem**

AN IMPORTANT  
MEDICAL SYNDROME  
4-17% PREVALENCE  
IN PEOPLE >65 YR



# Aging & Frailty



**Revised schematic of homeostenosis:** The older person employs or consumes physiologic reserves just to maintain homeostasis, and therefore there are fewer reserves available for meeting new challenges

## **FRAILITY AS A CORE CONCEPT (1 of 2)**

- Frail older adults are at high risk from stressors such as extremes of heat/cold, acute infection/injury, hospitalization, or surgery
- As a group, frail older adults are more likely to:
  - Have delayed recovery from illness and/or to fall
  - Develop greater functional impairment, including becoming disabled or dependent
  - Be hospitalized, with worse outcomes once hospitalized, including dependency
  - Die

## FRAILITY AS A CORE CONCEPT (2 of 2)

- Frailty is clinically observed to be a chronic, progressive condition, with a spectrum of severity
  - The most severely frail older adults appear to be in an irreversible, pre-death phase with high mortality over 6–12 mo
  - Earlier phases may be responsive to treatment, either to prevent or ameliorate the clinical manifestations of frailty
- **Primary frailty**—results from intrinsic aging processes
- **Secondary frailty**—associated with the end stages of several chronic diseases



# CONCEPTIONS OF FRAILITY

- Frailty is the outcome of a number of unrelated abnormal health conditions in an individual
  - This multimorbid state → increased risk of mortality and disability
  - The number of conditions predicts this vulnerability
- Frailty is a distinct physiologic syndrome resulting from dysregulation of multiple systems
  - Many of these systems interact
  - The aggregate impact is a decreased ability to maintain homeostasis in the face of stressors, resulting in vulnerability to adverse outcomes

# FRAILITY AS A PHYSIOLOGIC PROCESS

- According to the conception of frailty as a distinct physiologic syndrome, clinical manifestations are seen in:
  - **Strength**
  - **Balance**
  - **Motor processing**
  - **Nutrition**
  - **Endurance**
  - **Physical activity**
  - **Mobility**
  - **Cognition (possibly)**
- A phenotype has been validated that links all but the last in this list (*see next slide*)

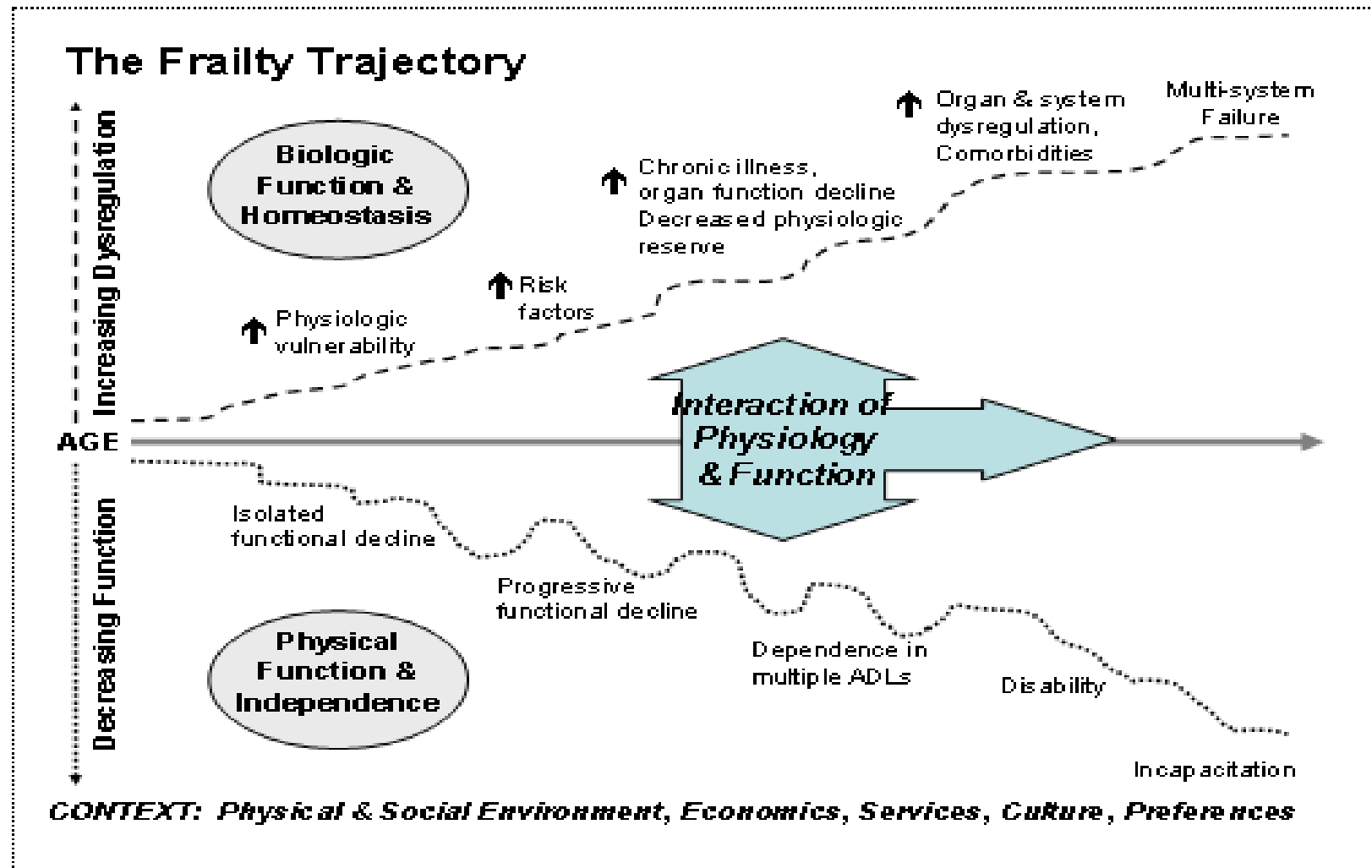
## **EVIDENCE AS TO CAUSE: PRIMARY FRAILITY**

- Although the fundamental underlying cause of frailty is still unknown, the intermediate process appears to entail the dysregulation of:
  - **Inflammation (indicated by increased IL-6 and CRP)**
  - **Decreased immune function**
  - **Anemia**
  - **Increased glucose intolerance, insulin resistance**
  - **Low levels of DHEA-S and IGF-1**
  - **Increased cortisol, low testosterone**
  - **Decreased heart rate variability**
  - **Nutritional derangements**
- The number of abnormal systems is a stronger predictor of the syndrome of frailty than dysfunction in any one system

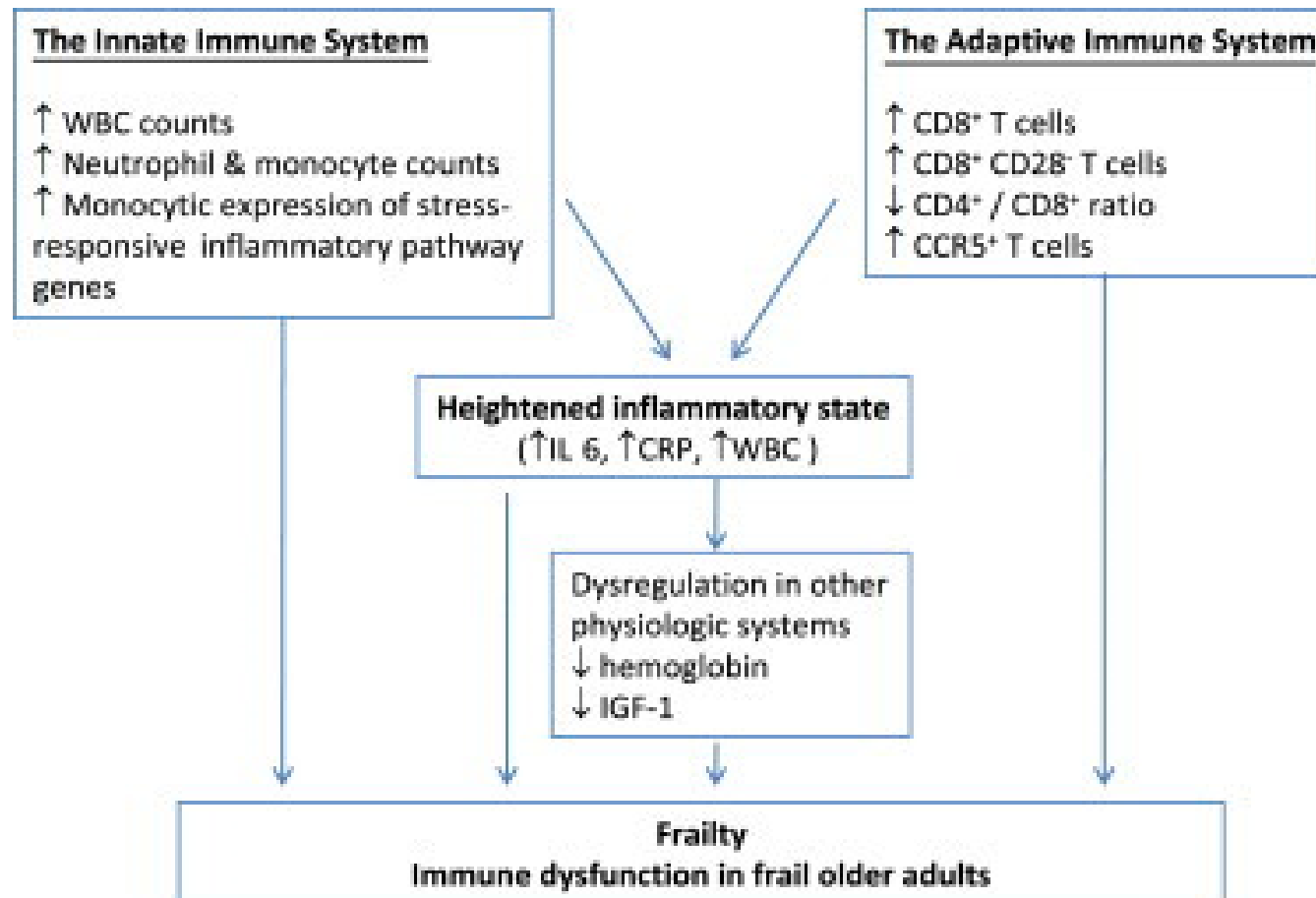
## **EVIDENCE AS TO CAUSE: SECONDARY FRAILITY**

- A variety of primary diseases independently predict development of the frailty phenotype, potentially through inflammation and/or their effect on cardiopulmonary function and inactivity:
  - **Immune disorders (HIV/AIDS)**
  - **Heart failure**
  - **COPD**
  - **Chronic infections (cytomegalovirus, tuberculosis)**

# The frailty trajectory

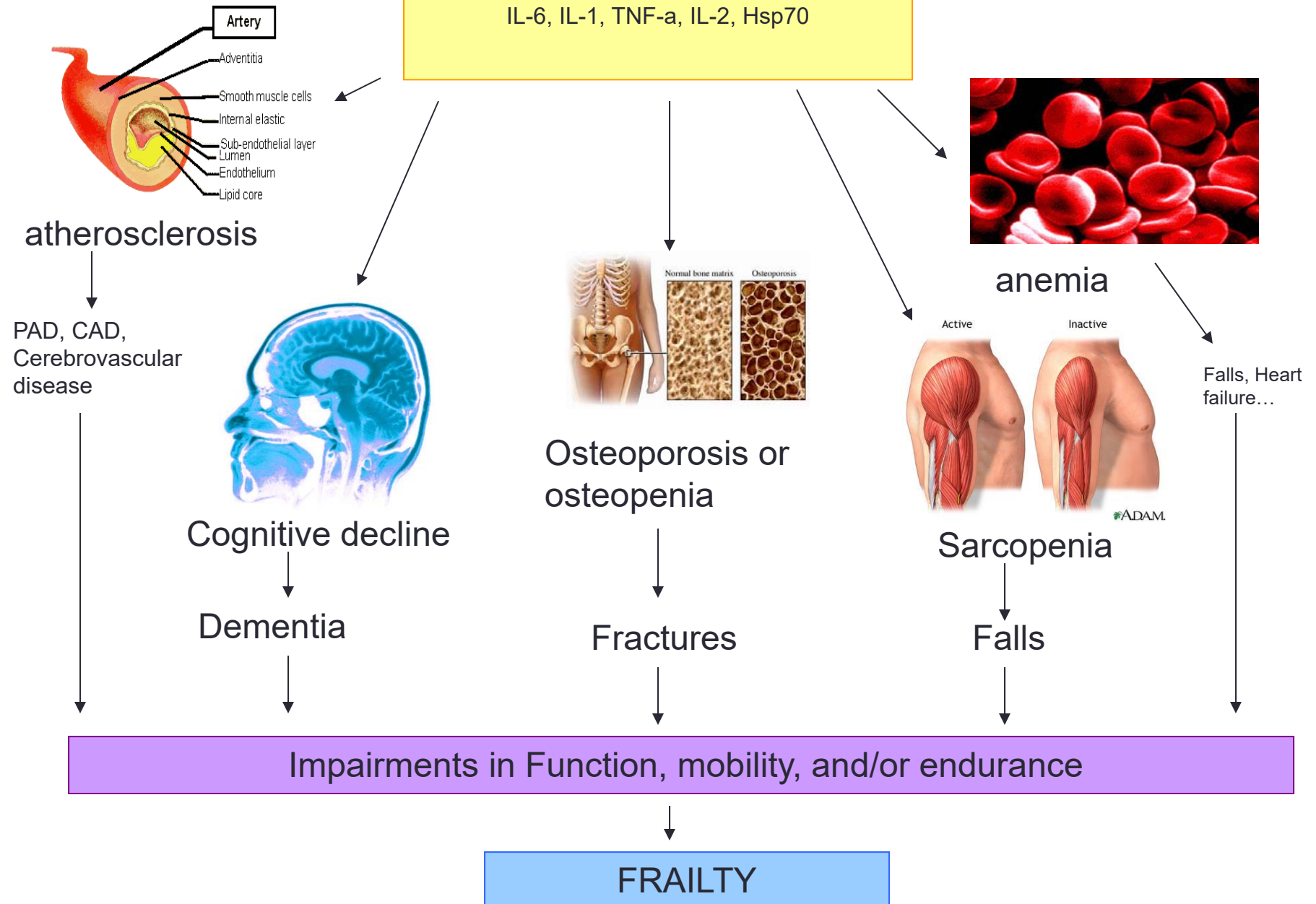


# Inflammation and immune system alterations in frailty



## Cytokine Over Expression

IL-6, IL-1, TNF- $\alpha$ , IL-2, Hsp70

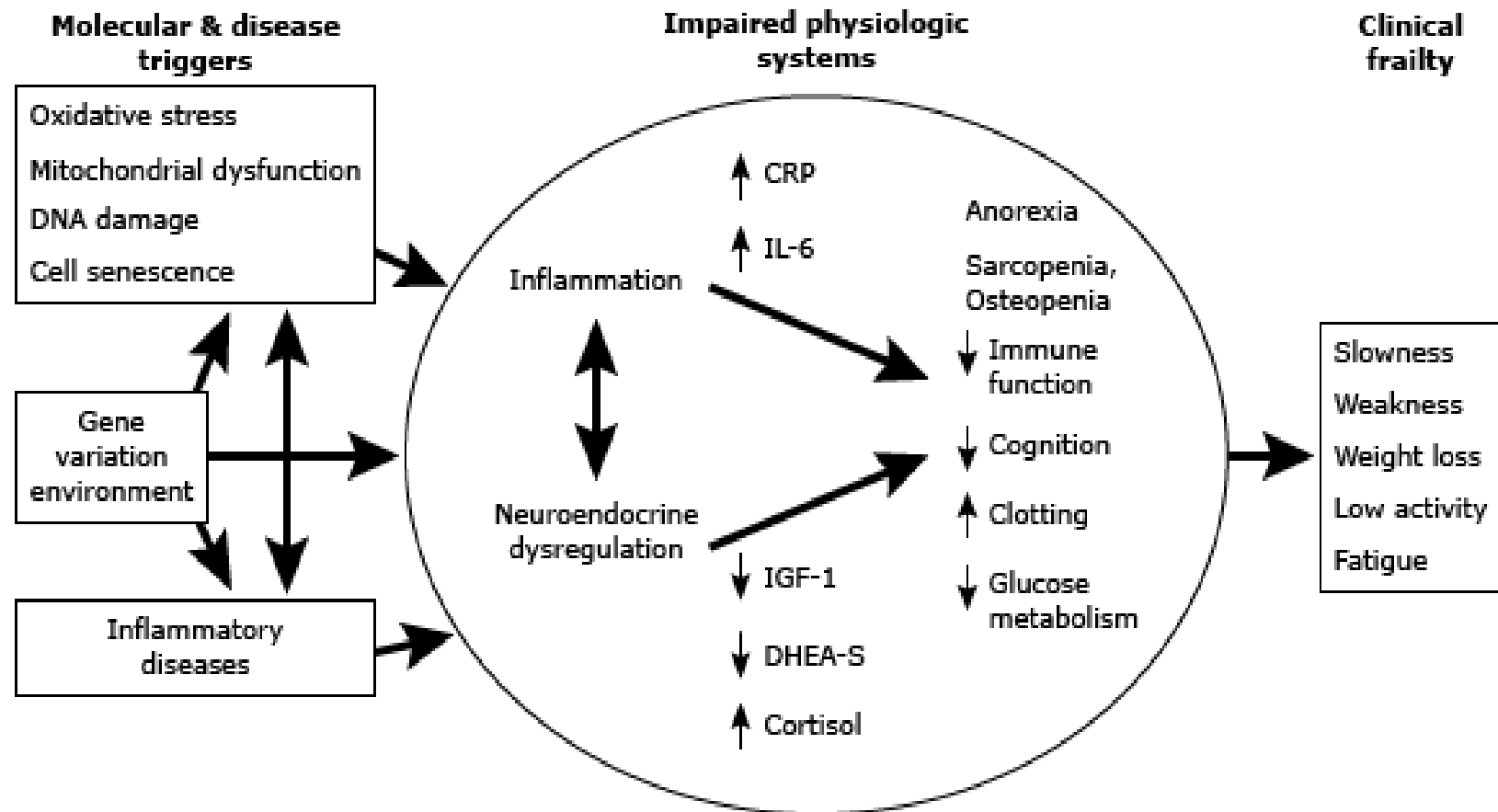


# Hormones & Frailty

Hormone	Deficient states may lead to the following
Growth Hormone, IGF-1	Sarcopenia, Osteoporosis
Testosterone	Cognitive decline, Depression, Osteoporosis
Estrogen *	Osteoporosis, Cognitive decline
Vitamin D	Osteoporosis, Sarcopenia, poor mobility
DHEA-S	Sarcopenia
Cortisol (▲)	Sarcopenia



## Hypothesized model of frailty and adverse health outcomes



Reproduced with permission from: Walston J, Hadley EC, Ferrucci L, et al. Research Agenda for Frailty in Older Adults: Towards a Better Understanding of Physiology and Etiology. *J Am Geriatr Soc* 2006; 54:991. Copyright © 2006 Wiley-Blackwell.

## Triggers to Recognize & Screen for Frailty

- Advanced age ( $>70$ ,  $\geq 75$ ,  $\geq 80$ ???)
- Suspected functional impairments
- Suspected cognitive impairment
- Consider if /and
  - ☐ Multiple co-morbidities
  - ☐ Psychosocial issues
  - ☐ Sensory impairments
  - ☐ Severe acute illness

## ASSESSMENT OF FRAILITY (1 of 2)

- Screen patients for frailty to:
  - Identify those at risk of adverse outcomes
  - Gauge the severity of risks
  - Find those who may benefit from prevention or treatment
  - Track change in status over time
  - Determine eligibility for palliative care for those at end stage
- The cumulative number of symptoms, signs, illnesses, and disabilities present is useful to characterize aggregate morbidity burden

## ASSESSMENT OF FRAILITY (2 of 2)

- Ways to assess frailty:
  - Assess number of phenotypic frailty criteria present (out of 5)
  - Rapid screening/assessments that have been validated, such as the interview-based FRAIL scale
  - Clinical Global Impression of Change in Physical Frailty (CGIC-PF): for frailty as a clinical composite or “gestalt”
  - Walking speed or grip strength (early manifestations of frailty syndrome)

# FRAILITY : A PHYSIOLOGIC PROCESS

## QUESTIONS FOR AN OFFICE VISIT

Characteristic	Criteria for frailty*
Weight loss	Lost >10 pounds unintentionally last year
Exhaustion	Felt last week that “everything I did was an effort” or “I could not get going”
Slowness	Time to walk 15 ft (cutoff depends on sex and height)
Low activity level	Expends <270 kcal/week (calculated from activity scale incorporating episodes of walking, household chores, yard work, etc.)
Weakness	Grip strength measured using hand dynamometer (cutoff depends on sex and BMI)

\*For specific measures and details for determining frailty criteria, see Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci*. 2001;56(3):M146-156.

## FRAIL - Questionnaire Screening Tool

- **F**atigue: Are you fatigued?
- **R**esistance: Cannot walk up 1 flight of stairs?
- **A**erobic: Cannot walk 1 block?
- **I**llnesses: Do you have more than 5 illnesses?
- **L**oss of weight: Have you lost more than 5% of your weight in the past 6 months?

Screen all persons over 70 yrs for frailty

## PREVAILING STRATEGIES FOR MANAGING FRAILITY (1 of 3)

**Comprehensive geriatric assessment and management** is designed to optimize outcomes for frail older adults, particularly preservation of their independence

- This team-based, multidisciplinary approach has positive effects on polypharmacy, falls, functional status, nursing-home admission, and mortality
- Should be coupled with accurate screening for frailty and ongoing, expert geriatric care

## PREVAILING STRATEGIES FOR MANAGING FRAILITY (2 of 3)

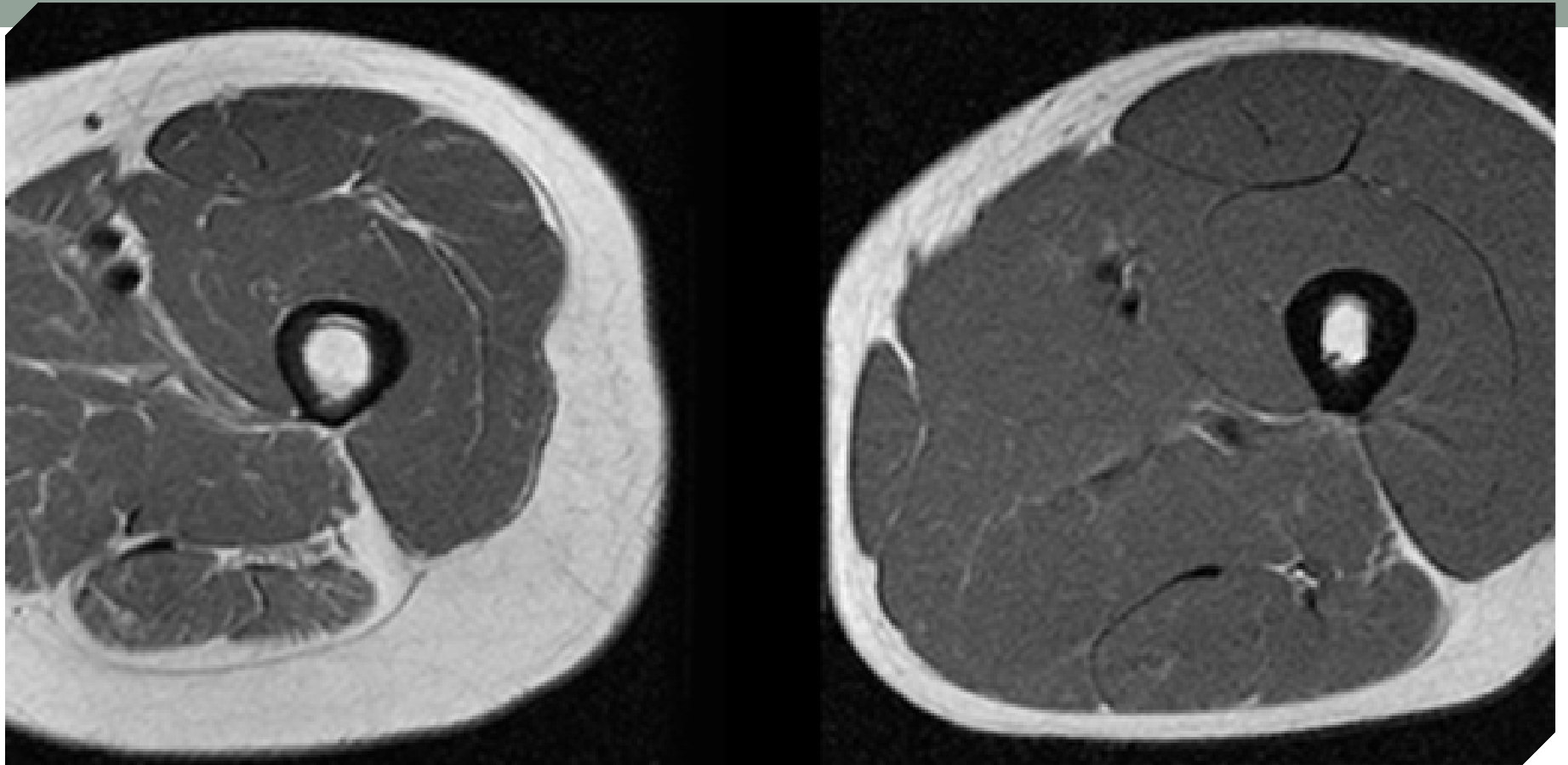
The focus of care should be to:

- **Exclude any modifiable precipitating causes of frailty**, including causes that are treatable or environmental
- **Improve the clinical manifestations of frailty**, especially low physical activity, strength, exercise tolerance, and nutrition, Vitamin D, reduce polypharmacy, immunization
- **Minimize the consequences of vulnerability**, whether in terms of environmental risks, risks from low social support, or risks from stressors such as acute illness or injury, hospitalization, or surgery



## POTENTIAL PREVENTION OF FRAILITY: BEHAVIORAL APPROACHES (1 of 2)

- Maintaining physical activity and muscle mass is critical in older adults at risk of frailty
- Resistance, or strengthening, exercise is effective in increasing muscle mass, strength, and walking speed in frail older adults
- Other forms of exercise, including stretching, Tai Chi, and aerobic exercise, are also helpful
- **Preventing immobility is critical**



Cross section of a thigh in a 65 year old  
and a 25 year old

## POTENTIAL PREVENTION OF FRAILITY: BEHAVIORAL APPROACHES (2 of 2)

- Consumption of a Mediterranean diet has been shown to lower the risk of becoming frail over 6 years in community-dwelling adults  $\geq 65$
- Attention to preventing nutritional inadequacy is important, including supplementation of **protein, calories, and micronutrients**
- In many studies, nutritional supplementation appears to be effective **only when added to exercise**

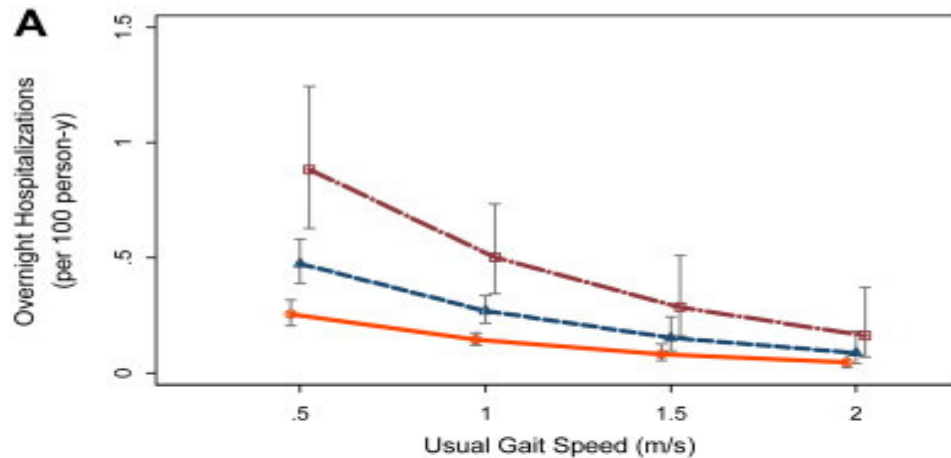
## Hormonal intervention

- Efficacy of hormone replacement in treating frailty not established
- Hormone therapy only indicated if there is clear clinical deficiency
- Testosterone replacement in older men can increase lean muscle mass, muscle strength, and aerobic endurance and reduces whole-body and trunk fat, *its effect on function has yielded mixed results*
- Vitamin D in older adults with vitamin D deficiency increases muscle strength and function and decreases falls and hip fractures, *its efficacy in frailty intervention has not been reported*
- -GH administration to older adults with low IGF-1 levels increases lean body mass and BMD and reduces body fat mass, *effect on frailty remains unknown*

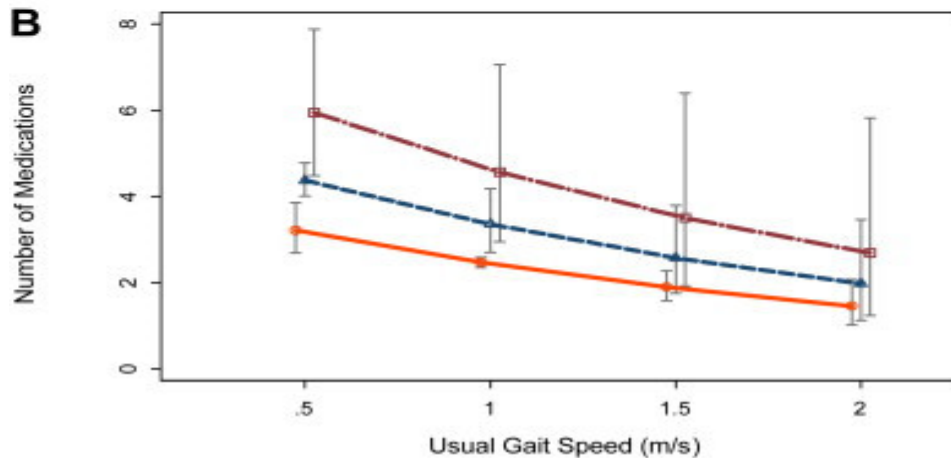
## PREVAILING STRATEGIES FOR MANAGING FRAILITY (3 of 3)

- The approaches that older adults use to adapt to age-related psychosocial losses and behaviors can also be applied to frailty:
  - Carefully choose goals
  - Optimize the abilities needed to reach these goals
  - Compensate for diminished competencies by increased reliance on other functions or by replacement
- Clinical management should include such approaches for care of frail older adults, as well as more standard medical approaches

# Walk as if your life depends on it! (it may)



(A) Rate of overnight hospitalization among older adults in NHANES 1999 to 2002, according to usual gait speed and presence of 1, 3, or 5 chronic diseases.



(B) Number of medications taken by older adults in NHANES 1999 to 2002, according to usual gait speed and presence of 1, 3, or 5 chronic diseases.

## Risk of rehospitalization—look like a definition of frailty risk!

- Age over 80
- Inadequate social support
- Multiple active chronic health problems
- History of depression
- Moderate-severe functional impairment
- Multiple hospitalizations past 6 months
- Hospitalization past 30 days
- Fair or poor health self rating
- History of non-adherence to medical regimen

Naylor M, Broton D, Campbell, et al. JAMA. 1999;17:613-620

## Possible ICD-10 codes to use

- |         |                           |
|---------|---------------------------|
| • R54   | • Frailty                 |
| • R53.2 | • Functional quadriplegia |
| • R54   | • Debility, unspecified   |
| • R53.8 | • Malaise and fatigue     |



# DELIRIUM: EARLY RECOGNITION AND MANAGEMENT

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## DSM-IV definition

- A syndrome composed of disturbances of consciousness, attention (ie arousal), and cognition, with abrupt onset and fluctuating course, and requires that the disturbance be etiologically related to medical causes

# CONFUSION ASSESSMENT METHOD

- Requires features 1 and 2 and either 3 or 4:
- 1. Acute change in mental status and fluctuating course
- 2. Inattention
- 3. Disorganized thinking
- 4. Altered level of consciousness

## CAM-S is using the CAM and grading it in severity

score	Feature of Delirium	Assesement
0-1	Fluctuating course	Where they better during nursing rounds than they were now?
0-2	Altered mental status	Observe if they are lethargic→ vigilant
0-2	Inattention	They are not following the conversation, staring out into a window
0-2	Disorganized thinking	Do they change topics or they make no sense

Short form is 0 to 7, where 7 is considered the most severe.

Inoute SK et al Ann Intern Med. 2014; 160:526-33

# DELIRIUM TAKES VARIOUS FORMS

- Hyperactive or agitated delirium
  - 30% of all cases
- Hypoactive delirium
  - 25% of all cases
  - less recognized or appropriately treated
- Mixed
  - 45% of all cases
- Additional features include emotional symptoms, psychotic symptoms, “sundowning”

# PREDISPOSING FACTORS

- **Advanced age**
- **Dementia, stroke, Parkinson's disease**
- **Functional impairment in ADLs**
- **Medical comorbidity**
- **History of alcohol abuse**
- **Male sex**
- **Sensory impairment (↓vision, ↓hearing)**
- **High Bun/creat ratio (dehydration)**
- **Cancer**

# Common Causes of Delirium and Confusional States

- Acute cardiac events (MI, CHF)
- Acute pulmonary events
- Brain disorders (infection, HI, hypertensive encephalopathy)
- Drugs
- Drug withdrawal (sedatives, alcohol)
- Fecal impaction
- Fluid or electrolyte disturbances
- Hypoglycemia, hypoxemia
- Indwelling devices
- Fever/hypothermia
- Infections (sepsis, UTI)
- Liver, renal failure
- Nutritional deficiencies
- Physical; burns, trauma
- Restraints
- Severe anemia, thrombocytosis
- Uncontrolled pain
- Urinary retention
- Social isolation

# D.E.L.I.R.I.U.M.

**D**rugs: \*

**E**lectrolytes : Na, Ca, glucose

**L**ack of drugs : Benzodiazepenes and ETOH withdrawal

**I**nfection especially respiratory, UTI, sepsis

**R**etention: Urinary retention, Fecal retention

Reduced vision and hearing

**I**ntracranial: meningitis, hemorrhage (DIC), stroke,  
subarachnoid hemorrhage, tumor

**U**remia: Dehydration

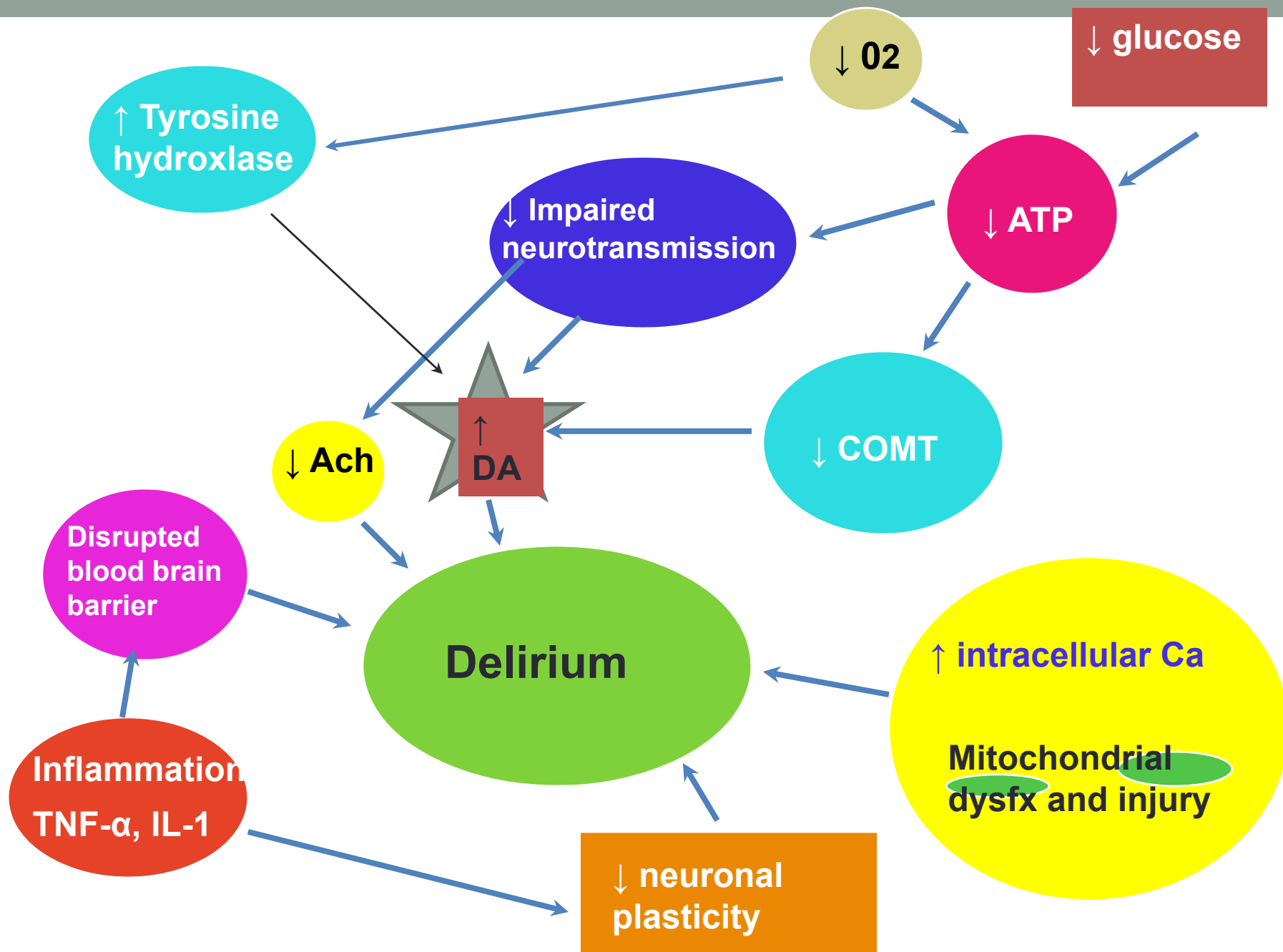
Uncontrolled pain

**Myocardial, pulmonary: MI, arrhythmia, worsening  
CHF/ COPD, hypoxia**



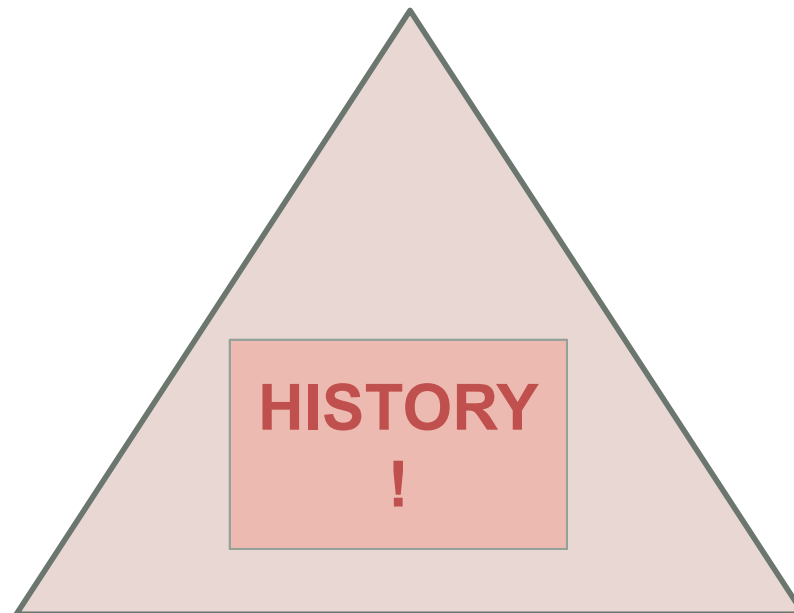
# Pathogenesis of Delirium

- Disruption of the ascending RAS from mid-pontine level and non-dominant parietal and frontal lobes (arousal and attention)
- Impairment of higher cortical function (insight and judgment; slowing of alpha waves and slow waves) as well as subcortical
- Reduced acetylcholine activity (anticholinergic agents)
- Alterations in neuropeptides (somatostatin, endorphins, serotonin, norepinephrine, GABA)
- Pro-inflammatory cytokines (interleukins and TNF alpha)



# Initial work up

**Medication review**



**Vitals**

**Include PAIN**

**Oxygenation**  
**Blood glucose**

# Continued working up of delirium

- The physical exam:

- Hydration
- Skin condition, infection
- Stool for retention
- Urinary retention (PVR)
- Always assess for pain
- Neurological exam, trauma, bitten tongue

- Labs/Radiology:

- BMP
- CBC c diff, UA, Urine culture, CXR
- PT/ PTT
- LFT's, Ammonia if pertinent
- Drug levels (beware “therapeutic” levels of digoxin, lithium, quinidine)
- ***CT brain if neurological exam is abnormal/trauma***
- ***EEG if altered consciousness, LP if symptoms***

## MANAGEMENT OF DELIRIUM

- Incident delirium can be reduced by 1/3 by managing:
  - Sleep deprivation
  - Cognitive impairment
  - Immobility
- To prevent or ameliorate delirium:
  - Avoid medicines associated with delirium
  - Prevent and treat infection
  - Detect and correct metabolic abnormalities
  - Frequently orient patients with cognitive or sensory impairment
  - Avoid excessive bed rest, room changes, and restraints

# MANAGEMENT:

## DRUGS TO REDUCE OR ELIMINATE

Almost any medication if time course is appropriate

- Alcohol
- Antibiotics and antivirals
- Anticholinergics
- Anticonvulsants
- Antidepressants
- Antihistamines
- Antiparkinsonian agents
- Antipsychotics
- Barbiturates
- Benzodiazepines
- Chloral hydrate
- H<sub>2</sub>-blocking agents
- Hypoglycemics
- Lithium, phenothiazines
- NSAIDS
- Muscle relaxants
- Opioid analgesics (esp. meperidine)

Cardiovascular and hypertension drugs  
antiarrhythmics, diuretics, digoxin,  
beta-blockers, clonidine, methyldopa

## MANAGEMENT: BEHAVIORAL PROBLEMS

- Provide “social” restraints
- Consider a sitter or allow family to stay in room
- Avoid physical or pharmacologic restraints
- **If absolutely necessary, use haloperidol**
  - for mild delirium: 0.25-0.5 mg po or 0.125-0.25 mg IV/IM
  - for severe delirium: 0.5-2 mg IV/IM
  - assess for akathisia and extrapyramidal effects
  - avoid in older persons with parkinsonism
  - in ICU, monitor for QT interval prolongation, torsade de pointes, neuroleptic malignant syndrome, withdrawal dyskinesias
  - Atypical antipsychotics NOT approved by the FDA but low dose risperidol is used
  - Endpoint is an awake manageable pt
  - Benzodiazepenes only for withdrawal syndromes

## ALTERNATIVES TO RESTRAINTS

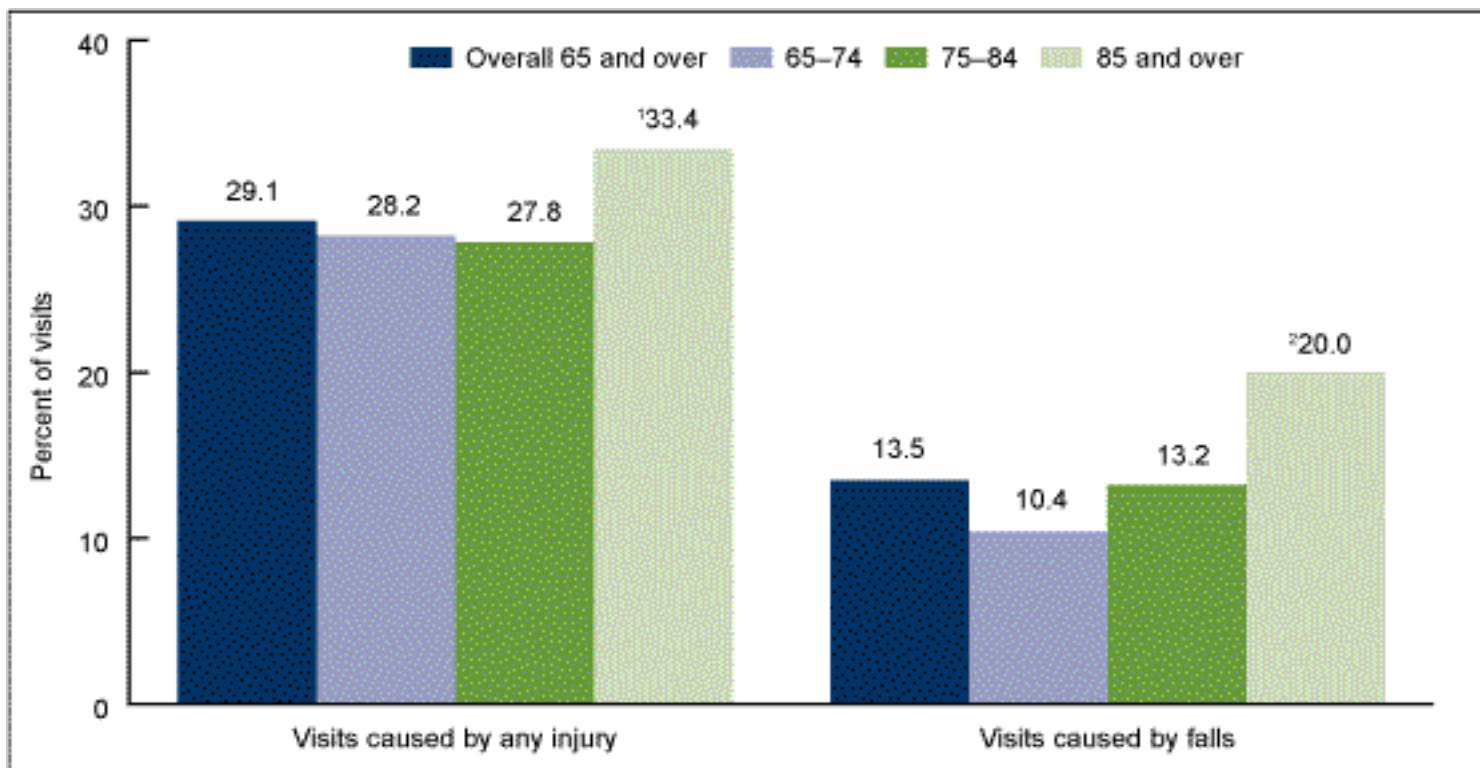
- **Commitment of the administration** to a restraint-free environment and awareness of ethical, legal, and clinical issues surrounding their use
- **Nursing evaluation of patient for treatable causes of agitation** (pain, hypoxia, need for BR, infiltrated iv, SE of medication) and response to intervention
- **Physician evaluation** (examination, laboratories, medication review, tubes, procedures, pharmacotherapy?)
- Activities Box
- Functional Intensive Care/ Dayroom
- Sitters (including family)
- Alarms - Wanderguard, Monitech wheelchair monitor, Tabs Mobility Monitor, door alarms



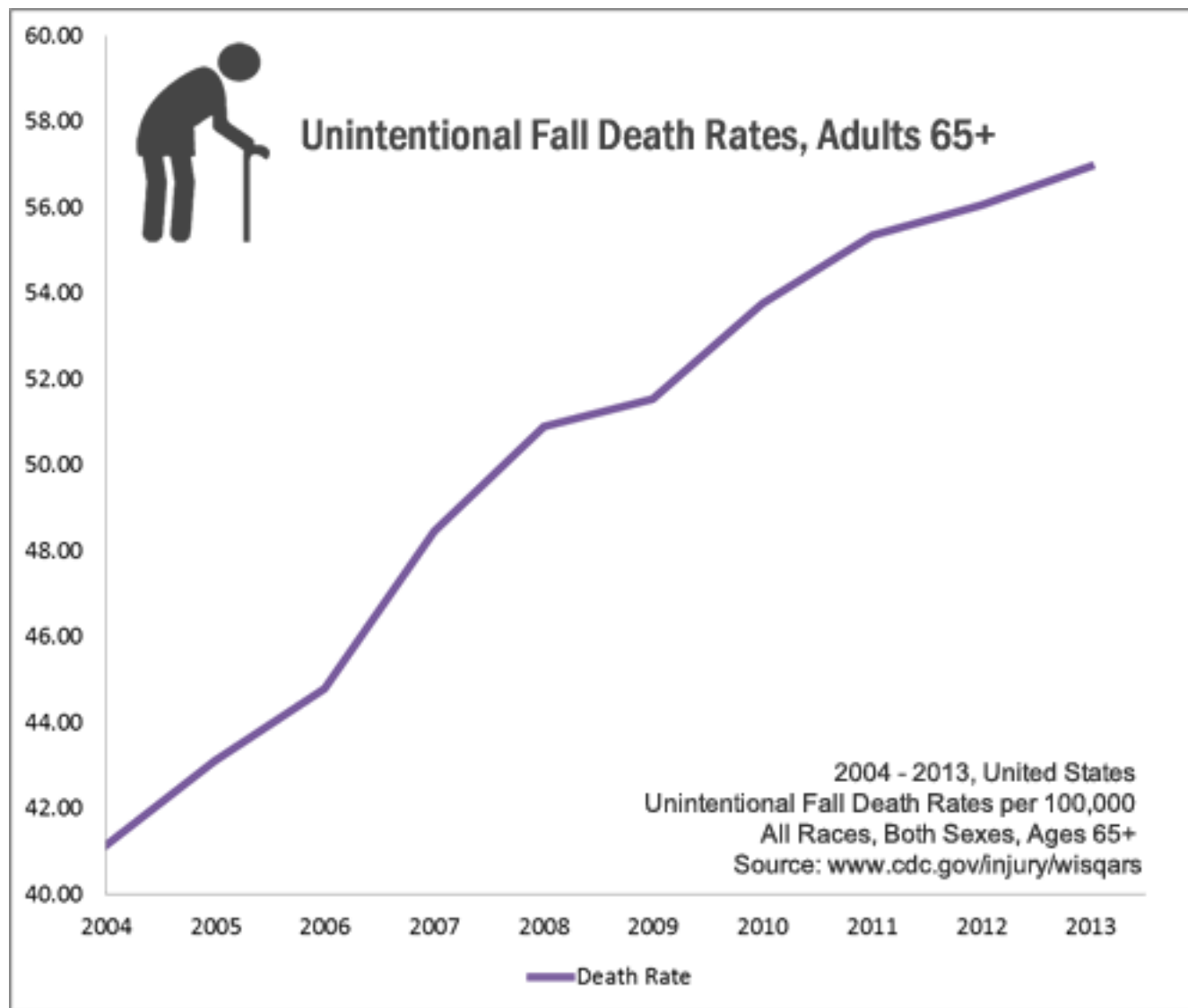
# FALL RISK

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Percentage of emergency department visits caused by any injury and by unintentional falls for persons aged 65 and over: United States, 2009–2010



NCHS Data Brief No. 130, October 2013



[Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Jan 16<sup>th</sup>, 2016](#)

# Scope of the problem

- Each year, approximately 28-35% of adults >65 experience a fall (WHO 2007); half of them are unable to get up
- Falling is a significant cause of injury and death in older persons, and is associated with morbidity and mortality
- Also linked to poorer overall functioning and early admission to long-term care facilities
- Effective fall prevention has the potential to reduce serious fall-related injuries emergency department visits, hospitalizations, NH placements, and functional decline
- Reducing fall risk in older individuals is therefore an important public health objective Healthy People 2010

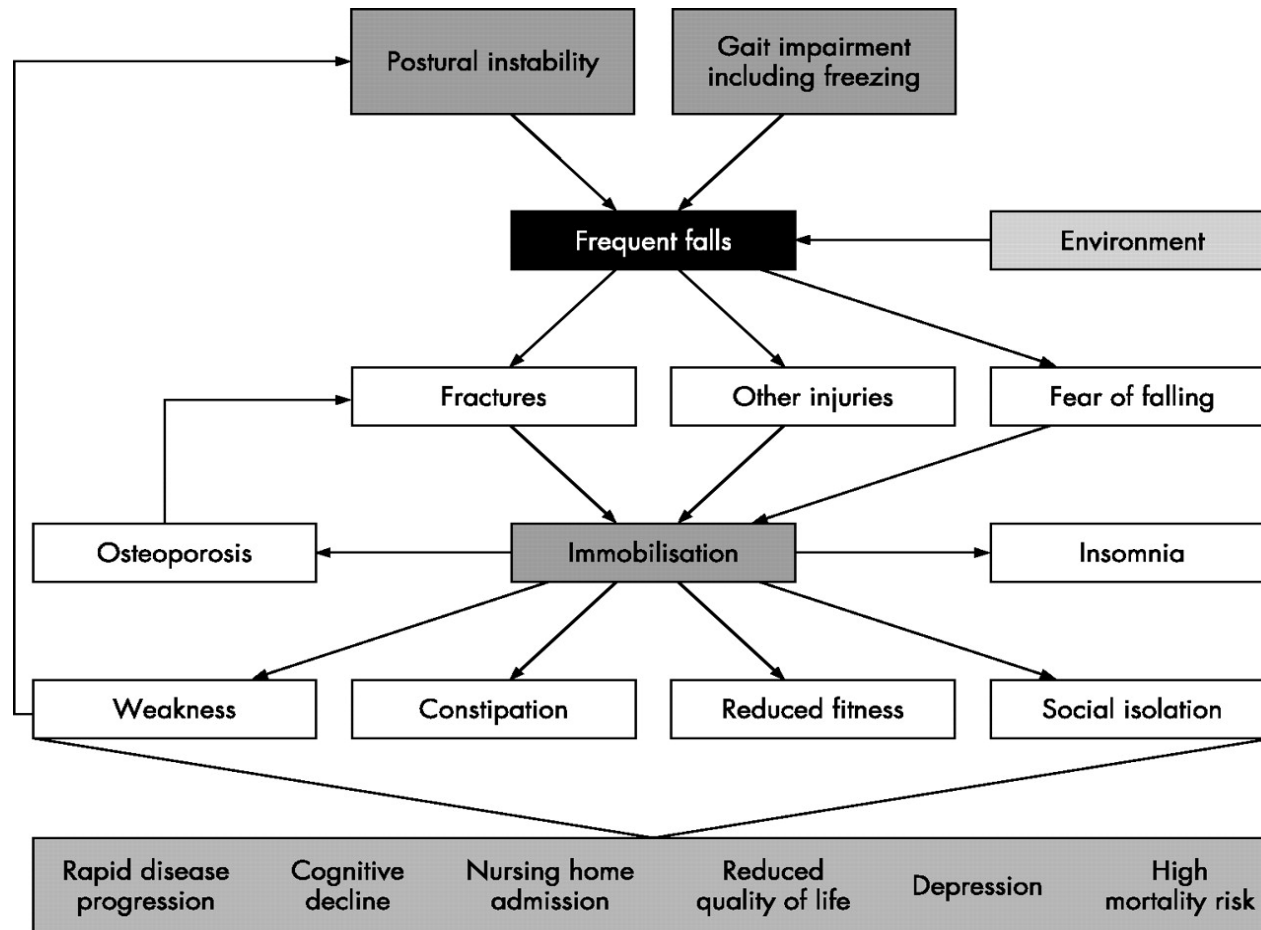
# Falls and TBI

- Falls are the most common cause of **traumatic brain injuries** (TBI)
- MCI, dementia, polypharmacy, and assistance with ambulation were predictive factors for fall-related TBI
- A comprehensive ED evaluation for falls and assessment of fall risk may prevent future falls (Teo D et al, submitted to Geriatr and Gerontology 2017)
- Over 700,000 patients a year are hospitalized because of a fall injury, most often because of a head injury or hip fracture
- Each year at least 250,000 older people are hospitalized for hip fractures
- More than 95% of hip fractures are caused by falls, usually by falling sideways

# Some Potential Complications of Falling

- Abrasions and lacerations
- Bruising and contusions
- Head injury (e.g., concussion, subdural hematoma)
- Fear of falling, resulting in loss of confidence, decreased independence, and social isolation
- Fracture, sprain, dislocation, or other joint injury
- Hemorrhage (internal or external bleeding)

# The vicious cycle of falling



# Causes of falls in the elderly; usually multifactorial

Rarely due to single cause

- **Intrinsic causes**
  - age-related changes, acute or chronic conditions, medication effects
- **Extrinsic causes**
  - environment or activities, inability or failure to follow safety measures



# The History is (Still) Everything!

## From Who?

- Patients
- Family
- Caregivers
- Landlords
- Referring institution
- EMS/ transport
- Home health workers
- Dialysis centers

## Of What?

- Fall circumstances
- Baseline mental status and cognition
- Baseline functional status
- Medications (and changes)
- Co-morbidities
- Assistive devices
- Support system
- Condition of the home (EMS, caregivers, police)

# Intrinsic factors

- Age >80 years
- Anemia \*
- Arthritis
- Balance deficit
- Cardiac arrhythmias
- Cognitive impairment
- Dehydration
- Electrolyte imbalance or hypoglycemia
- Depression
- Diabetes
- Dizziness or vertigo
- Fall history
- Fear of falling
- Female sex\*
- Gait and mobility problems (e.g., foot problems, peripheral neuropathy, \* Parkinson's disease\*, stroke)
- Low vitamin D

\*Pandya N, et al. Curr Med Res Opin 2008; 24: 2139-2149.  
Dharmarajan TS et al. J Am Med Dir Assoc 2007; 8: e9-e15.

# Extrinsic factors

- Alcohol intoxication
- Any recent hospitalization
- Environmental factors (e.g., slippery surfaces, poor lighting, obstacles)
- Inappropriate footwear
- **Medications and polypharmacy\***
- Multifocal lens\* or inappropriate glasses
- Use of assistive devices

Rubenstein LZ et al. Ann Intern Med 1994; 121: 44

Johnson L et al. J Am Geriatr Soc 2008; 56: 178-180.2-451

# General Gait Assessment: What to look for in the elderly person

## Changes in gait with aging

- Average gait speed declines 12% to 16% per decade past 70 yrs.
- Stride frequency increases
- Stride length decreases at a given walking speed

# Some Categories of Medications That May Increase Fall Risk -1

- Antiarrhythmics
- Anticholinergics
- Antidepressants (tricyclics, selective serotonin reuptake inhibitors, serotonin–norepinephrine reuptake inhibitors)
- Antidiabetic agents
- Antiepileptics
- Antihypertensives
- Antiparkinsonian agents

## Some Categories of Medications That May Increase Fall Risk -2

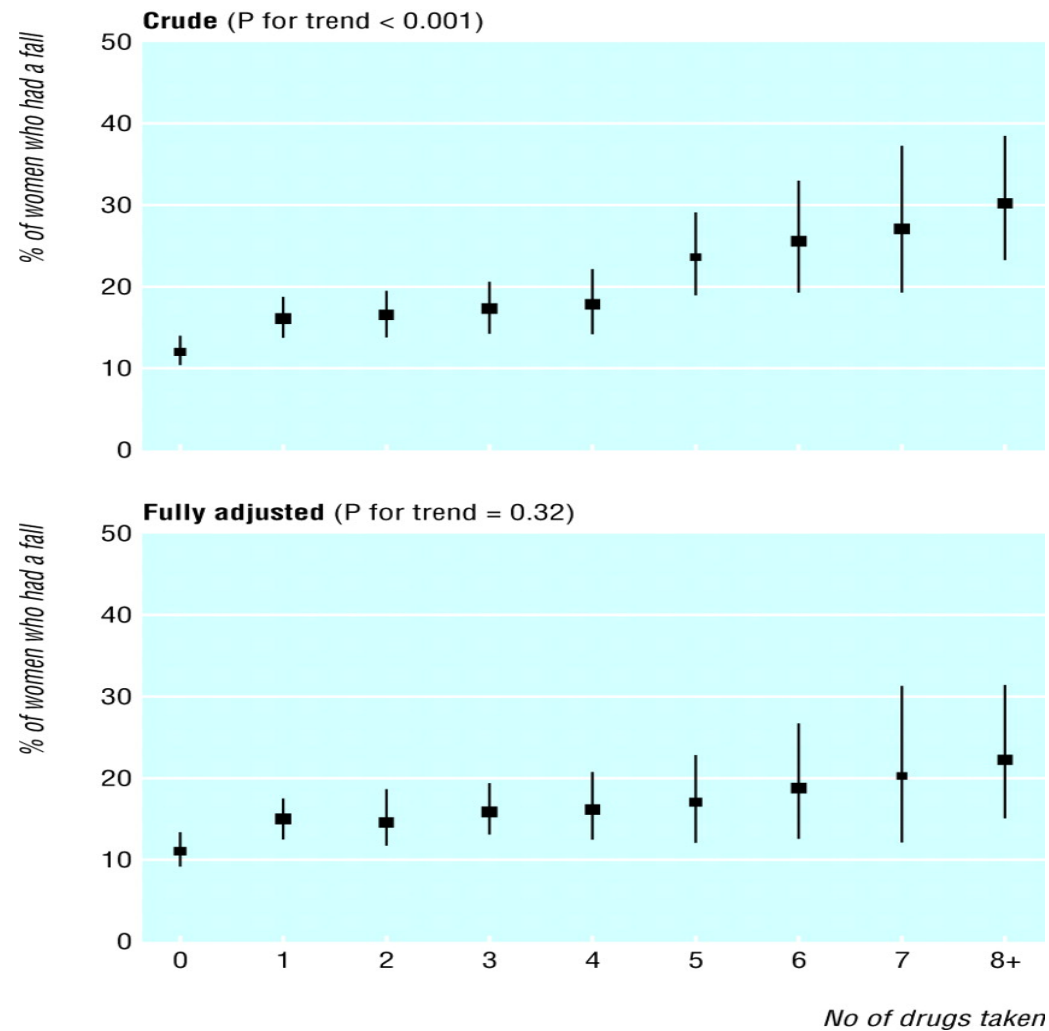
- Antipsychotic medications (typical and atypical)
- Benzodiazepines (both short acting and long acting)
- Cholinesterase inhibitors
- Diuretics
- Opioid analgesics
- Sedative hypnotics
- Urinary antispasmodic agents
- Vasodilators

## Meta-analysis of the Impact of 9 Medication Classes on Falls in Elderly Persons

22 articles, 79000 participants  
*Arch Intern Med.* 2009;169(21):1952-1960.

Medication Class	OR
Antihypertensive agents	1.24
Diuretics	1.07
$\beta$ -blockers	1.01
Sedatives and hypnotics	1.47
Neuroleptics and antipsychotics	1.59
Antidepressants	1.68
Benzodiazepines	1.57
Narcotics	0.96
NSAIDS	1.21

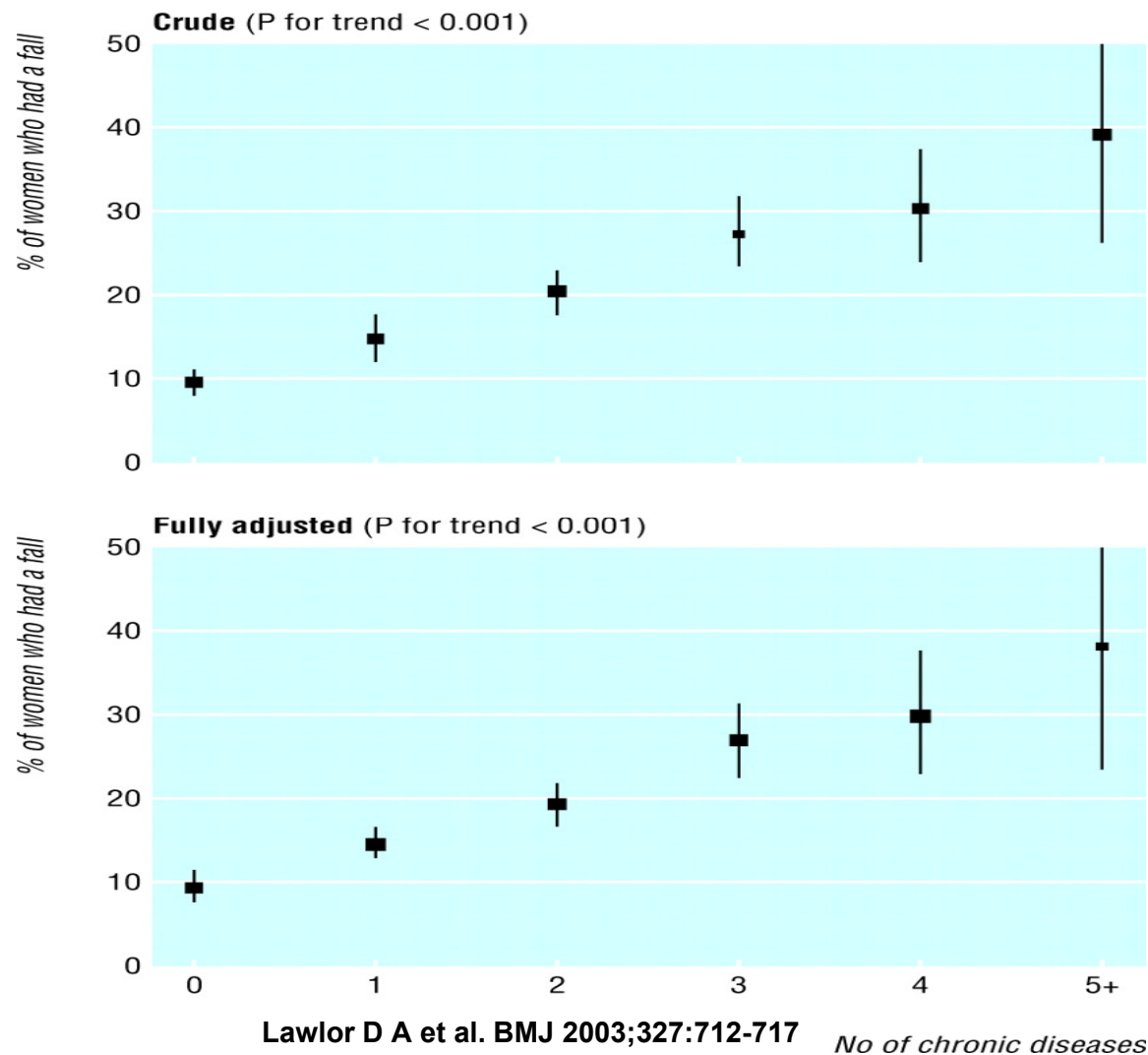
**Prevalence of falls in the previous 12 months and number of drugs taken (crude data and fully adjusted for age, each chronic disease, body mass index, alcohol consumption, haemoglobin concentration, and social class).**



Lawlor D A et al. BMJ 2003;327:712-717



**Prevalence of falls in the previous 12 months and number of simultaneous chronic diseases  
(crude data and fully adjusted for age, each drug taken, body mass index, alcohol  
consumption, haemoglobin concentration, and social class).**



# AGS/BGS FALLS PREVENTION GUIDELINES

- Most commonly identified interventions to prevent falls in community dwelling elders:
  - Ask about falls in the past year
  - Prescribe exercise, particularly balance, strength, and gait training
  - Assess function routinely; annually?
  - Discontinue or minimize psychoactive and other medications; annual medication review?
  - Manage postural hypotension
  - Manage foot problems and footwear
  - Supplement vitamin D
  - Treat vision impairment
  - Manage heart rate and rhythm abnormalities
  - Modify the home environment

# CLINICAL GUIDELINES

- Ask all older adults about falls in past year
- Single fall: check for balance or gait disturbance
- Recurrent falls or gait or balance disturbance:
  - Pursue a multifactorial falls risk assessment
  - *For a summary of the recommendations of the expert panel on falls prevention assembled by AGS and BGS, see [www.american geriiatrics.org](http://www.american geriiatrics.org)*

## Checklist for risk of further falls and post-fall evaluation--1

RISK CATEGORY	ASSESSMENT
Fall history	History of previous falls?
Medications	Review record for medications or combinations or recent changes that could predispose to falls
Underlying conditions	<ul style="list-style-type: none"> <li>▪ Impaired gait, balance, dizziness?</li> <li>▪ heart rate and rhythm and BP</li> <li>▪ orthostatic hypotension and conditions predisposing to it.</li> <li>▪ acute illness or chronic conditions that may increase the risk of injury from falls.</li> <li>▪ Vitamin D deficiency?</li> </ul>
Functional status	<ul style="list-style-type: none"> <li>▪ Level of mobility, restraints</li> <li>▪ Gait, sitting and standing balance</li> <li>▪ Incontinence?</li> <li>▪ Leg strength and joint function</li> <li>▪ Use of assistive devices ? (walker, cane)</li> </ul>

## Checklist for risk of further falls and post-fall evaluation--2

RISK CATEGORY	ASSESSMENT
Neurological status	<ul style="list-style-type: none"> <li>▪ Impair vision (e.g., cataracts, glaucoma)</li> <li>▪ Sensory deficits, including peripheral neuropathies.</li> <li>▪ Muscle strength, proprioception, reflexes, and cerebellar function</li> <li>▪ New neurological deficits</li> </ul>
Psychological factors	<ul style="list-style-type: none"> <li>▪ Review delirium,</li> <li>▪ Impaired cognition, judgment, memory,</li> <li>▪ Safety awareness, and decision-making capacity.</li> </ul>
Environmental factors	<ul style="list-style-type: none"> <li>▪ Environmental factors that could cause or contribute to falls, furniture, lighting, rails, door thresholds</li> <li>▪ Assess footwear -may be contributing to fall risk</li> </ul>

# PHYSICAL EXAMINATION

- The most important part includes an assessment of integrated musculoskeletal function
  - Functional reach test
  - Up and Go test (with or without timing)
  - Berg Balance Test
  - Performance-Oriented Mobility Assessment (POMA)

## LABORATORY AND DIAGNOSTIC TESTING

- **Tests and procedures** should be guided by the history & physical exam: echocardiography, brain imaging, radiographic studies of spine
- **Hemoglobin, BUN, creatinine, glucose:** can exclude anemia, dehydration, or hyperglycemia
- **Holter monitoring:** no proven value for routine evaluation
- **Carotid sinus massage** with continuous heart rate and BP monitoring is advocated by some for pts with unexplained falls: can uncover carotid sinus hypersensitivity

## The components most commonly included in efficacious interventions in older persons living in the community were:

- Adaptation or modification of home environment [A]
- Withdrawal or minimization of psychoactive medications [B]
- Withdrawal or minimization of other medications [C]
- Management of postural hypotension [C]
- Management of foot problems and footwear [C]
- Exercise, particularly balance, strength, and gait training [A]



## Adverse Musculoskeletal Outcomes Associated with Low Vitamin D Serum

- Serum concentrations  $<30$  ng/mL ( $<75$  nmol/L) have been associated with
  - balance problems
  - impaired lower extremity function
  - higher fall rates
  - lower bone mineral density
  - muscle weakness
  
- Bischoff-Ferrari HA et al. Am J Clin Nutr 2004a;80:752-8
- Flicker L, et al.. J Am Geriatr Soc 2005;53:1881-8.

# Selected Recommendations for Vitamin D Supplementation-AGS 2013

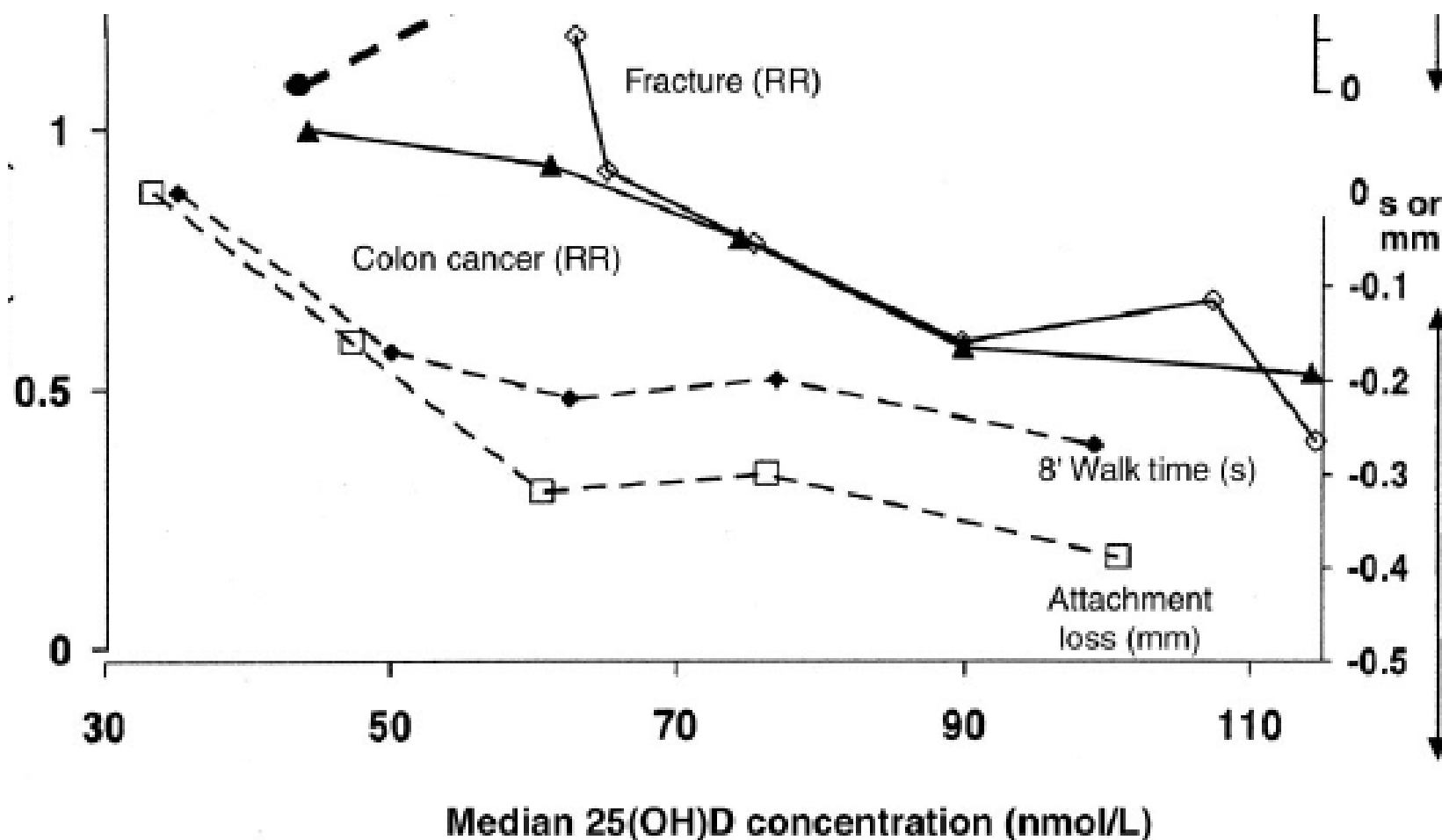
- **STATEMENT 3**: Clinicians should review older adults' vitamin D intake from all sources (diet, supplements, sunlight) and discuss strategies to achieve a total vitamin D input associated with fall and fracture prevention
  - Recommend an average daily input from all sources of 4,000 IU for all older adults
  - Should result in approximately 92% of older adults in the US achieving target 25(OH)D (>30 ng/ml) levels regardless of skin pigmentation, obesity, or sun exposure

American Geriatrics Society Workgroup on Vitamin D Supplementation for Older Adults 2013

# Fall Risk is Increased During Care Transitions

- From hospital to home
- From rehabilitation facility or nursing home to home
- Decline in function is not appreciated or addressed (adaptation of home or additional equipment and support)
- Improper medication reconciliation

## Relationship between vitamin D levels and BMD, gait speed, alveolar attachment, and fractures.\*



Bischoff-Ferrari HA et al. Am J Clin Nutr 2006a;84:18-28.

# DIABETES MANAGEMENT IN OLDER ADULTS; TEMPERED APPROACH

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## Tailor Treatment to the Vulnerable Patient

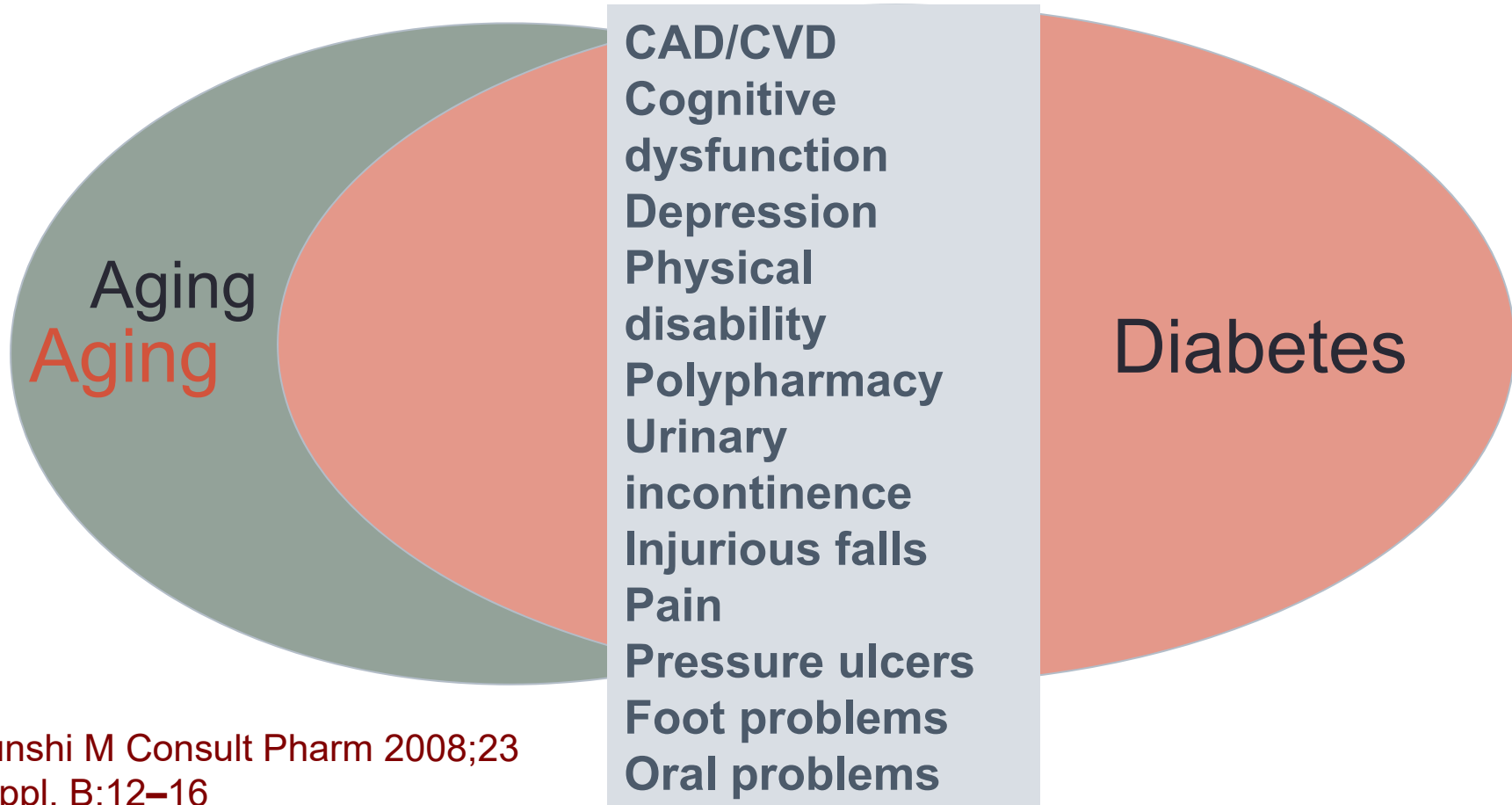
- Ethnic / Cultural / Sex / Socioeconomic differences / disparities
  - Strong social support improves outcomes
  - Tailor to incorporate culture, religion, language and literacy elements
- Food Insecurity (unreliable availability of nutritious food)
  - Propose solutions for homelessness, poor literacy etc (A)
- Cognitive Dysfunction
  - Tailor treatment to avoid hypoglycemia (A)
  - If DM + CV risk, benefits of statins outweigh risks in dementia
  - If second generation antipsychotics are used, weight, glycemic and lipid levels need to be monitored (C)
- Mental Illness
  - Diabetes is 2 – 3 times higher in those with schizophrenic / bipolar disorders
  - Treatment of depression may improve glycemic control

# Principles of Diabetes Management in PA/ LTC settings

- Establish targets for blood glucose control (FBG, PP, A1C)
- Maintain adequate nutritional status
- Assess comorbidities and general health status
- Risk of hypoglycemia and falls
- Individualize therapy
  - Quality of life
  - Cognitive and functional status
  - Disease severity and complications
  - Expressed preferences
  - Life expectancy
- Address CV risk factors when possible
- Maximize functional status and increase activity

## Geriatric Syndromes More Prevalent In Persons With Diabetes

- heterogous population with regard to comorbidities and health status
- critical to establishing personalized goals and treatments





# Common Comorbidities

- Depression, anxiety
- Cognitive impairment
- Obstructive sleep apnea
- Low testosterone in men
- Fatty liver disease
- Kidney disease and impaired renal function
- Periodontal disease
- Cancer
- Hearing impairment
- Fractures, arthritis
- Heart failure

ADA. 3. Initial Evaluation and Diabetes Management Planning. Diabetes Care 2015;38(suppl 1):S17

## **Characteristics of older adults and their diabetes management is based on living situation, personal goals, functional capabilities, and facility capabilities**

- Community-dwelling patients
- Assisted living facilities
- Hospitalized inpatients
- Skilled nursing facility (rehabilitation) patients
- Nursing facility (long-term)

## Recommendations from the ADA Position Statement 2016

- Hypoglycemia risk is the most important factor in determining glycemic goals due to the catastrophic consequences in this population. **B**
- Simplified treatment regimens are preferred and better tolerated. **E**
- Sole use of SSI should be avoided. **C**
- Liberal diet plans have been associated with improvement in food and beverage intake in this population. To avoid dehydration and unintentional weight loss, restrictive therapeutic diets should be minimized. **B**
- Physical activity and exercise are important in all patients and should depend on the current level of the patient's functional abilities. **C**

## A Framework for Considering Treatment Goals for Glycemia in Older Adults with Diabetes

Pt characteristics/ health status	Rationale	Reasonable A1C goal	Fasting or pre-prandial glucose mg/dL	Bedtime glucose mg/dL
Healthy *	Longer remaining life expectancy	< 7.5 %	90-130	90-150
Complex/intermediate **	Intermediate remaining life expectancy High treatment burden, hypoglycemia, falls	<8.0 %	90-150	100-180
Very complex/poor health ***	Limited remaining life expectancy makes benefit uncertain	<8.5 %	100-180	110-220

\*Few coexisting chronic illnesses, intact cognitive and functional status

\*\* Multiple coexisting chronic illnesses, or 2+ IADL impairments, mild to mod cognitive impairment

\*\*\* LTC or end-stage chronic illnesses, mod to severe cognitive impairments, 2+ ADL dependencies

# Management of Diabetes in Long-term Care and Skilled Nursing Facilities:

## *A Position Statement of the American Diabetes Association*

Diabetes Care 2016;39:308–318

Medha N. Munshi, Hermes Florez,  
Elbert S. Huang, Rita R. Kalyani,  
Maria Mupanomunda,  
**Naushira Pandya**, Carrie S. Swift,  
Tracey H. Taveira, and Linda B. Haas

## Framework for considering diabetes management goals. *Munshi et al. Diabetes Care 2016;39*

	Special considerations	Rationale	A1C	Fasting and Premeal BG targets	Glucose monitoring
Community-dwelling patients at SNF for rehab	<ul style="list-style-type: none"> <li>- Rehab Potential</li> <li>- Goal to discharge home</li> </ul>	Need optimal glycemic control after acute illness	<ul style="list-style-type: none"> <li>- Avoid relying on A1C due to acute illness</li> <li>- Follow current BG trends</li> </ul>	100–200 mg/dL	Monitoring frequency based on complexity of regimen
Patients residing in LTC	<ul style="list-style-type: none"> <li>-Limited life expectancy</li> <li>-Frequent health changes</li> <li>Impact BG</li> </ul>	<ul style="list-style-type: none"> <li>-Limited benefits of intensive glycemic Control</li> <li>-Focus on QOL</li> </ul>	<ul style="list-style-type: none"> <li>- &lt;8.5%</li> <li>- Use caution Interpreting A1C</li> </ul>	100–200 mg/dL	Monitoring frequency based on complexity of regimen and risk of hypoglycemia
Patients at end of life	<ul style="list-style-type: none"> <li>-Avoid invasive diagnostic/ Therapeutic procedures with little benefit</li> </ul>	<ul style="list-style-type: none"> <li>- No benefit of glycemic control except avoiding symptomatic hyperglycemia</li> </ul>	- No role of A1C	Avoid symptomatic hyperglycemia	Monitoring periodically only to avoid symptomatic hyperglycemia

## What's in a number?

### Interpretation of A1C

#### A1c may be increased by

- Hypothyroidism
- Splenectomy
- Aplastic anemia
- Iron deficiency ( $\geq 5.5\%$  but not over  $6.5\%$ )

#### A1C may be decreased by

- Anemia
- Blood loss, transfusions
- Abnormal Hb (spurious)
- Hemodialysis and Hct  $< 30\%$
- Liver disease
- Race

# Risk Factors For Severe Hypoglycemia

- Age
- Unawareness of, or previous severe hypoglycemia
- High doses of insulin or sulfonylureas
- Recent hospitalization or intercurrent illness
- Slowed hormonal regulation and countregulation
- Polypharmacy (>5 prescribed meds)
- “Tight control” of diabetes
- Improper timing of insulin or wrong type
- Insulin injection in hypertrophic sites
- Frequent use of sliding-scale insulin
- Chronic liver, renal or cardiovascular disease, alcohol
- Gastroparesis with delayed carbohydrate absorption
- Increased insulin sensitivity (weight loss, increased activity)
- Endocrine deficiency (thyroid, adrenal, or pituitary)

Lipsa JAMA Int Med 2014; 174

Chelliah. Drugs aging 2004:21

AMDA, Clinical Practice Guideline. Columbia, MD: 2015



## ★ Important Caveat ★

**It is more important to address persistently abnormal trends in blood glucose values rather than attempting to adjust the treatment regimen in response to a few isolated abnormal values.**

# 2015 Beers Criteria; Endocrine

American Geriatrics Society 2015 Beers Criteria Update Expert Panel

Therapeutic category	Rationale	Recommendation	Quality of evidence	Strength
Insulin, sliding scale	Higher risk of hypoglycemia without improvement in hyperglycemia regardless of care setting; in the absence of basal insulin	Avoid	Moderate	Strong
Glyburide	Higher risk of severe prolonged hypoglycemia in older adults			

# Excessive Reliance on Sliding Scale Insulin

- Often the sole mode of control
- Tendency to use “one size fits all” regimens
- Use of SSI is now on the Beers list 2015
- AMDA CPG recommends that patients on SSI be re-evaluated within 1 week and converted to fixed daily insulin doses that minimize the need for correction doses <sup>(1)</sup>
- Preliminary data from a retrospective study reveals that about 70% of BG results done by finger stick have no action taken in individuals on SSI
- ***Clinical judgment and ongoing clinical assessment*** are important for making decisions regarding the treatment of hyperglycemia<sup>1,2</sup>

1. AMDA. *Diabetes Management in the Long-Term Care Setting Clinical Practice Guideline*. Columbia, MD: AMDA; 2015.

2. Pandya N, Wei W, Kilpatrick BS, et al. "The Burden of Sliding Scale Insulin". JAGS Dec 2013

## DIABETES MANAGEMENT IN PATIENTS AT END OF LIFE (Including Palliative Care and Hospice patients)

### Recommendations

- Focus on promoting comfort; controlling distressing symptoms (including pain, hypoglycemia, and hyperglycemia),
- Avoiding dehydration,
- Avoiding ED visits, hospital admissions, and institutionalization,
- Preserving dignity and quality of life.
- Decreasing complexity of treatment; higher threshold for additional diagnostic testing including glucose monitoring should be considered
- Important to respect a patient's right to refuse treatment and withdraw oral hypoglycemic agents and/or stop insulin if desired during the end-of-life care. **E**

## Suggested Insulin Regimens For Different Clinical Situations (AMDA 2015)

Clinical Situation	Suggested Insulin Regimens (in order of lowest hypoglycemic risk)
Risk of nocturnal hypoglycemia	<ul style="list-style-type: none"> <li>• Basal insulin (e.g., glargine, detemir) QD in am</li> <li>• Intermediate-acting insulin (e.g., NPH) at HS instead of before evening meal</li> <li>• Lower dose of prandial, intermediate-acting, or basal insulin before evening meal or at HS</li> </ul>
Tube feeding (continuous)	<ul style="list-style-type: none"> <li>• Basal insulin QD at bedtime</li> <li>• Intermediate-acting insulin (e.g., NPH) Q12 h</li> <li>• Addition of short-acting insulin (regular) Q 6 h to achieve initial or long-term control</li> </ul>
Tube feeding (nocturnal)	<ul style="list-style-type: none"> <li>• Intermediate-acting insulin (e.g., NPH) before dinner</li> <li>• Insulin mixture (e.g., aspart 70/30, lispro 75/25) before dinner</li> <li>• Standard mixture 70/30 (Novolin or Humulin 70/30) before dinner</li> </ul>

# Problems with Care Transitions

- DM is the first-listed diagnosis in 8.5% of adults >65 yr, and 4<sup>th</sup> most common diagnosis overall <sup>(1)</sup>
- Caloric intake may be significantly decreased
- High dose steroids may increase insulin resistance (care in steroid weans)
- Change in injection sites

Diabetes Data and Trends [http://www.cdc.gov/diabetes/statistics/hospitalization\\_national.htm](http://www.cdc.gov/diabetes/statistics/hospitalization_national.htm)

# Problems with Care Transitions...

- At the time of admission to a facility, documentation should include
  - the current meal plan,
  - activity levels,
  - prior treatment regimen
  - laboratory tests (including A1C, lipids, and renal function if available) **E**
- Care transitions are important times to revisit diabetes management targets, perform medication reconciliation, provide patient and caregiver education, reevaluate the patient's ability to perform diabetes self-care behaviors, and have close communication between transferring and receiving care teams to ensure patient safety and reduce readmission rates. **E**



# THANK YOU

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