Geriatric Frailty

No One Dies of Old Age

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Sharp HospiceCare

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Disclosures

- National Hospice and Palliative Care Organization (NHPCO)
- Coalition for the Advancement of Palliative Care (CAPC)
- MCE - CME for Primary Care
- Family Medicine Education Consortium (FMEC)
- Goldblatt IT Systems

Introduction

- Define Geriatric Frailty Syndrome
- Discuss the Importance of this Syndrome
- Discuss Treatments

What is Frailty?

"Physiologic syndrome, characterized by decreased reserve, and diminished resistance to stressors, resulting from cumulative decline across multiple physiologic systems, and causing vulnerability to adverse outcomes."

— The American Geriatric Society

Lack of physiologic reserve
Frailty is progressive
It is independent of other medical disease

Boockvar, Kenneth S MD, MS et al, *Palliative Care for Frail Older Adults, JAMA 2006 Vol 296(18), pp 2245-53*

Additional health care costs when the claims-based frailty Index was added to the CMS-HCC model:

Reference: Johnston KJ, et al. Ann Intern Med. 2020;doi:10.7326/M19-3261.

About 2/3 of Physiologic Function is Excess

Examples of validated physiologic parameters where about 70% loss is necessary before evidence of failure:

1. VO2-oxygen transport
2. Myocardial oxygen consumption
3. Arterial cross sectional area
4. Hemoglobin-oxygen dissociation
5. Maximum breathing capacity
6. Forced expiratory volume
7. Hematologic values (plts, WBCs)
8. Hepatic function
9. Renal function
10. Blood sugar
11. Sensory capacity (hearing and vision)
12. Cognitive health
13. Brain dopamine content

Bortzll, Walter M, *A Conceptual Framework for Frailty: A Review,* 2002, Journal of Gerontology, vol 57A(5), pp M283-M288

Why Do We Fail to Recognize Frailty?

1. Does not fit classic disease model
2. Gradual decline which may not be appreciated – strength, function, nutrition
3. May attribute changes to “old age” and not appreciate that a clinical response is relevant – patients/families and healthcare providers

Pearls:

Frailty is frequently not identified until late in the process when there may be nothing to delay or prevent inevitable outcomes

Adapted by the American Geriatric Society

(Freid-Hopkins Frailty Phenotype)

Frailty has a Phenotype: Requires 3 or more of 5 clinical features

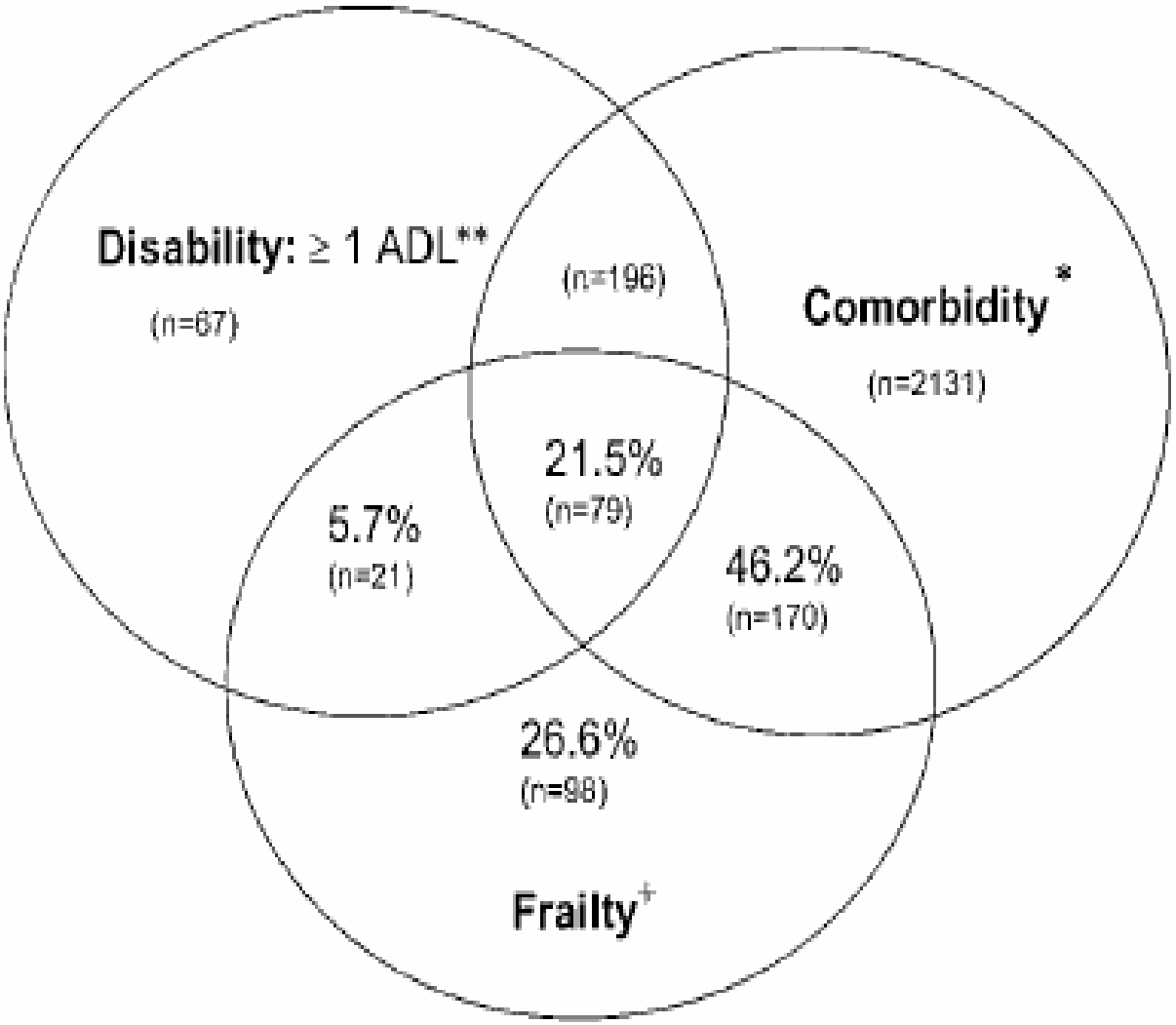
1. Loss of strength
2. Weight loss (unintended)
3. Low activity level/increased sleeping
4. Poor endurance / easily fatigued
5. Slowed performance/unsteady gait

There are over 60 models for frailty.

However, most do not reflect the frailty process.

-Multi-morbidity / comorbidity

-Disability

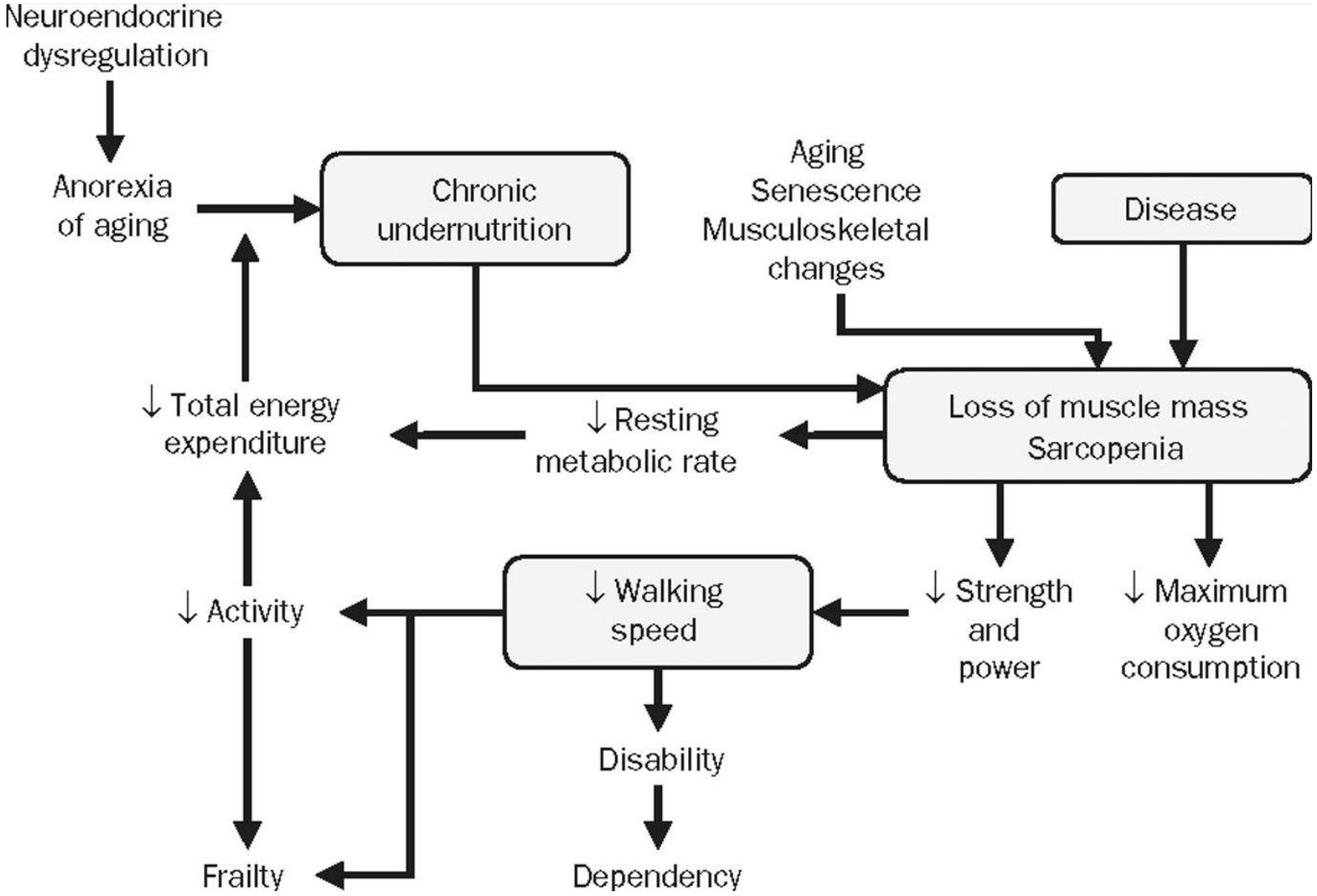


Fried, Linda P, et al, *Frailty in Older Adults: Evidence for a Phenotype*, Journal of Gerontology, MEDICAL SCIENCES 2001, Vol. 56A, No 3 M146-M156

Frailty is not the same as disability

Secondary Features

1. Decreased cognition
2. Decreased balance
3. Decreased motor processing
4. Change in emotional status
5. Poor self rated health
6. Deficient social support



Singh, MD, MPH, Mandeep et al, *Frailty and Its Potential Relevance to Cardiovascular Care*, MIH Public Access; published in final edited form as *Mayo Clin Proc.* 2008 October; 83(10):1146-1153

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Frailty is Associated with Increased Rates of:

- Acute illness
- Falls
- New or worse functional impairment
- Institutionalization
- Length of stay
- Prescriptions
- Healthcare expenditures
- Hospitalizations
- Death

"Frailty imparts an exponentially increased vulnerability to disease and death."

Evaluating The Needs Of The Pre-terminal Demographic

1. Transportation deficit
2. Mobility deficit
3. Financial restraint
4. Social support/family deficit
5. Cognitive deficit
6. Compliance deficit

Types of Frailty:

Primary Frailty

Frailty which occurs in the absence of significant overt disease

Secondary Frailty

Frailty which occurs with associated known advanced disease

- Secondary Frailty has a worse 4-year prognosis than primary frailty
- 600% increased mortality risk
- 1000% increased morbidity risk

From a Cellular Perspective:

"Organisms are born with a finite capacity for stem-cell mediated repair after chronic exposure to tissue injury. Once the capacity is exhausted, a cycle of pathologic inflammation ensues and leads to overt disease manifestations."

Goldschmidt-Clement, Pascal J, et al, *On the Memory of Chronic Illness,* 2003, Science of Aging Knowledge Environment, pp.1-5

Prevalence:

7-25% of persons over age 65 are frail

30-46% of persons over age 85 are frail

Cardiovascular Health Study:

63% of frail patients had no ADL deficit

32% has no or only one of nine common long term diseases

Phenotype also validated in:

Women's Health and Aging Studies I and II

Pathophysiology of this Syndrome

1. Loss of Skeletal muscle mass – “Sarcopenia”
   a. Rate of muscle loss accelerates after ages 50 and 75
   b. May also involve visceral protein loss (albumin)

2. Neuroendocrine dysfunction
   a. Hormones associated with frailty: low estrogen, low testosterone, low growth hormone, low IGF 1 (insulin growth factor), DHEA, cortisol

3. Chronic Inflammation
   a. Increased levels of proinflammatory cytokines; IL6, c-reactive protein

Associated with:

1. Decreased muscle function
2. Decreased neurologic function
3. Decreased energy metabolism
4. Altered immunity – immune senescence
5. Altered endocrine function
6. Altered hematopoetic function

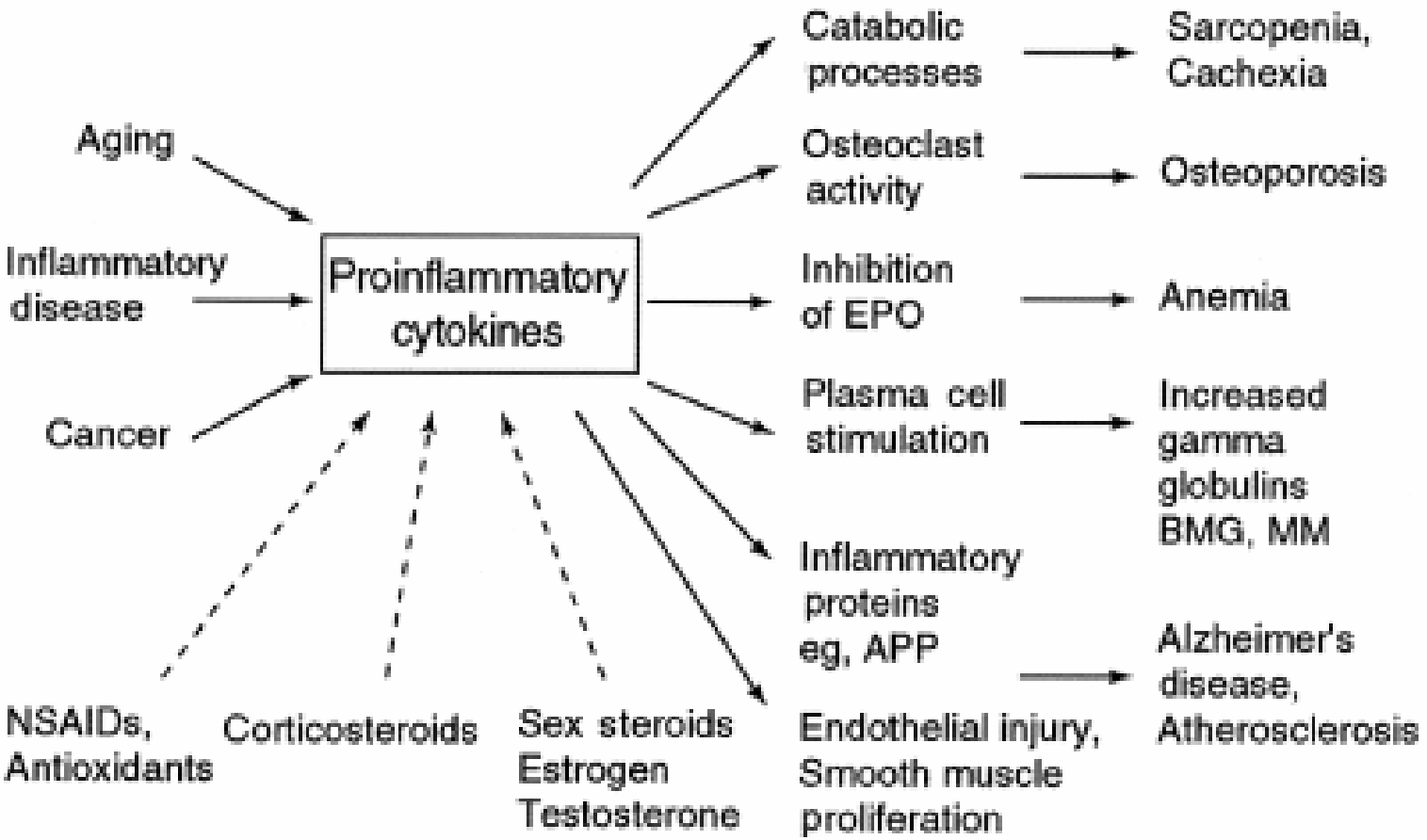
Frailty on a Cellular/Chemical Level

Appears to be the balance of:

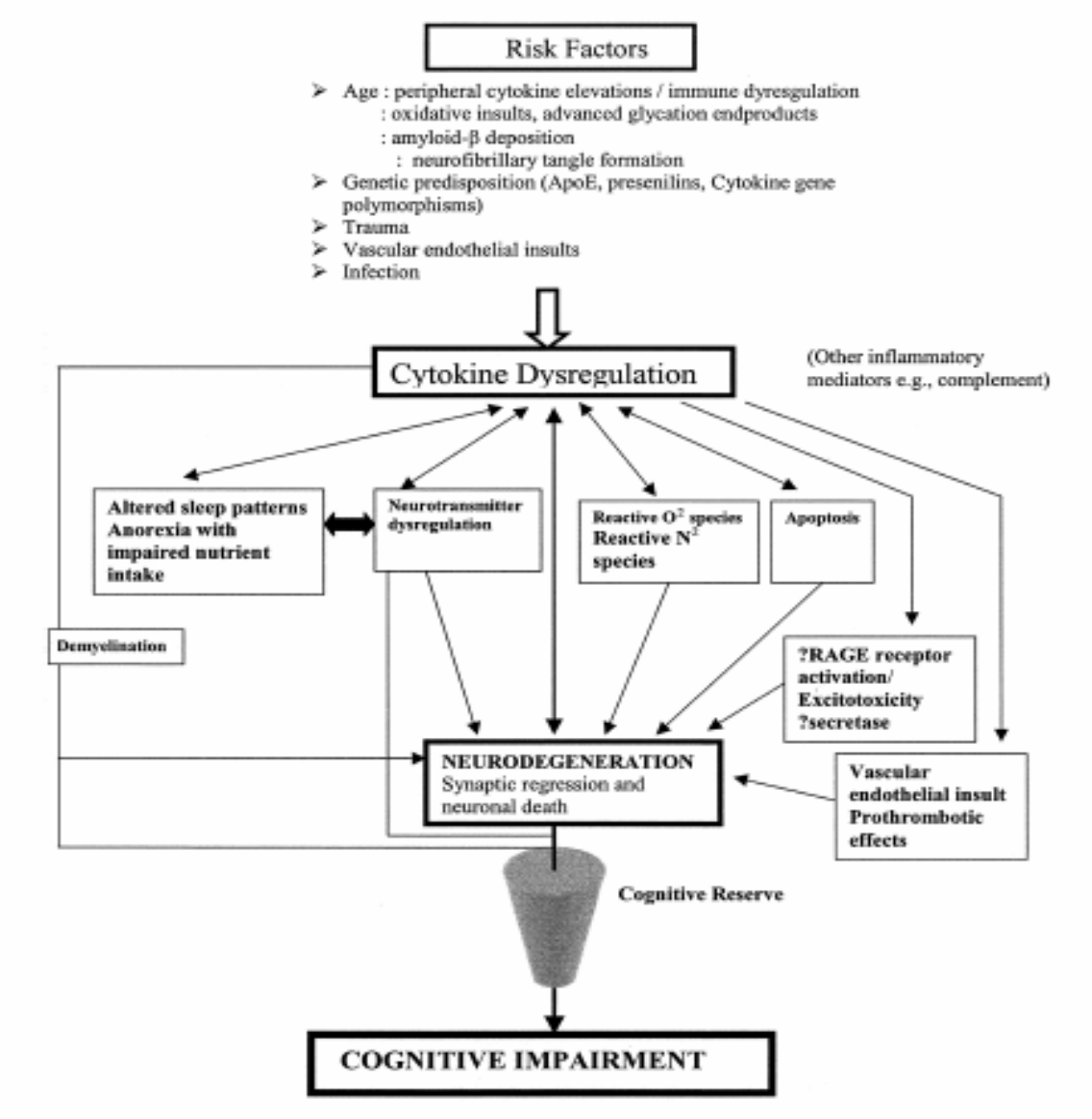
Pro-Inflammatory Cytokines
(e.g. IL6, tumor necrosis factor)

Versus

Anti-inflammatory Cytokines (e.g. IL10)



Ershler, MD, William B, *Biological Interactions of Aging and Anemia: A Focus on Cytokines*, JAG 51 (Suppl):S18-S21, 2003



Wilson, MBBS, Craig J, et al. *Cytokines and Cognition: The Case for a Head-to-Toe Inflammatory Paradigm,* JAGS, 50:2041-2056, 2002

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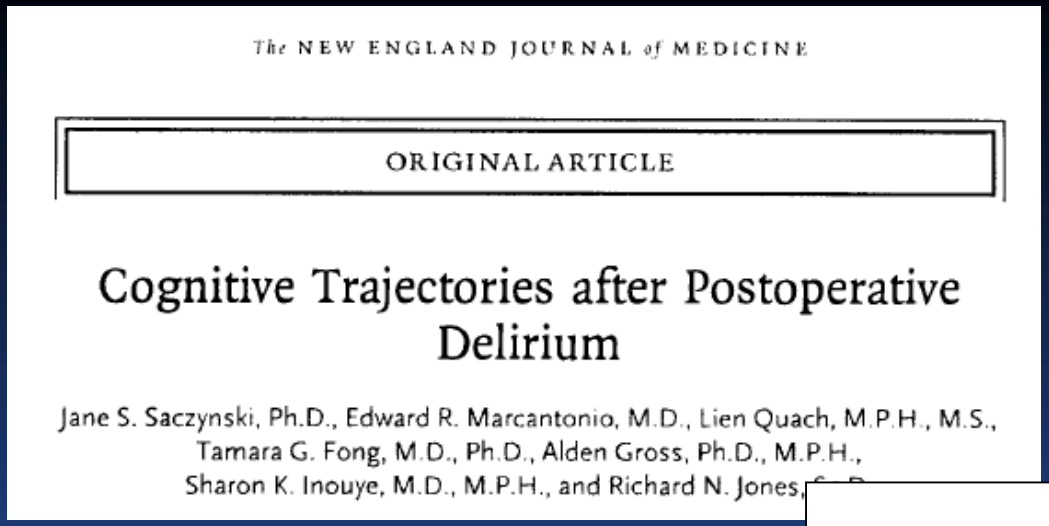
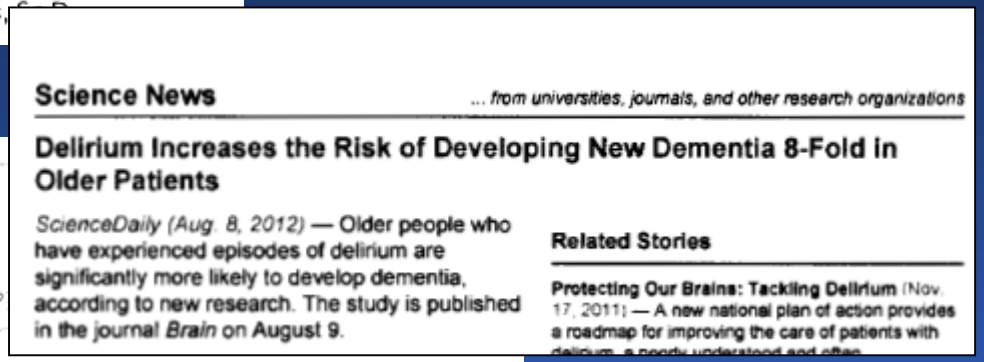


The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Cognitive Trajectories after Postoperative Delirium

Jane S. Saczynski, Ph.D., Edward R. Marcantonio, M.D., Lien Quach, M.P.H., M.S., Tamara G. Fong, M.D., Ph.D., Alden Gross, Ph.D., M.P.H., Sharon K. Inouye, M.D., M.P.H., and Richard N. Jones,



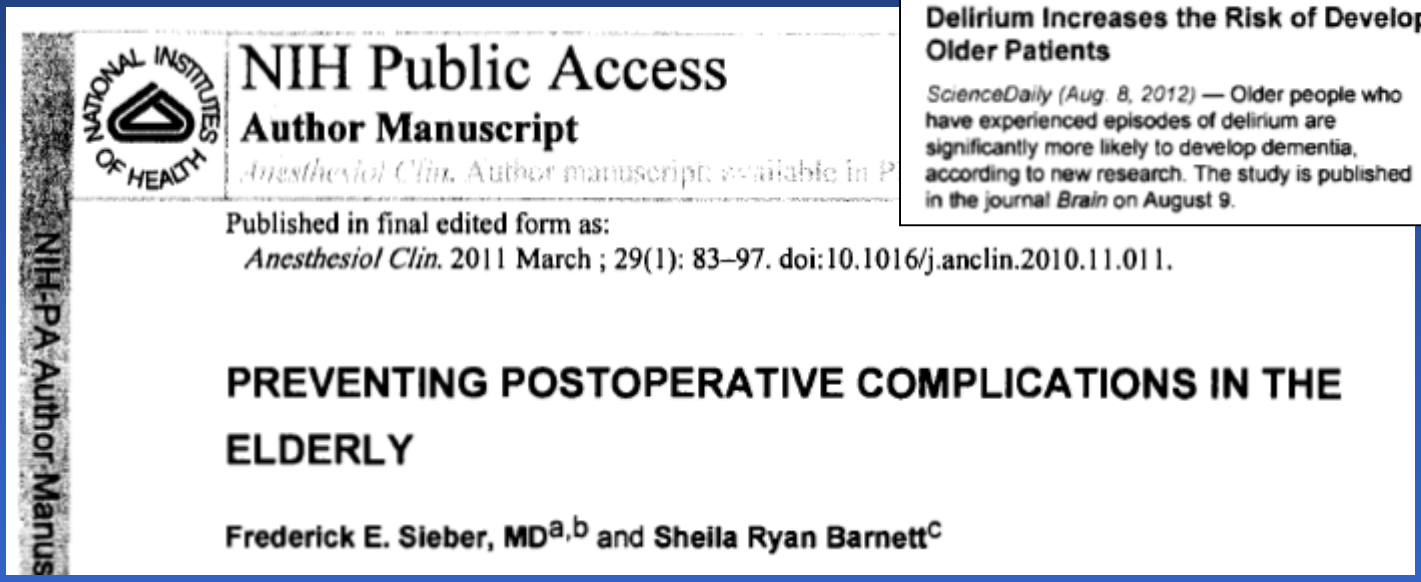
Science News ... from universities, journals, and other research organizations

Delirium Increases the Risk of Developing New Dementia 8-Fold in Older Patients

ScienceDaily (Aug. 8, 2012) — Older people who have experienced episodes of delirium are significantly more likely to develop dementia, according to new research. The study is published in the journal *Brain* on August 9.

Related Stories

Protecting Our Brains: Tackling Delirium (Nov. 17, 2011) — A new national plan of action provides a roadmap for improving the care of patients with



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Anesthesiol Clin. Author manuscript; available in P

NIH-PA Author Manus

Published in final edited form as:

Anesthesiol Clin. 2011 March ; 29(1): 83–97. doi:10.1016/j.anclin.2010.11.011.

PREVENTING POSTOPERATIVE COMPLICATIONS IN THE ELDERLY

Frederick E. Sieber, MD[a,b] and **Sheila Ryan Barnett**[c]

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Rates of Loss of Muscle Strength

5% per day for the elderly

1.5% per day for healthy adults & geriatric patients.

Addressing Geriatric Frailty-Outcomes

1. Higher functional status – e.g. less falls
2. Better quality of life – increased energy, patient/family feels like they are “doing something”
3. Greater patient satisfaction – patient feels like healthcare providers are “doing something”
4. Greater family satisfaction – same
5. Prepares patient and families for inevitable outcomes

Addressing multiple areas produces returns greater than the sum of the individual components

National Surgical Quality Improvement Program (NSQIP) 2016

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Robinson, Thomas N, MDFACS, et al, *Accumulated Frailty Characteristics Predict Postoperative Discharge Institutionalization I the Geriatric Patient,* 2011 J Am Coll Surg 213(1);37-42

Pts > 65 yo undergoing major operations expected to need ICU care
X = 73 +/- 6 years, n=223
Frailty Characteristics Associated with Institutional Discharge:
Prolonged TUGT (>15 seconds)
Any Functional Dependence
(1 and 2 are most highly associated with institutional discharge)
Older Age
Charlson Index ≥ 3
Hematocrit ≤ 35%
Alb <3.4
Mini-Cog ≤ 3

The more characteristics, the more likely they would be in an institution. 30% of the original 223 were institutionalized after hospitalization.

3 or more characteristics predicted institutionalization with a sensitivity and specificity of 82% and 84% respectively.

Frailty As A Predictor of Surgical Outcomes

LOS for Major Procedures

No Frailty	4.2 days
Intermediate	6.2 days
Frail	7.7 days

Surgical Complications Major Procedures

No Frailty	19.5%
Intermediate	33.7%
Frail	43.5%

Martin A Makary, MD, MPH, Am Coll Surg. 2010 Jun;210(6):901-8. doi: 10.1016

Discharge Disposition (Assisted Living or SNF)

Minor Procedure	
No Frailty	0.8%
Intermediate	0%
Frail	17.4%
Major Procedure	
No Frailty	2.9%
Intermediate	12.2%
Frail	42.1%

Treatment

Table 1. Clinical Criteria and Management Strategies for Frailty

Symptom	*Criteria for frailty*		*Management strategies*
Fatigue/exhaustion *	Patient responds to the following statements about the previous week: "I felt as if everything I did was an effort." "I could not get going." Score each response as: 0 points = never or rarely; 1 point = 1 to 2 days; 2 points = 3 to 4 days; 3 points = most of the time Patients with a total score of 2 or 3 points are considered frail		Physical therapy Treatment of underlying conditions Energy conservation measures Medication review Daily activity to promote function, balance, flexibility, and socialization
Inactivity	Men: <383 kcals of activity expended per week (sitting or inactive) Women: <270 kcals		Same as for fatigue/exhaustion Family presence Socialization
Slowness	Men Height ≤ 159 cm (62.6 in): ≥ 7 seconds to walk 15 ft Height ≤ 159 cm (68 in): ≥ 6 seconds	Women Height ≤ 173 cm (68 in): ≥ 7 seconds Height ≤ 173 cm (68 in): ≥ 6 seconds	Resistance strength training Tai Chi Physical therapy Family presence Socialization with activities
Weakness†	Men BMI ≤ 24 kg per m^2: grip strength ≤ 29 kg BMI 24.1 to 28: grip strength ≤ 30 kg BMI > 28: grip strength ≤ 32 kg	Women BMI ≤ 23: grip strength ≤ 17 kg BMI 23.1 to 26: grip strength ≤ 17.3 kg BMI 26.1 to 28: grip strength ≤ 18 kg BMI > 28: grip strength ≤ 21 kg	Resistance strength training Tai Chi and walking Physical therapy Family presence Socialization with activities
Weight loss	Unintentional weight loss of ≥ 10 lb or ≥ 5 percent of body weight in the previous year		Liberal, culturally appropriate diet Frequent, small feedings Nutritional supplements between meals Resistance strength training Oral and dental care Family presence Socialization with activities Assessment for feeding disability Feeding assistance Appetite stimulants (limited role)

NOTE: *Persons with at least three of these criteria are deemed frail and have six times the mortality over three years than those who are not frail. Persons with two of these findings are considered "pre-frail" and are at twice the risk of progression to the full syndrome.*[15]

BMI = body mass index

**—Self-reported exhaustion is an indicator of maximum volume of oxygen utilization and a predictor of cardiovascular disease.*

†—Measured using a grip dynamometer

Information from references 15 and 16.

Weakness:

1. Age appropriate exercise
2. Lower extremity resistance training
    a. Doubles leg strength
    b. Increases walking speed
    c. Increases spontaneous movement

“Get Up and Move”

Physical inactivity is the strongest correlate of body composition

Cesari, Malteo, et al, *Frailty Syndrome and Skeletal Muscle: Results from the In Vecchiane Chianti Study,* 2006, Am J Clin Nutr, vol 83, pp 1142-48

Inverse correlation between calories burned per week during exercise and mortality

Fried, Linda P, et al, *Risk Factors for 5-Year Mortality in Older Adults: The Cardiovascular Health Study,* 1998, JAMA, vol 279(8), pp 585-92

Balance

1. Tai Chi and other balance programs

   One-third (1/3) of persons > 65 fall per year.

   Ten percent (10%) of these falls produce serious outcomes.

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PREVENTION OF FALLS IN OLDER PERSONS

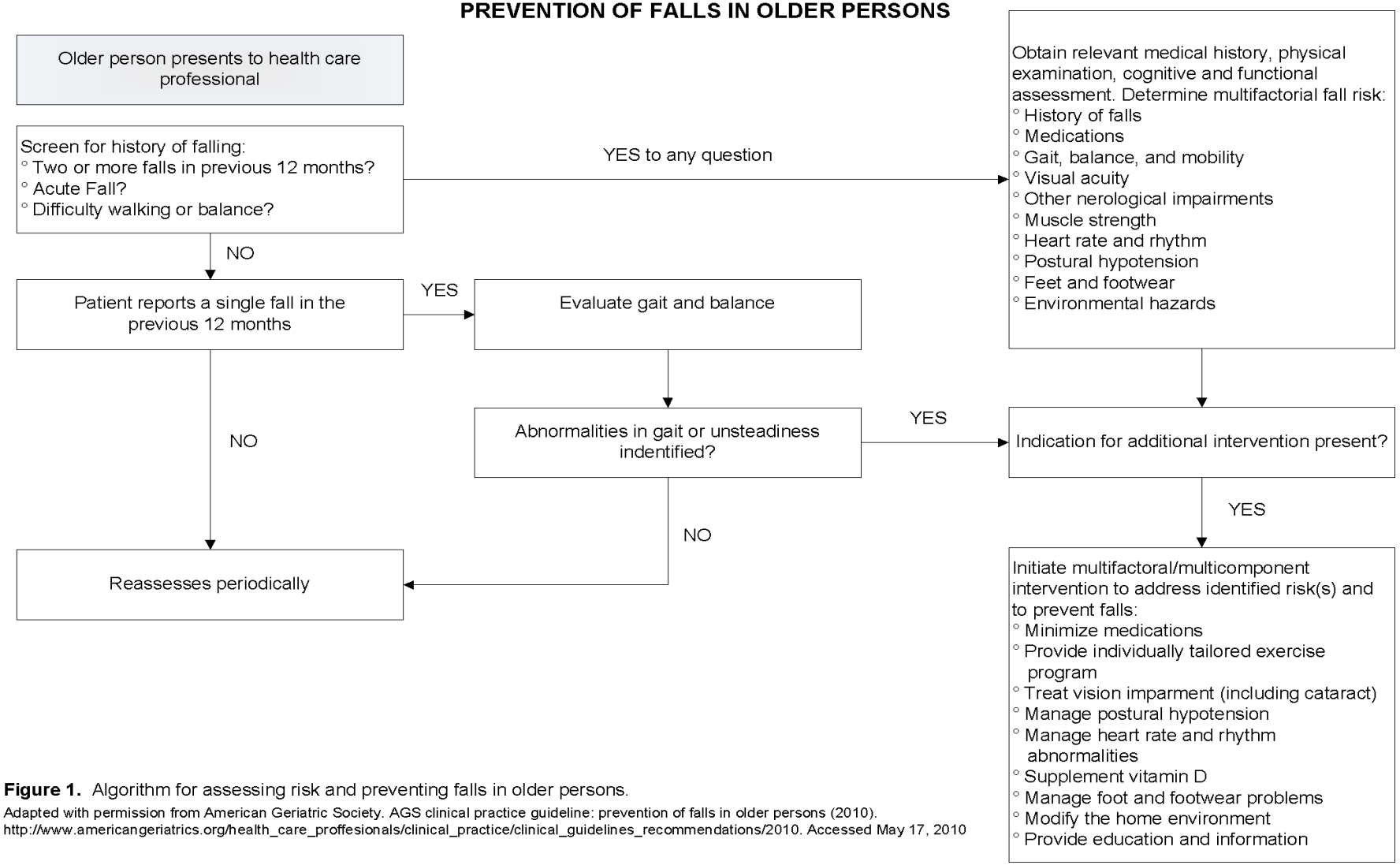

Figure 1. Algorithm for assessing risk and preventing falls in older persons.

Adapted with permission from American Geriatric Society. AGS clinical practice guideline: prevention of falls in older persons (2010). http://www.americangeriatrics.org/health_care_proffesionals/clinical_practice/clinical_guidelines_recommendations/2010. Accessed May 17, 2010

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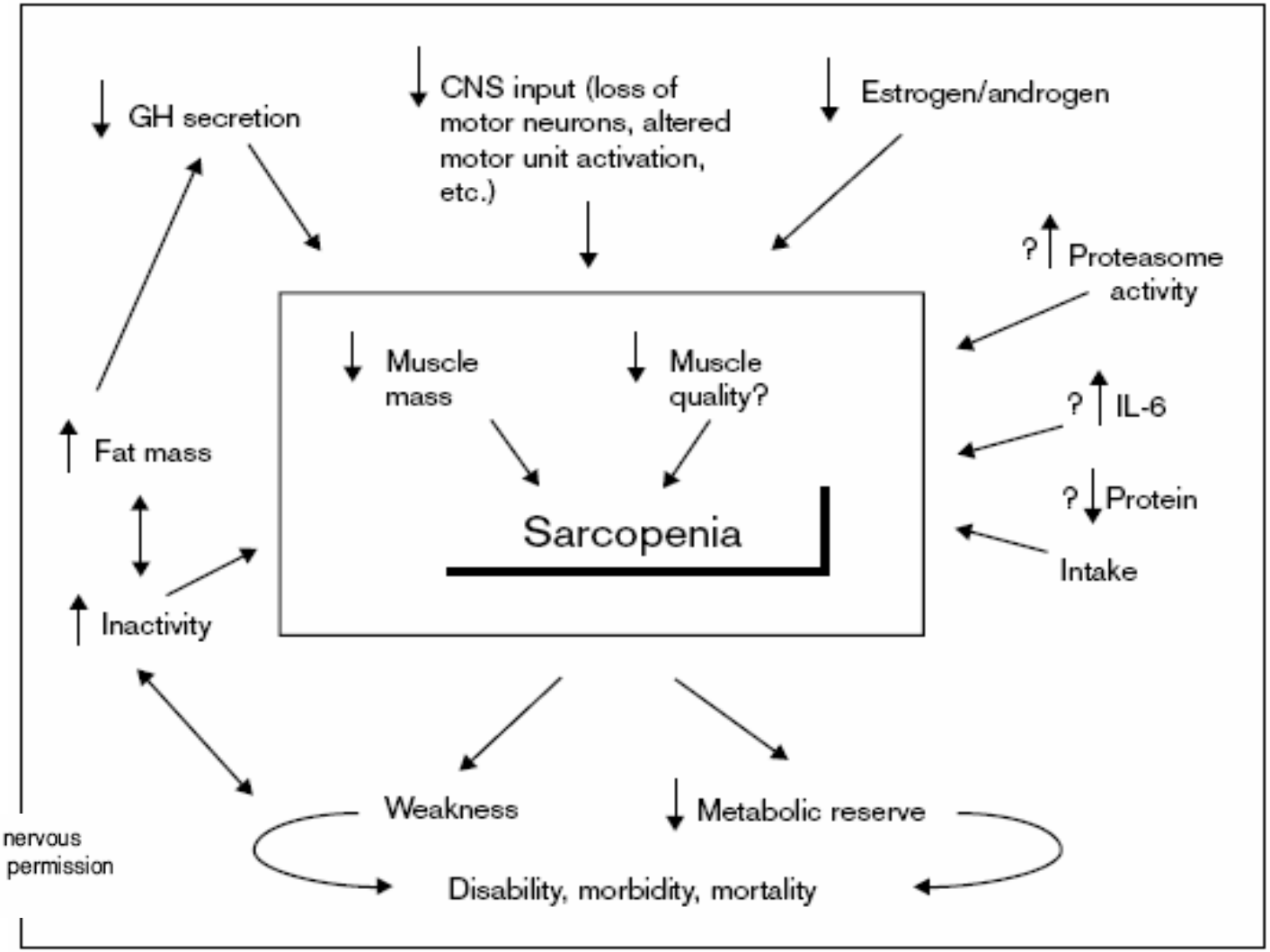
Factors Associated with Sarcopenia

1. Genetics
2. Increased cytokine levels
3. Decreasing hormone production
4. Increased free oxygen radicals
5. Loss of motor nerve end-plates
6. Anorexia and malnutrition
7. Decreased cognitive function
8. Immobility/lack of exercise

Abate, M et al, *Frailty in the Elderly: The Physical Dimension,* 2007, Europa Medciophysica vol 43(3), pp 407-14



GH, growth hormone; CNS, central nervous system; IL, interleukin. Adapted with permission [1,9].

Roubenoff, Ronenn, *Catabolism of Aging: Is It An Inflammatory Process?*, Curr Opin Clin Nutr Metab Care, 2003 6:295-299

Fatigue: Mechanisms to Conserve or Create Energy

1. Change environment, e.g. bedside commode, move phone near patient/cell phone
2. Adjust room temperature
3. Reorder tasks – eat/rest/bathe
4. Modify procedures, e.g. sit while showering
5. Consider a trial of increased activity
6. Eliminate medicines which are sedating or effect balance
    a. B-blockers
    b. Antihistamines
    c. Tricyclics
    d. Anticholinergics
7. Consider a trial of Psychostimulants – given in the morning
    a. 5-10mg of methylphenidate
    b. 2.5mg of dextroamphetamine
    c. 200mg of modofinal

De-medicating the Elderly

Learn when to stop medications: stop as many medicines as possible.

Weight Loss

Systemic review of 34 trials with 2,484 participants suggested that supplements containing protein and calories have little or no effect on weight gain. There was no effect on strength or function.

Bookyar, Kenneth S MD, MS, *Palliative Care for Frail Older Adults,* 2006, JAMA, Vol 296(18), pp. 2245-2253

The Cochrane Collaborative:

Protein and Energy Supplementation in Elderly People at Risk from Malnutrition 2009

- 62 trials with 10,187 patients
- pooled weighted mean difference was 2.2% weight change from 42 trials
- However, **there was no significant reduction in mortality in the supplemented versus controlled groups for malnourished patients**
- Mortality results with supplementation were statistically significant for patients defined as undernourished (N=2461)

"Adequate calories and protein were provided, with sample means exceeding standard means for energy, protein and micronutrients. Still, subjects showed weight loss and severe depletion of lean and fat body mass … This study shows that despite administration of apparently adequate formula, micronutrient deficiencies and marasmic malnutrition exist in chronically ill patients."

(64% of these patients developed bedsores)

Henderson, Cynthia T, MD, MPH, FACN, et al, *Prolonged Tube Feeding in Long-Term Care: Nutritional Status and Clinical Outcomes,* 1992, Journal of American College of Nutrition, vol 11(3), pp 309-25

Conclusion:

The limited effect of supplemental nutrition on outcomes is because the underlying cause of weight loss in frail patients is due to:

1. Low grade inflammation
2. Neuroendocrine dysregulation

These patients are NOT starving or receiving inadequate nutritional intake!

End of Life Can Be Ugly

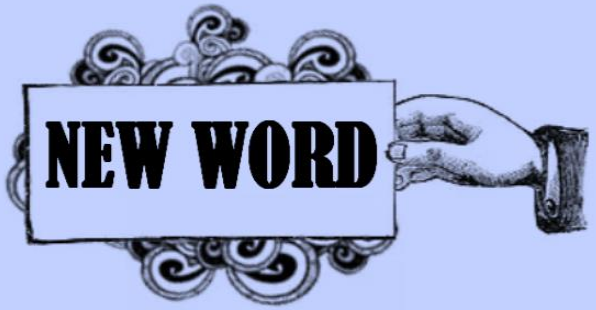
Even when health care providers have done everything they are supposed to, patients, providers and families should expect issues such as:

1. Wasting, cachexia and sarcopenia
2. Delirium
3. Infections
4. Bedsores

When we are unaware of this issue we leave ourselves and our patients' families emotionally unprepared for the inevitable consequences of the best that the healthcare industry has to offer.

“Mortapause”

Dr. Daniel R. Hoefer



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Treating Weight Loss or Decreasing Nutritional Intake

1. Provide foods of patient choice
2. Provide EtOH
3. Smaller frequent meals
4. Good oral care
5. Address dentures/dentition
6. Provide access to nutritious foods
7. Supplements
8. Treat depression
9. Treat pain
10. Eliminate medicines which make it difficult to swallow or alter taste
11. Socialization with meals

There is NO FDA approved drug to address weight loss

Megestrol:

1. Increases risk of thromboembolism
2. Induces hypocortisolism
3. Diarrhea

Mirtazpine and SSRIs:

1. Treat depression and may have benefit on weight

In The Non-terminal and Pre-terminal Demographics:

"Calorie restriction has proven to be the most effective method of extending both median and maximal life expectancy in several mammalian species."

- Decreases fat store
- Calorie restriction decreases the rates at which proteins are oxidized. Superoxide and H2O2 are generated as a by-product of normal oxidative metabolism in mitochondria. This with nitrous oxide and peroxicholate damages cells. Calorie restriction is believed to counteract the stress-associated oxidative damage.

Larsson, Lars, et al, *Age Related Changes in Skeletal Muscle,* 2000, Drugs and Aging, vol 4 pp 303-16

Conclusion:

1. Weight loss in the non-morbidly obese geriatric population is associated with increased mortality, even voluntary weight loss.
2. Dieting without exercise accelerates sarcopenia (75% fat mass, 25% muscle mass)
3. Increased fat is associated with increased pro-inflammatory cytokines/increased muscle is associated with increased anti-inflammatory cytokines (e.g. IL10)
4. Exception: weight loss which spares muscle loss, i.e. dieting with significant exercise

Micronutrient Deficiency:

1. Vitamin D
2. Vitamin B12
3. Iron
4. Calcium

Also vitamins D, E, C and folate

Office Rx for Treatment:

Food intake

Resistance training

ASHD prevention

Isolation avoidance

Limit pain

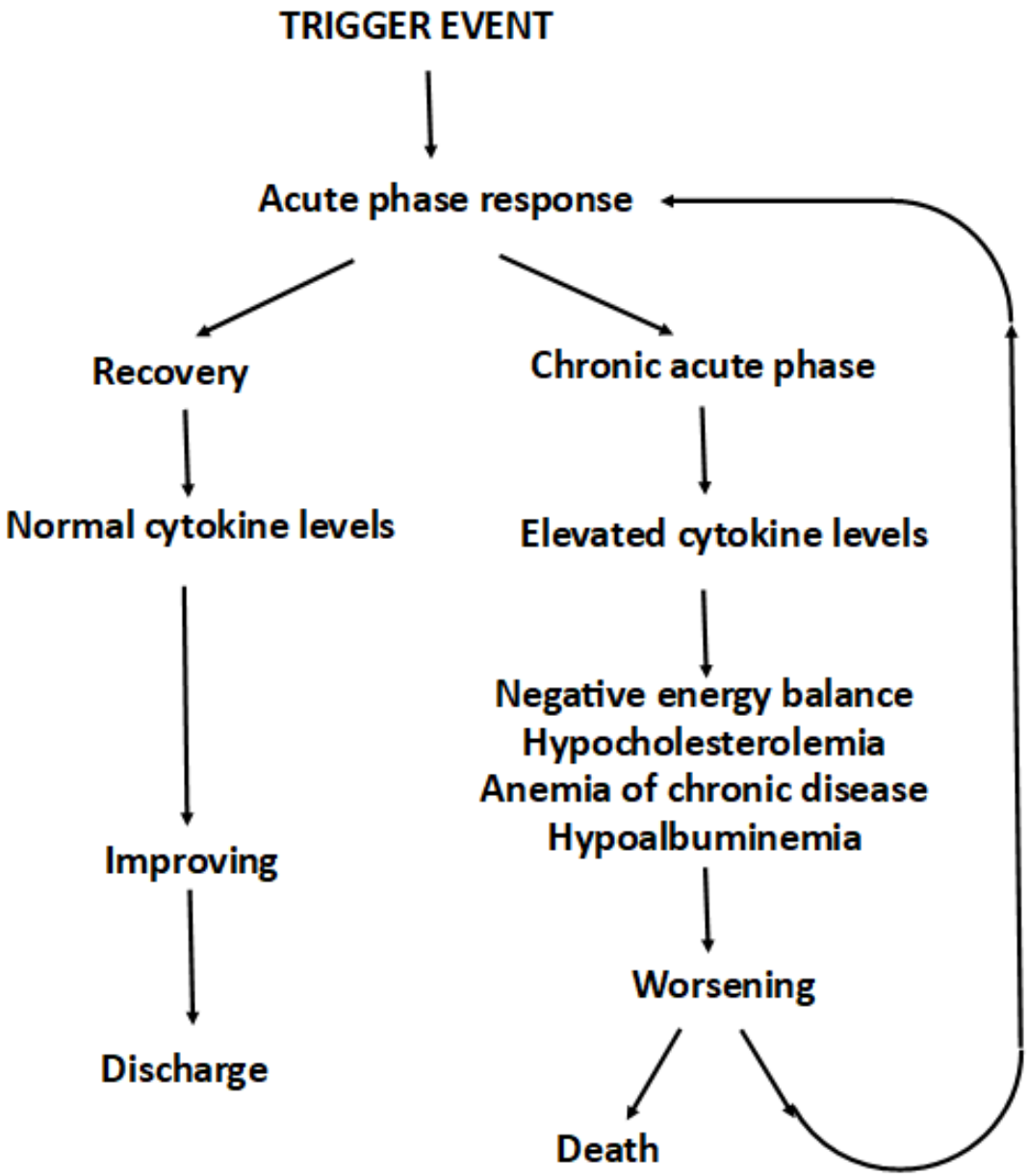
Tai chi

Yearly Testosterone?

- Depression
- Endocrine
- Food Intake
- Resistance Training
- ASHD Prevention
- Isolation Prevention
- Limit Pain
- Tai Chi
- Yearly Medicine Review

Understanding Prognosis in Geriatric Frailty Syndrome:

Mortality is 300-500% greater in frail than pre-frailty or no frailty.



Verdery, MD, PhD, Roy B, Failure to Thrive in the Elderly from t*he Arizona Center on Aging, Tucson, Arizona*, Vol 11(4)653-659.

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Elevated or diminished hemoglobin is associated with increased mortality – Cardiovascular Health Study

Adjusted Hazard Ratio is 1.57

Independent of cause

Zakai, Neil MD, et al, *A Prospective Study of Anemia States, Hemoglobin Concentration, and Mortality in an Elderly Cohort,* 2005, Arch Int Med, pp 2214-19

Independent Predictors of Mortality:

Inflammatory Markers

- Elevated IL-6 = 1.9 RR
- Elevated CRP = 1.6 RR
- Elevated IL-6 and CRP = 2.6 RR

Harris, Tamara, B, MD, MS, et al, *Association of Interleukin6 and C-Reactive Protein Levels with Mortality in the Elderly,* 1999, Am J Med, vol. 106, pp 506-12

Prognosis and Visceral Protein:

Elevated IL6 is associated with elevated CRP and decreased albumin

<3.8 mg/dl of albumin is associated with increased morbidity, mortality and disability

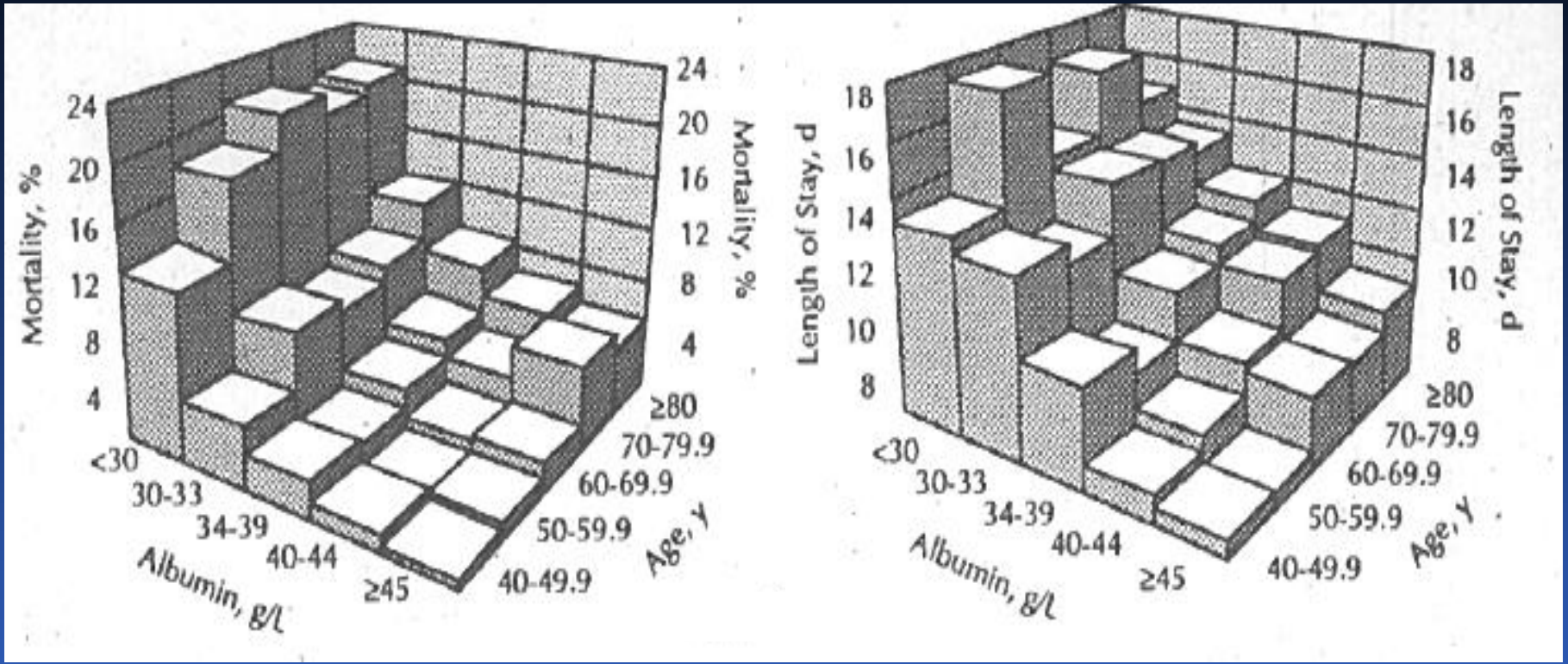
Age related changes appear to be due to changes in synthesis and degradation

15,511 Patients > or = to age 40

For patients with albumins on admission of <3.4 gm/dl

- 21% of population
- Hospital mortality of 14% versus 4%; 350% more likely to die
- Longer LOS
- More likely to be readmitted and if readmitted, done so sooner

There is a 9.7% decrease in albumin per decade. Decreased albumin is associated with multiple medical conditions



Herman MD, MPH, Francois, et al, *Serum Albumin Levels on Admission as a Predictor of Death, Length of Stay, and Readmission,* 1992, Jan, Arch Intern Med, Vol 152, 125-130

Albumin <3.5mg/dl was associated with a 50% 1 year mortality

Inverse relationship to mortality and death rate at any albumin level

Rudman, Daniel MD, et al, *Relationship of Serum Albumin Concentration to Death Rate in Nursing Home Men,* 1987 Journal of Enteral and Parenteral Nutrition, vol 11, pp 360-63

Frailty/Cholesterol/Prognosis: Women (Nursing Home)

n = 92 women

"J-Shaped relationship between mortality and serum cholesterol" (weight, hemoglobin, glucose also "J" or "U" shaped)

Held true when controlled for: age, blood pressure, weight, history of myocardial infarction, CrCl, plasma proteins and cancer. (Cancer found on necropsy in only one patient)

Study excluded: smokers, persons on cholesterol medicines, patients with liver disease, acute illness, SNF < six months

Results:

Mortality rate is 520% greater at a cholesterol level of 4.0 mmo/ltr than at the nadir level, 7.0 mmol/ltr (180% higher at 8.8mmol/liter)

4.0mmol/liter = 155mg/dl

7.0mmol/liter = 270 mg/dl

8.8mmol/liter = 339 mg/dl

Forette, Bernard, et al, *"Cholesterol as a Risk Factor for Mortality in Elderly Women,"* 1989, Lancet, pp.868.70

Frailty/Cholesterol/Prognosis: Men (Nursing Home)

n = 129 men

Results:

For Cholesterol levels < 150mg/dl death rate was 63% at 14 months; versus 9% if >150 mg/dl

Rudman, Daniel MD, et al, *"Prognostic Significance of Cholesterol in Nursing Home Men,"* 1988, Journal of Enteral and Parenteral Nutrition, vol 12, pp155-58

Frailty Hyporcholesterolemia

Verdery, Rob B, et al, *"Hypocholesterolemia as a Predictor of Death: A Prospective Study of 224 Nursing Home Residents,"* 1991, Journal of Gerontology, Vol 46(3), pp.M84-M90

"Residents had a 10-fold greater risk of dying if they had low cholesterol levels (2.3mmol/1 = 89mg/dl) and a 2-fold greater risk at high cholesterol levels (7.5mmol/1 = 290mg/dl)." Nadir was 4.7 mmol/1 = 181 mg/dl
Low albumin, low hemoglobin, low and low BMI were associated with a 400% greater risk of all cause mortality.

Frailty Hypocholesterolemia

- Decubiti
- Elevated WBC's
- Use of enteral feeding
- Being bedbound

Were all associated with:

- Hypocholesterolemia
- Hypoalbuminemia
- Anemia
- Hyperglycemia
- Low BMI

Frailty/Hypocholesterolemia / Prognosis

Results:

For patients in this study with low cholesterol, low hemoglobin and low albumin, mortality was 84% at one (1) year versus 7% if no risk factors.

Oster P, et al, *"The Prognostic Significance of Hypocholesterolemia in Hospitalized Patients,"* 1981,Klinische-Wochen Schriff, vol 59, pp857-860

Cholesterol and Hospitalization

For cholesterol levels <120mg/dl on two consecutive days immediately after admission, mortality rate was 32%. Prognosis was particularly poor for:

Heart Disease – 36%

Liver Disease – 31%

Malignancies – 33%

200 of 3700 consecutive admissions

For Cholesterols <80mg/dl, mortality rate was 57%, 80 to 100 - 20%, 100 to 120 - 20%

Oster P, et al, *"The Prognostic Significance of Hypocholesterolemia in Hospitalized Patients,"* 1981,Klinische-Wochen Schriff, vol 59, pp857-860

Cholesterol and Hospitalization

For patients who developed hypocholesterolemia – started at > or = to 160mg/dl but fell to <120 mg/dl:

- Greater LOS (x3)
- More likely to have had surgery
- NPO for 5 days or longer
- More complications
- Slightly more likely to die (10 versus 4 deaths, p=0.08)

Noel, Margaret A MD, et al, *"Characteristics and Outcomes of Hospitalized Older Patients Who Develop Hypocholesterolemia,"* JAGS, vol 39, pp455-61

Table 2

Mortality from Lower Respiratory Infection In Nursing Home Residents, by Potential Predictors

Predictor	No. of Missing Values*	30-day Mortality: No. of Participants with Condition	30-day Mortality: Risk of Exposed No. (%)	30-day Mortality: Relative Risk (95% CI)
Diagnosis				
Probable pneumonia	14	42	9 (21.4)	3.04 (1.16, 7.96)
Possible pneumonia	14	70	10 (14.3)	1.63 (0.59, 4.49)
Demographics				
Sex, Female	0	105	12 (11.4)	1.03 (0.35, 2.99)
Age, >91 years	0	32	3 (9.4)	0.79 (0.24, 2.59)
ADL Status				
Resident bedfast	0	37	8 (21.6)	2.81 (1.14, 6.95)
Katz ADL: 6 dependencies	2	70	13 (18.6)	4.27 (1.27, 14.3)
Magnitude estimation ADL				
≤4500	0	69	3 (4.35)	1.0 (referent)
4501 to 5430		51	5 (9.80)	2.26 (0.56, 9.01)
5431		21	8 (38.1)	8.76 (2.55, 30.1)
Cognitive Performance Scale Status (0 to 6 scale)†	8			
0 to 2		41	4 (9.76)	1.0 (referent)
3 to 5		57	3 (5.26)	0.54 (0.13, 2.28)
6		35	8 (22.9)	2.34 (0.77, 7.12)
Vital Signs (at nurse evaluation)				
Systolic blood pressure ≤110	1	32	7 (21.9)	2.62 (1.06, 6.49)
Diastolic blood pressure ≤ 60	0	44	6 (13.6)	1.32 (0.51, 3.41)
Temperature ≥38.2 °C	0	33	7 (21.2)	2.54 (1.03, 6.31)
Pulse, beats per minute				
70 to 99	0	94	5 (5.32)	1.0 (referent)
≤69		17	4 (23.5)	4.42 (1.32, 14.8)
≥100		30	7 (23.3)	4.39 (1.50, 12.8)
Respiratory rate > 30	0	41	8 (19.5)	2.44 (0.98, 6.06)

Mehr, David RMd, MS et al, *"Mortality from Lower Respiratory Infections in Nursing Home Residents"*, 1998, J Fam Prac 47(21):298-304

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Table 2

Predictor	No. of Missing Values*	30-day Mortality: No. of Participants with Condition	30-day Mortality: Risk of Exposed No. (%)	30-day Mortality: Relative Risk (95% CI)
Conditions				
Catheter in use	0	20	6 (30.0)	3.63 (1.48, 8.88)
Decubitus ulcer	0	22	5 (22.7)	2.46 (0.95, 6.38)
Body mass index <17.5	13	27	2 (7.41)	0.83 (0.19, 3.62)
Lab Findings				
Albumin <3.0	39	27	6 (22.2)	5.56 (1.49, 20.7)
Potassium >5.0	33	9	4 (44.4)	5.50 (2.05, 14.8)
White blood cells ≥15,000	10	33	7 (21.2)	3.46 (1.25, 9.58)
Lymphocytes ≤800	12	28	6 (21.4)	3.09 (1.13, 8.46)
Cholesterol <140	40	21	5 (23.8)	4.76 (1.40, 16.2)
Creatinine clearance < 25	38	27	6 (22.2)	5.63 (1.51, 21.0)
Blood urea nitrogen ≥30	19	38	9 (23.7)	4.97 (1.63, 15.1)
Comorbid Conditions				
Coronary heart disease	0	40	5 (12.5)	1.15 (0.43, 3.09)
Chronic obstructive pulmonary disease	0	28	6 (21.4)	2.42 (0.96, 6.10)
Coronary heart failure	0	31	3 (9.68)	0.82 (0.25, 2.69)
Cerebrovascular disease	0	34	4 (11.8)	1.05 (0.36, 3.04)
Cancer	0	14	0 (0.0)	‡
Diabetes mellitus	0	19	2 (10.5)	0.92 (0.23, 3.72)
Hypertension	0	46	3 (6.52)	0.48 (0.14, 1.59)

ADL denotes acttivites of daily living; CI, confidence interval
• Based on 141 episodes in 121 residents.
† Higher scores indicate poorer congitive function.
‡ No mortality in exposed group prevents computation of confidence intervals

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6 most Powerful predictors of Poor Outcome for a NH Patient with Pneumonia

1. Complete ADL deficiency RR 8.76
2. CrCL < 25 RR 5.63
3. Albumin < 3.0 RR 5.56
4. Potassium > 5.0 RR 5.50
5. BUN > or = 30 RR 4.97
6. Chol < 140 RR 4.76

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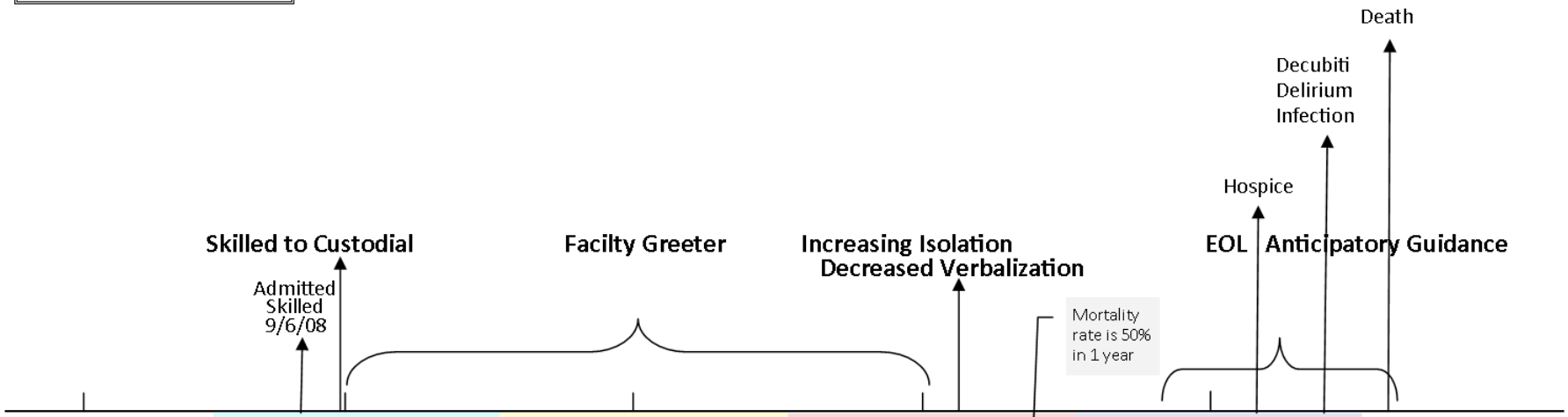
PROGNOSTIC DATA

71 Year old male

CHF - Moderate
Dementia - Moderate
Tib Fib– FX

a. 20% of Medicalre - Hospital to Skilled
b. 1/3 of Skilled to Custodial
c. Greater than 50% of new Custodial patients die withing 6 months

a. Complete ADL deficit
   - Worst 1st year Prognosis
b. Anticipate:
   - Pressure Ulcers
   - Weight Loss
   - Delirium
   - Infection



Tib Fib Fx NWB → W/C

13lb wt loss

Weight	206	208	206	204	206	204	191	192	186	184
ADL (Assist)	Assisted Living → 3 ADL	-4		-4		-5	-6**			
Alb		3.6			3.4	3.4	3.4(8/13/11)	2.9(1/12/12) ╪		
Chol				LDL 109	161(LDL 101)	178 (114)	156(90) ╪*			
Hgb		12.5		12.1	12.2	12.2	11.4 ╪			
BNP				294		391, 417, 594				
Cr		1.2		1.1		0.8				

*Cholesterol less than 150 in men 63% mortality at 14 months
** Worst 1 year prognostic marker
╪ Low cholesterol, low albumin, low hemoglobin = 84% 1 year mortality

Hoefer, Daniel, M.D

Conclusion:

Frailty:

- Is under-recognized
- Is an independent diagnosis
- Is progressive but treatable
- Has a predictable course and significant prognostic consequences

Thank you!

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