Older Age Risk Assessment Pre-Workshop Reference

AAIM Triennial October 15-20, 2022
Boston, MA

Facilitators

Sheila MacDonnell, MD, MS, DBIM

Tim Steffen, MD, DBIM, FALU, FLMI

Pre-Read Material

- Please read this material **PRIOR** to attending the workshop
- The information is
  - Geared towards the newer insurance medical director and those interested in the industry
  - Intended to be a helpful reference for the board exam
  - Journal of Insurance Medicine (JIM) articles referenced to highlight the industry research on certain biometrics, testing and labs that are leveraged at older ages
  - Outlined in red boxes on slides to reflect important takeaways
- **The workshop itself will be entirely case discussion**
- **We can't wait to see you in Boston in October!**

Objectives

- Differentiate chronological aging vs. physiological aging and normal aging vs. successful aging
- Review US population statistics and leading causes of death at older ages
- Explore the Impact of multi-morbidity, functional disability, frailty, polypharmacy and falls on mortality and review the get up and go screen (GUG)
- Discuss mild cognitive impairment (MCI) and dementia, associated mortality and screening tools including mini-Cog, clock draw test (CDT), and the delayed word recall (DWR)
- Review of industry studies related to build, albumin, NT-probnp and anemia in older adults
- Explore underwriting tools available at older ages
- Review the ongoing risk associated with COVID-19 and this population group

- Workshop will be entirely case-based with discussion

Objectives

- **Differentiate chronological aging vs. physiological aging and normal aging vs. successful aging**
- Review US population statistics and leading causes of death at older ages
- Explore the Impact of multi-morbidity, functional disability, frailty, polypharmacy and falls on mortality and review the get up and go screen (GUG)
- Discuss mild cognitive impairment (MCI) and dementia, associated mortality and screening tools including mini-Cog, clock draw test (CDT), and the delayed word recall (DWR)
- Review of industry studies related to build, albumin, NT-probnp and anemia in older adults
- Explore underwriting tools available at older ages
- Review the ongoing risk associated with COVID-19 and this population group

- Workshop will be entirely case-based with discussion

Chronologic vs Physiologic Age

- Age is commonly measured chronologically and a person 65 years or older is often referred to as “elderly”
- From the SOA Older Age Underwriting Practices Survey, most respondents consider older age as 70+
- It is well understood that chronological age does not account for the significant heterogeneity in the aging process
- The concept of physiologic age provides a better understanding of the diversity of health and the aging process in this group

Defining ‘elderly’ in clinical practice guidelines for pharmacotherapy
Singh S, Bajorek B.
Pharmacy Practice 2014 Oct-Dec;12(4):489

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4282767/

2016 Older Age Underwriting Practices Survey Report

https://www.soa.org/globalassets/assets/Files/Research/Exp-Study/older-age-underwriting-report.pdf

Physiologic Age

- Based on physical, cognitive and psychosocial health
  - Number and severity of chronic diseases
    - Multimorbidity
  - Degree of independence or dependance
    - Functional ability vs disability
    - Frailty vs vitality
  - Variety of social networks
  - Daily activities, exercise, lifestyle and habits
- In general, these physiologic age characteristics are better predictors of outcome in the older age population than chronological age alone

Goodwin, L (2006) *Brackenridge's Medical Selection of Life Risks Fifth Edition*, Chapter 7

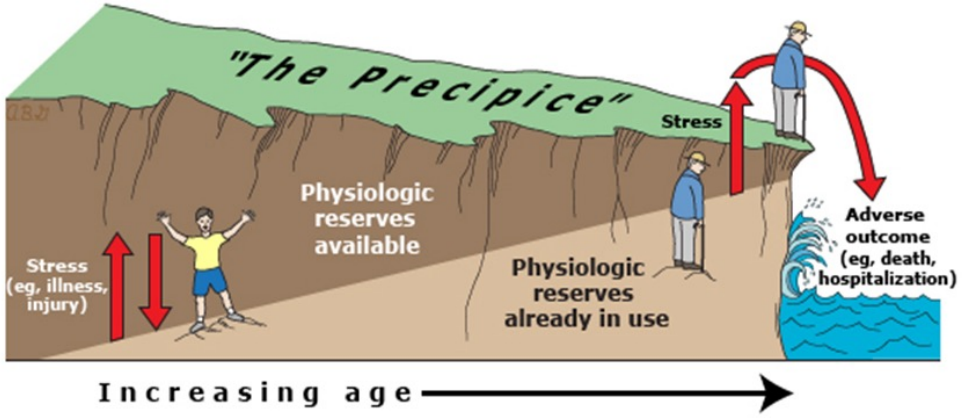
Physiologic Changes Associated with Normal Aging

- Hematopoietic system
  - Functional bone marrow reserves are reduced
  - Reduced WBC function
- Gastrointestinal
  - Increased reflux esophagitis
  - Sensitivity to gastric irritants (NSAIDS)
- Renal
  - Renal mass and function decline with reduced creatinine clearance
  - Increased sensitivity to medication toxicity
- Cardiovascular
  - Elevated blood pressure
    - Ventricular cardiomyocytes hypertrophy in compensation
  - Increased risk for CAD
  - Impaired LV filling/diastolic dysfunction leading to increased LA size and resultant risk of A. Fib
  - Reduced response in HR and EF to exercise
  - Increased calcification of heart valves
- Pulmonary
  - Increased frequency of pneumonia and likelihood of hypoxia
  - Loss of lung volume surface area and lung elasticity
  - Cough is less vigorous and mucociliary clearance is slower
- Genitourinary
  - Prevalence of urinary incontinence increases
- Musculoskeletal
  - Reduced muscle mass in relation to body weight
  - Recovery to injury is slowed
  - Impaired mobility and balance
  - Increased probability of fracture with reduced bone mass
- Central Nervous System
  - Brain volume loss/atrophy most prevalent in the frontal and temporal lobes
- Skin
  - Atrophy, decreased elasticity, and impaired reparative responses
- Eyes
  - Presbyopia
- Immune system
  - Immunosenescence –
    - Disruption in the ability of lymphocytes to work in concert to generate effective immune responses
    - Loss of precise regulation of the inflammatory process
    - Increased risk of infection, malignancy and autoimmune disorders

Taffert, G. (2022). Normal Aging. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on July 18, 2022), from https://www.uptodate.com/contents/normal-aging

Homeostenosis

- As one grows older, there are progressive and predictable biological changes associated with increased susceptibility to many diseases
- Aging is a heterogeneous process
- Multiple factors affect each individual differently based off their chronic disease profile/severity, genetics and lifestyle/habits, among other physiological and psychological factors
- "The ability to maintain homeostasis is challenged over time due to diminishing physiologic reserves that occurs with aging – Homeostenosis"
- Frailty occurs when physiologic reserves available are diminished to a point that the individual is unable to return to homeostasis



Based on information from: Taffet GE. Physiology of aging. In: Cassel CK, Leipzig RM, Cohen HJ, et al [eds]. Geriatric Medicine: An Evidence-Based Approach, 4th ed. New York, Springer, 2003.

Graphic 58907 Version 9.0

Taffert, G. (2022). Normal Aging. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on July 18, 2022), from https://www.uptodate.com/contents/normal-aging

Successful Aging and Resilience

- Successful aging - older individuals who continue to function well, both physically and cognitively, with minimal to no chronic disease impact
  - These are individuals who have a high quality of life, low stress, are quick to recover from adversity, and have a high level of vitality/activity
- Resilience (per the American Psychological Association) – "The process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress, or 'bouncing back' from difficult experiences."
  - Characteristics that foster resilience:
    - Higher quality of life
    - Greater happiness
    - Better mental health/wellbeing
    - Optimism
    - Successful aging
    - Lower depression
    - Strong coping skills
    - A strong social network
  - These characteristics lead to longevity and reduced mortality risk

The impact of resilience among older adults
MacLeod, S et. al.
Geriatric Nursing Volume 37, Issue 4, July–August 2016, Pages 266-272

https://www.sciencedirect.com/science/article/pii/S0197457216000689#bib1

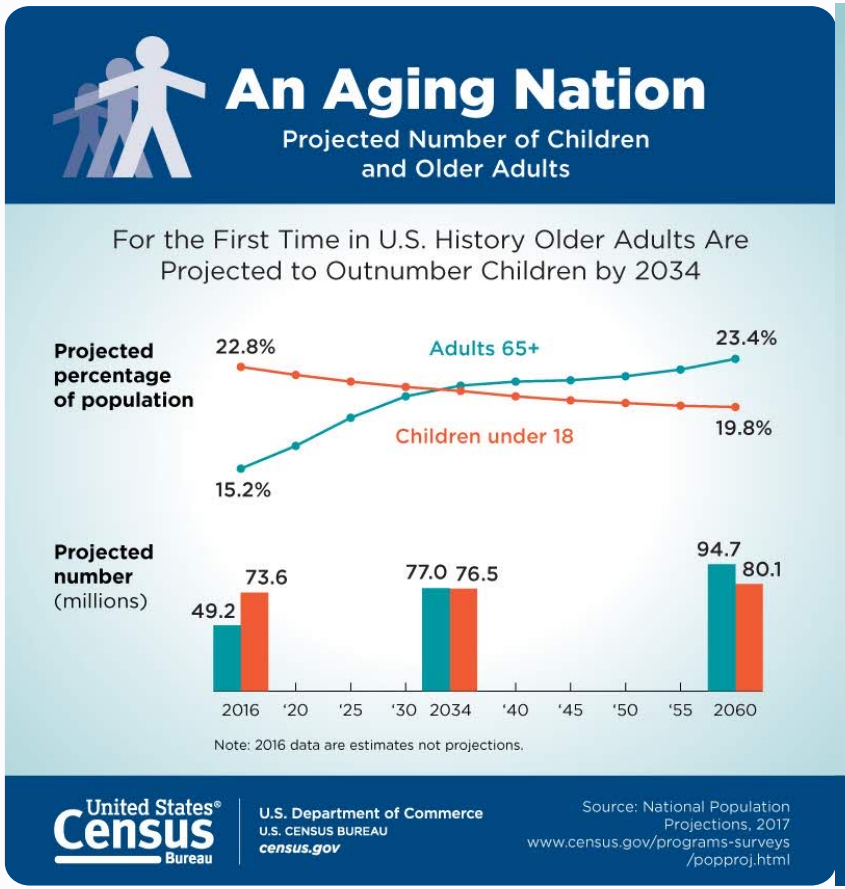
Objectives

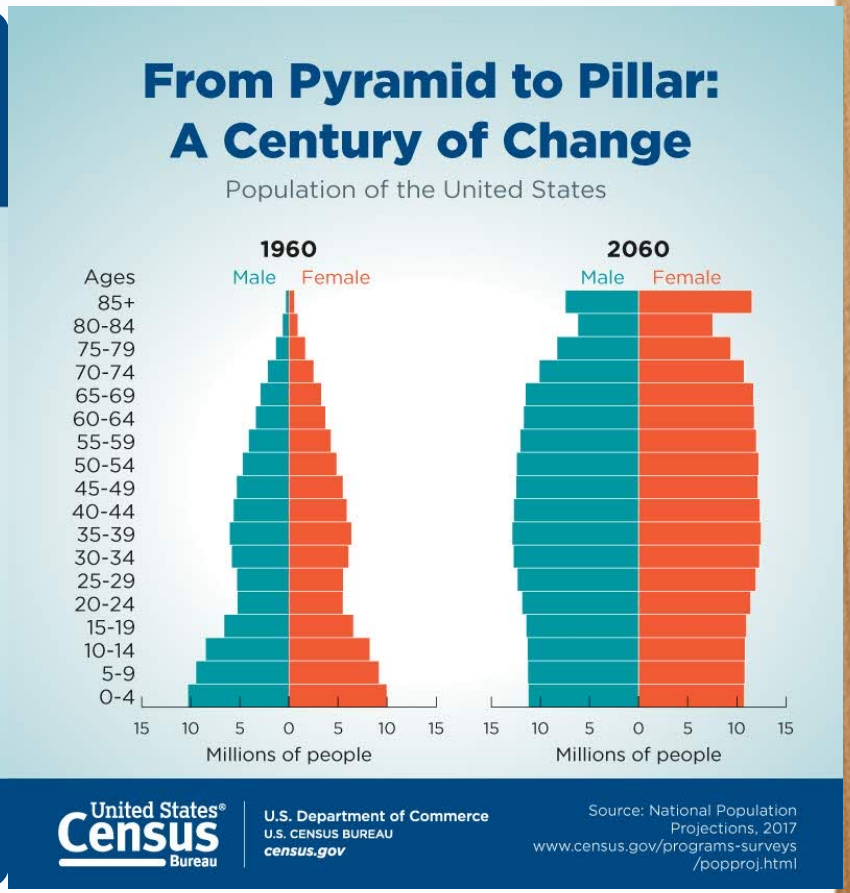
- Differentiate chronological aging vs. physiological aging and normal aging vs. successful aging
- **Review US population statistics and leading causes of death at older ages**
- Explore the Impact of multi-morbidity, functional disability, frailty, polypharmacy and falls on mortality and review the get up and go screen (GUG)
- Discuss mild cognitive impairment (MCI) and dementia, associated mortality and screening tools including mini-Cog, clock draw test (CDT), and the delayed word recall (DWR)
- Review of industry studies related to build, albumin, NT-probnp and anemia in older adults
- Explore underwriting tools available at older ages
- Review the ongoing risk associated with COVID-19 and this population group

- Workshop will be entirely case-based with discussion

The US Population is Aging…

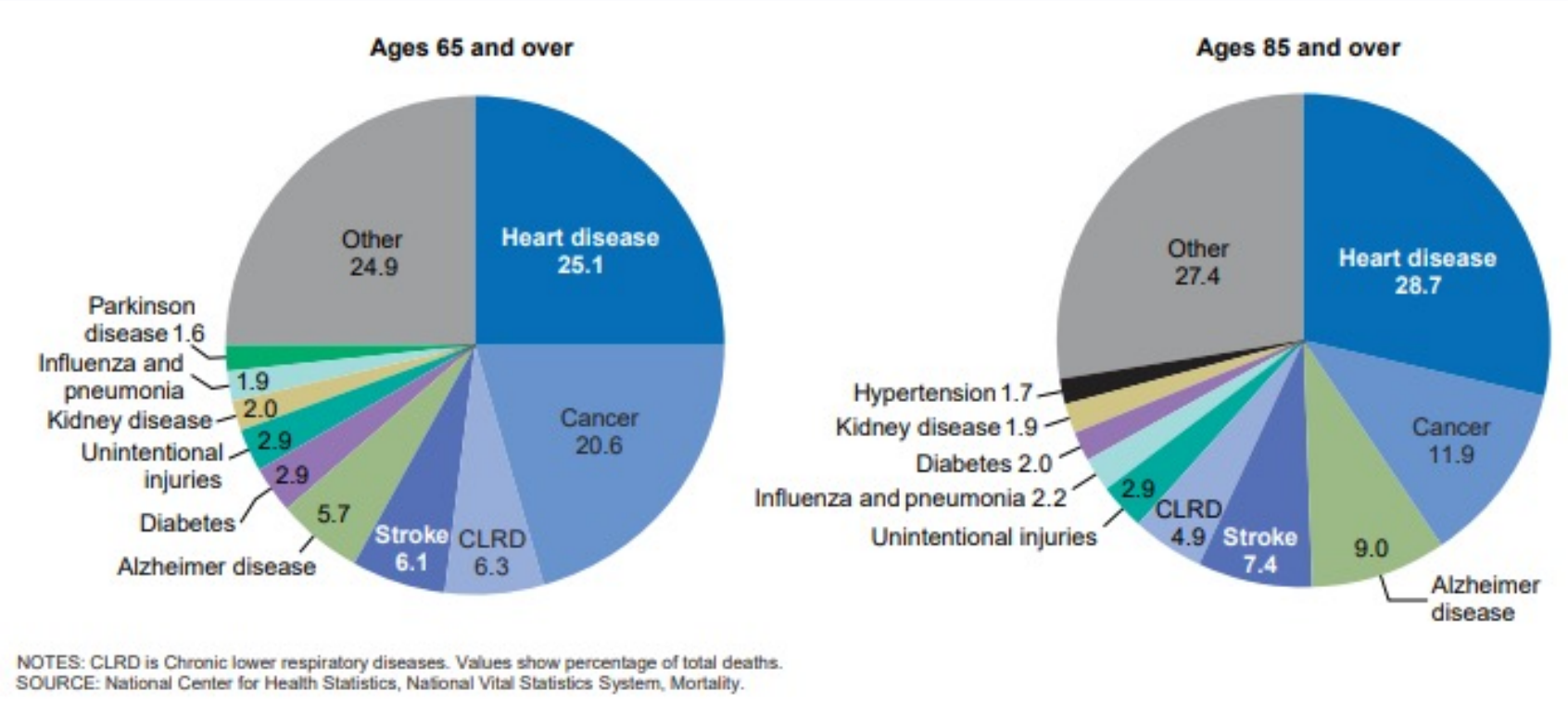
- It's estimated that in 2030 when all the baby boomers will be over 65, older Americans will make up 21% of population (vs 15% today)
- 2060 nearly 1 in 4 Americans will be 65 years and older
- Fewer births along with longer life expectancy also leads to US aging





Source: https://www.census.gov/library/stories/2018/03/graying-america.html - accessed June 2022

Percent Distribution of the 10 Leading Causes of Death United States, 2019



Source: https://www.cdc.gov/nchs/data/nvsr/nvsr70/nvsr70-09-508.pdf - accessed June 2022

Society of Actuaries – Cause of Death Report

SUMMARY OF CLAIMS BY YEAR, QUARTER, AND MAIN CAUSE GROUP, 2015 - 1Q 2021

Calendar Year	Quarter	Communicable	COVID-19	Non-Communicable	Non-Medical	Unknown	Quarter Totals
2015	1	13,023	0	59,018	3,723	45,271	121,035
	2	10,228	0	52,365	3,598	41,353	107,544
	3	8,713	0	50,913	3,730	39,178	102,534
	4	9,697	0	52,800	3,610	46,182	112,289
2016	1	11,301	0	55,732	3,624	44,586	115,243
	2	9,475	0	51,034	3,748	40,853	105,110
	3	8,764	0	49,916	3,880	40,322	102,882
	4	9,693	0	54,151	3,743	46,114	113,701
2017	1	11,878	0	56,685	3,738	45,412	117,713
	2	9,418	0	50,929	3,854	40,827	105,028
	3	8,710	0	49,083	3,930	40,039	101,762
	4	9,671	0	52,616	3,785	47,762	113,834
2018	1	12,511	0	55,172	3,555	48,001	119,239
	2	8,956	0	50,014	3,692	42,297	104,959
	3	8,074	0	49,109	3,723	41,132	102,038
	4	8,509	0	50,810	3,578	50,169	113,066
2019	1	9,648	0	50,776	3,493	51,261	115,178
	2	7,933	0	46,892	3,622	48,770	107,217
	3	6,717	0	45,219	3,717	47,873	103,526
	4	7,776	0	48,856	3,600	49,990	110,222
2020	1	10,231	763	52,978	3,414	48,406	115,792
	2	8,988	10,052	52,012	3,652	48,196	122,900
	3	8,046	5,707	52,164	3,945	45,632	115,494
	4	9,133	16,567	53,504	3,662	52,506	135,372
2021	1	8,928	15,242	51,741	3,494	51,791	131,196
Cause Totals		**236,021**	**48,331**	**1,294,489**	**92,110**	**1,143,923**	**2,814,874**

SUMMARY OF CLAIMS BY CAUSE AND AGE GROUP, 2015 - 1Q 2021

Main Cause Category	Cause Subcategory	5-39	40-74	75-94	Cause Grand Total
Communicable	Influenza/Pneumonia	380	15,608	53,689	**69,677**
	Other Communicable	329	10,655	22,833	**33,817**
	Respiratory Diseases	634	39,564	92,329	**132,527**
	COVID-19	261	17,678	30,392	**48,331**
Non-Communicable	Cancer	4,070	187,994	185,608	**377,672**
	CVD other than hypertension	3,481	147,555	371,409	**522,445**
	Diabetes	285	7,622	9,878	**17,785**
	Digestive	775	18,359	17,136	**36,270**
	Hypertension	228	12,240	29,723	**42,191**
	Kidney Disease	178	8,294	18,676	**27,148**
	Nervous System	859	26,011	121,574	**148,444**
	Other Non-Communicable	2,247	30,821	89,466	**122,534**
Non-Medical	Auto Transport Accidents	3,056	7,171	2,547	**12,774**
	Other Accidents	7,392	17,341	22,142	**46,875**
	Other Non-Medical	3,054	5,235	5,125	**13,414**
	Suicide	4,152	12,368	2,527	**19,047**
Unknown	Unknown	10,855	430,545	702,523	**1,143,923**
Age Group Grand Total		**42,236**	**995,061**	**1,777,577**	**2,814,874**

Source: https://www.soa.org/49667f/globalassets/assets/files/resources/research-report/2022/2022-cause-death-report.pdf

Percentage of Total Deaths 1999-2020

- Actuaries price products with the understanding that older age individuals die at a higher rate than younger
- 75% of those who have died between 1999 - 2020 are age 65+

Underlying Cause of Death, 1999-2020 Results

Deaths occurring through 2020

Request Form | Results | Map | Chart | About

Underlying Cause of Death Data | Dataset Documentation | Other Data Access | Help for Results | Printing Tips | Help with Exports | Save | Export | Reset

Quick Options | More Options | Top | Notes | Citation | Query Criteria

Ten-Year Age Groups	Deaths	Population	Crude Rate Per 100,000	% of Total Deaths
< 1 year	20,921	3,783,052	553.0	0.7%
1-4 years	3,676	15,793,631	23.3	0.1%
5-14 years	5,497	40,994,163	13.4	0.2%
15-24 years	29,771	42,687,510	69.7	1.0%
25-34 years	59,178	45,940,321	128.8	2.1%
35-44 years	82,986	41,659,144	199.2	2.9%
45-54 years	160,393	40,874,902	392.4	5.6%
55-64 years	374,937	42,448,537	883.3	13.1%
65-74 years	555,559	31,483,433	1,764.6	19.5%
75-84 years	688,027	15,969,872	4,308.3	24.1%
85+ years	873,746	6,604,958	13,228.6	30.6%
Not Stated	147	Not Applicable	Not Applicable	0.0%
Total	**2,854,838**	**328,239,523**	**869.7**	**100.0%**

https://wonder.cdc.gov/ Accessed 7/2022

The Impact of Disease on Life Expectancy

- The ability to assign mortality risk and determine insurability stems from an understanding of life expectancy within a given disease(s)/impairment(s)
- Reports of cause of death from a single underlying disease are often flawed or outright incorrect in the older age group
  - Can lead to an underestimation of the extent of other contributing conditions
- Coexisting conditions can contribute to death, but are not always accounted for in studies or death reports
- Assessing mortality risk in the older age population is complex
- Research addressing survival and treatment in the older age group is lacking

Contribution of Individual Diseases to Death in Older Adults with Multiple Diseases
Tinetti, M et al.
J Am Geriatr Soc. 2012 Aug; 60(8): 1448–1456 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3419332/

Total and Cause-Specific Mortality in the Cardiovascular Health Study

Anne B. Newman , Michael C. Sachs , Alice M. Arnold , Linda P. Fried , Richard Kronmal , Mary Cushman , Bruce M. Psaty , Tamara B. Harris , John A. Robbins , Gregory L. Burke , Lewis H. Kuller , and Thomas Lumley

J Gerontol A Biol Sci Med Scil. 2009; Vol. 64, No. 12, 1251–1261

- 5,888 men(42.4%) and women(57.6%) were followed in the US for an average of 13 - 16years
- Age 65 and older (avg 72.8 years)
- Mortality rates were calculated per 100 person-years.
- Survival curves for the CHS cohort were compared with an age-, race-, and sex-matched sample from the U.S. population.

Factors associated with <u>increased</u> Relative Risk of Mortality

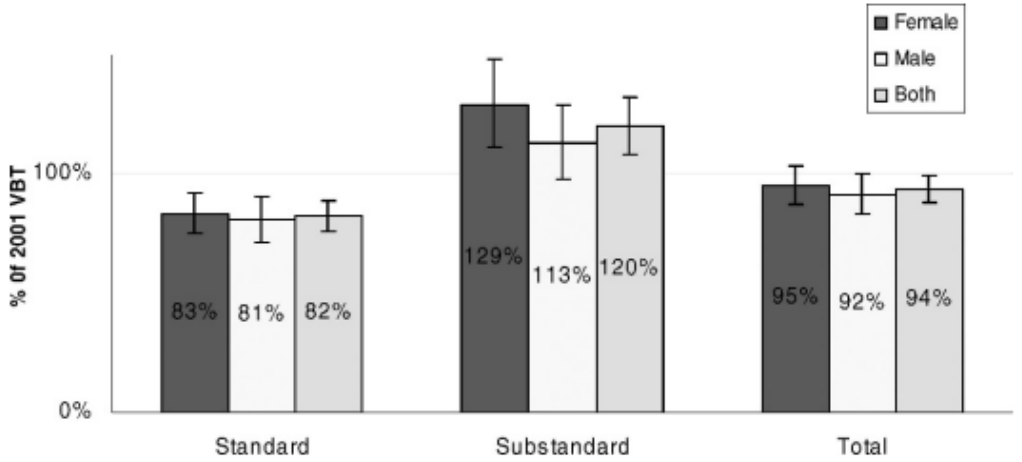
- Low body weight
- Smoking
  - Most significant > 50 pack year
- Low self-rated health report
- ADL difficulties
- Low physical activity
- History of CHF
- History of CAD
- Low FVC
- Major EKG abnormality
- Carotid Stenosis
- Low ABI
- Low Serum Albumin
- Elevated Serum Creatinine
- Elevated IL-6 level
  - Marker of dysregulation of immune function and a chronic inflammatory state

https://academic.oup.com/biomedgerontology/article/64A/12/1251/567245

Mortality Experience in the Elderly in the Impairment Study Capture System

Thomas Ashley, MD, FACP; Clifton Titcomb, Jr, MD; Anna Hart, MS; Richard Bergstrom, FSA, MAAA – J Insur Med 2008;40:110-115

- Mortality experience and underwriting analyzed on policies issued at ages 70 +
- Policy issue dates from 1990–1998 and observation ran from 5–12 years
- 64% Female, 36% male
- 1430 deaths occurred within the study group of 102,507 policy years
- Groups divided into standard and substandard issued policies and MR were calculated
- Cases issues standard had MR of 82% of the 2001 VBT
- Cases issues substandard had worse mortality with MR of 120% of 2001 VBT



"Proper risk selection in the elderly is difficult. Our study provides reassurance that industry risk classification performance is effective."

Objectives

- Differentiate chronological aging vs. physiological aging and normal aging vs. successful aging
- Review US population statistics and leading causes of death at older ages
- **Explore the Impact of multi-morbidity, functional disability, frailty, polypharmacy and falls on mortality and review the get up and go screen (GUG)**
- Discuss mild cognitive impairment (MCI) and dementia, associated mortality and screening tools including mini-Cog, clock draw test (CDT), and the delayed word recall (DWR)
- Review of industry studies related to build, albumin, NT-probnp and anemia in older adults
- Explore underwriting tools available at older ages
- Review the ongoing risk associated with COVID-19 and this population group

- Workshop will be entirely case-based with discussion

Multimorbidity

- "The co-occurrence of two or more chronic medical or psychiatric conditions, which may or may not directly interact with each other"
- Multimorbidity is common and increases substantially with age
- There is evidence to suggest that multimorbid individuals
  - Have higher mortality
  - Have higher rates of functional decline and disability
  - Report poorer quality of life
  - Have higher healthcare costs
- Mental illness, especially depression, has been shown to increase the negative outcomes associated with multimorbidity

Effect of Chronic Diseases and Multimorbidity on Survival and Functioning in Elderly Adults

Debora Rizzuto, PhD, Rene J. F. Melis, PhD, Sara Angleman, PhD, Chengxuan Qiu, PhD.

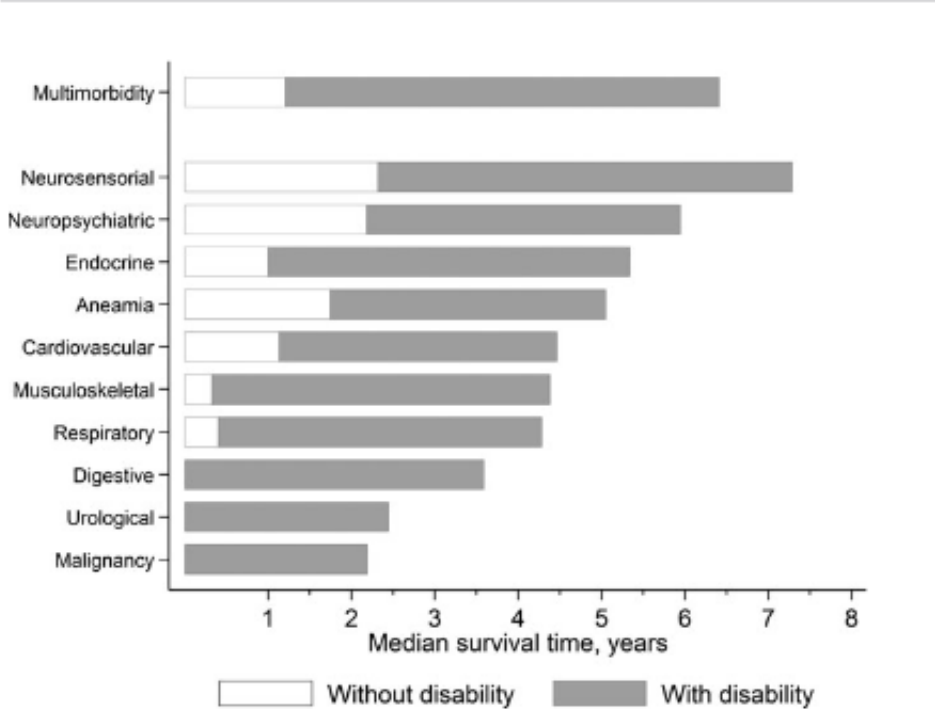
The Journal of the American Geriatrics Society 5:1056–1060, 2017

https://agsjournals.onlinelibrary.wiley.com/doi/10.1111/jgs.14868

Effect of Chronic Diseases and Multimorbidity on Survival and Functioning in Elderly Adults

Debora Rizzuto, PhD, Rene J. F. Melis, PhD, Sara Angleman, PhD, Chengxuan Qiu, PhD.
The Journal of the American Geriatrics Society 5:1056–1060, 2017

- Study consisting of 1099 individuals of Central Stockholm aged 75 and older – The Kungsholman Project
- This was an **11 year** follow up study
- Most common condition in this study was multimorbidity affecting 70%
  - Multimorbidity defined as ≥ 2 coexisting chronic diseases of 38 chronic conditions
  - The 38 chronic diseases were grouped using the ICD-10 classification system into 10 categories



https://agsjournals.onlinelibrary.wiley.com/doi/epdf/10.1111/jgs.14868

Effect of Chronic Diseases and Multimorbidity on Survival and Functioning in Elderly Adults

Debora Rizzuto, PhD, Rene J. F. Melis, PhD, Sara Angleman, PhD, Chengxuan Qiu, PhD.
The Journal of the American Geriatrics Societv 5:1056–1060. 2017

Table 1. Number and Prevalence of Cases at Baseline of group of Chronic Diseases and Multimorbidity, Number of Related Deaths, Hazard of Mortality, Population Attributable Risk (PAR) of Death, and Median Years of Life Lost (YLL) at Follow-Up

	Baseline		11 Year of Follow-Up			
Organ System	Cases, n	Prevalence per 100 (95% CI)	Deaths, n	Mortality, HR (95% CI)[a]	PAR, % of Death (95% CI)	Median YLL[b]
Anemia	199	18.1 (15.9–20.5)	165	1.5 (1.3–1.7)	5.4 (3.6–7.2)	−1.6
Cardiovascular	655	59.6 (56.7–62.5)	492	2.7 (2.2–3.2)	28.0 (24.7–31.2)	−5.0
Digestive	80	7.3 (5.9–9.0)	57	1.2 (0.9–1.4)	—[c]	—[c]
Endocrine	156	14.2 (12.3–16.4)	110	1.0 (0.8–1.2)	—[c]	—[c]
Malignancy	153	13.9 (12.0–16.1)	117	1.8 (1.6–2.1)	6.7 (5.4–8.0)	−4.3
Neuropsychiatric	297	27.0 (24.5–29.7)	264	2.3 (2.0–2.7)	17.0 (15.0–19.0)	−2.0
Musculoskeletal	279	25.4 (22.9–28.0)	238	1.5 (1.3–1.7)	8.8 (6.1–11.4)	−2.5
Neurosensorial	285	25.9 (22.9–28.1)	229	1.1 (0.9–1.3)	—[c]	—[c]
Respiratory	86	7.8 (6.4–9.6)	71	1.4 (1.2–1.8)	2.5 (1.3–3.7)	−1.5
Urological	99	9.0 (7.5–10.9)	73	1.3 (1.0–1.7)	—[c]	—[c]
Multimorbidity	774	70.4 (67.7–73.1)	608	5.1 (2.6–9.6)	69.3 (50.7–80.8)	−7.5

[a]Hazard ratios (HRs) were derived from two flexible parametric models using age as time scale; the first model included all specific group of diseases, sex, education, and age at baseline. The second model included multimorbidity, sex, education, and age at baseline.
[b]Median YLL was estimated comparing median survival with and without the specific chronic condition, that were derived from survival functions.
[c]Estimates only for conditions with a clear effect on mortality.
CI = confidence interval.

- **Multi-Morbidity accounted for 69% of deaths, 7.5 years lost**
- **Those with multimorbidity lived 81% of their remaining years of their life with disability (median 5.2 years)**
- **1/3 of the total deaths in this study were attributed to CVD**

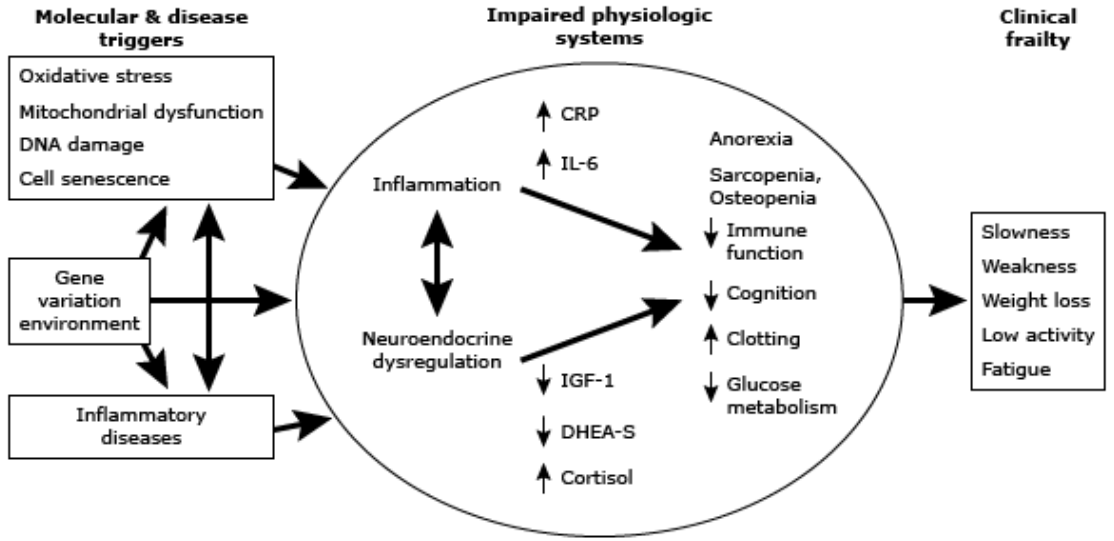
https://agsjournals.onlinelibrary.wiley.com/doi/epdf/10.1111/jgs.14868

Frailty

- Prevalence – 4 to 16% in community dwelling individuals 65 and older
- Pre-frailty – prevalence ranges from 28 to 44% in community dwelling individuals 65 and older
- Definition varies but typically includes physiologic decline and marked vulnerability to adverse health outcomes
- Increased risk for procedural complications, falls, institutionalization, disability and death
- After adjusting for comorbidities – frailty predicts hip fractures, disability and hospitalization
- Pathophysiology driven in part by inflammatory pathways, dysregulation of neuroendocrine systems
- No gold standard for detecting frailty – many tools

Walston J. (2021). Frailty. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on September 11 2022), from https://www.uptodate.com/contents/frailty

Hypothesized model of frailty and adverse health outcomes



CRP: C-reactive protein; IL: interleukin; IGF: insulin-like growth factor; DHEA-S: dehydroepiandrosterone sulfate.

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.

UpToDate®

Walston J. (2021). Frailty. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on September 11 2022), from https://www.uptodate.com/contents/frailty

Frailty - Definitions

- Two frameworks that impact frailty measurement tools
- Physical frailty – frailty phenotype – fatigue, low activity, weakness, weight loss and slow gait
  - Fried Frailty Tool or Frailty Phenotype
- Deficit accumulation frailty or index frailty – cumulative comorbidities and cumulative illness
  - Accumulation of illnesses, functional and cognitive decline and social situations
  - Requires 20 or more questions, the higher number of deficits, the higher the frailty score

Walston J. (2021). Frailty. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on September 11 2022), from https://www.uptodate.com/contents/frailty

Fried Frailty Tool (Frailty Phenotype)

What underwriting tools may help to assess?

- Requires participation and specialized equipment for grip strength and walking speed
- 5 criteria
  - Weight loss (≥ 5% of body weight in last year) ← **Application/APS**
  - Exhaustion (positive response to questions regarding effort required for activity) ← **APS, maybe**
  - Weakness (decreased grip strength) ← **Typically, don't get this**
  - Slow walking speed (>6 or 7 seconds to walk 15 feet) ← **Get Up and Go Exam**
  - Decreased physical activity (males <383Kcals/week, females <270Kcals/week) ← **APS, maybe**
- Pre-frailty – 1 or 2 criteria
- Frailty – 3+criteria

Walston J. (2021). Frailty. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on September 11 2022), from https://www.uptodate.com/contents/frailty

Polypharmacy

- Exact number of medications that qualify as "polypharmacy" is variable but generally is considered 5-10 medications
- Typically includes prescription medications but can include over the counter medications and herbal or other supplements
- Approx. 20% of Medicare beneficiaries have 5+ chronic conditions and 50% receive 5+ medications
- Regardless of age, the greater numbers of medications used has been independently associated with an increased risk for an adverse drug event (ADE) and increased risk of hospitalization
- Associated with decreased physical and cognitive capability, even after adjusting for disease burden
- Beers criteria – originally developed by expert consensus panel (1991) medications considered potentially inappropriate for older individuals
  - identifies 5 categories of concern – Inappropriate for most older individuals, those medications that should be avoided in particular scenarios, those that should be used with caution, drug-drug interactions, require dose adjustment

Rochon, P. (2022). Drug Prescribing for Older Adults. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/drug-prescribing-for-older-adults

Polypharmacy – Older Ages at Risk

- Increases risk for ADEs due to metabolic changes and decreased drug clearance associated with aging
  - Risk compounded by increasing numbers of drugs used
- Increases potential for drug-drug interactions and for prescription of potentially inappropriate medications
- Increases possibility of "prescribing cascades“
  - Prescribing cascade – when an ADE is misinterpreted as a new medical condition and then another drug is prescribed to treat the ADE
- Can lead to adherence issues, especially if compounded by visual or cognitive impairment
  - 2017 systematic review of observational studies - suggested that medication regimen complexity is associated with nonadherence

Rochon, P. (2022). Drug Prescribing for Older Adults. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/drug-prescribing-for-older-adults

Falls in Older Individuals

- Leading cause of injury-related death among adults age 65 and older, and the age-adjusted fall death rate is increasing
  - Age-adjusted fall death rate is 64 deaths per 100,000 older adults
- Fall death rates among adults ages 65 and older increased about 30% from 2009 to 2018
- The fastest growing rate was among adults aged 85 and older (about 4% per year)
- 2018 Behavioral Risk Factor Surveillance System
  - 27.5% adults 65+ reported at least one fall within the past year (35.6 million falls)
    - 10.2% fall-related injury
  - 85+ years old –falls within the past year increased to about 34%
  - Falls account for 62% of non-fatal injuries leading to ER visits in 65+
  - About 5% of falls in older individuals lead to hospitalization

Source: https://www.cdc.gov/falls/dta/fall-deaths accessed July 2022

Kiel, D. (2022). Falls in Older Persons: Risk Factors and Patient Evaluation. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/falls-in-older-persons-risk-factors-and-patient-evaluation

Preventing Falls in Older Persons

Lainie Van Voast Moncada, MD and L Glen Mire, MD – Am Fam Physician 2017; 96(4):240-247

Risk Factors for Falls in Older Persons

- Cardiac – arrhythmias, congestive heart failure (CHF), hypertension (HTN)
- Environmental hazards
- Medications – risk is higher when 4+medications
- Metabolic – Diabetes (DM), low body mass index (BMI), Vitamin D deficiency
- Musculoskeletal – arthritis, balance impairment, foot problems, gait impairment, impaired activities of daily living (ADLs), limited activity, lower extremity muscle weakness, musculoskeletal pain, use of assistive device
- Neurologic – delirium, dizziness or vertigo, Parkinson disease or other movement disorders, peripheral neuropathy, history of cerebrovascular accident/transient ischemic attack
- Psychological – depression, fear of falling
- Sensory impairment – auditory impairment, multifocal lens, visual impairment
- Other – acute illness, anemia, cancer, inappropriate footwear, nocturia, obstructive sleep apnea (OSA), postural hypotension, urinary incontinence
- Age>80, white race, female, cognitive impairment, history of falling, history of fractures, recently discharged from the hospital (within one month)

Get Up and Go Test (GUG)

- A person is observed rising from a standard arm chair, walking forward 10 feet, turning around and walking back to the chair and sitting back down
- Originally described with a grading scale
  - 1= normal, 5 =severely abnormal
- Later versions used a timed component
- May uncover issues with leg strength, balance and vestibular function, and gait

Kiel, D. (2022). Falls in Older Persons: Risk Factors and Patient Evaluation. In *UpToDate*, J. Givens (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/falls-in-older-persons-risk-factors-and-patient-evaluation

The "Get up and go" test for gait assessment in older adult patients

The "Get up and go" test for gait assessment in older adult patients[1]	
Have the patient sit in a straight-backed high-seat chair	
Instructions for patient:	
Get up (without use of armrests, if possible)	
Stand still momentarily	
Walk forward 10 feet (3 meters)	
Turn around and walk back to chair	
Turn and be seated	
Factors to note:	
Sitting balance	
Transfers from sitting to standing	
Pace and stability of walking	
Ability to turn without staggering	
Modified qualitative scoring[2]	
(1) No fall risk	Well-coordinated movements, without walking aid
(2) Low fall risk	Controlled, but adjusted movements
(3) Some fall risk	Uncoordinated movements
(4) High fall risk	Supervision necessary
(5) Very high fall risk	Physical support of stand by physical support necessary
Timed test reference values (record time from initial rising to re-seating)[3]	
Age (years)	**Mean time in seconds (95% CI)**
60 to 69	8.1 (7.1 to 9.0)
70 to 79	9.2 (8.2 to 10.2)
80 to 99	11.3 (10.0 to 12.7)

Sources:

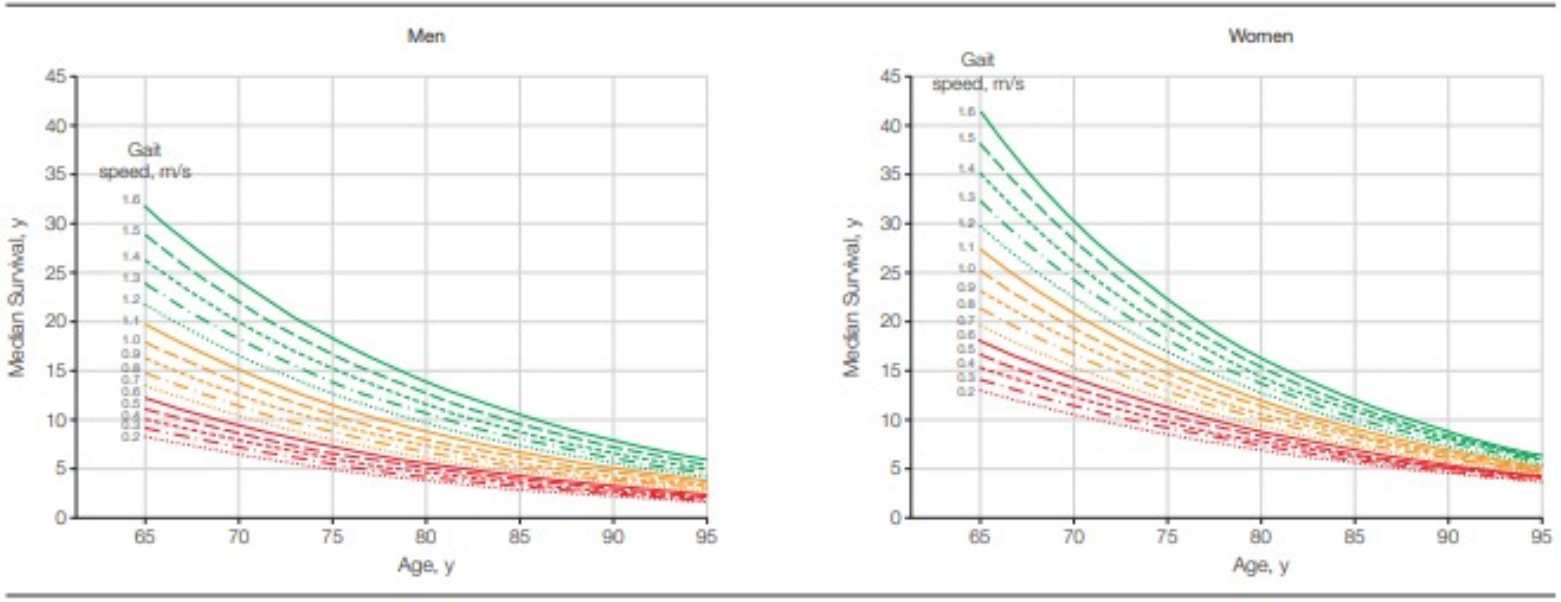
1. *Reproduced with permission from: Fleming KC, Evand JM, Weber DC, Chutka DS. Practical Functional Assessment of Elderly Persons: A Primary-Care Approach [Symposium on Geriatrics-Part III]. Mayo Clinic Proceedings 1995; 70:890. Copyright © 1995 Mayo Foundation.*
2. *From: Nordin E, Lindelöf N, Rosendahl E. Prognostic validity of the Timed Up-and-Go test, a modified Get-Up-and-Go test, staff's global judgement and fall history in evaluating fall risk in residential care facilities. Age Ageing 2008; 37:442. By permission of the British Geriatrics Society. Copyright © 2013 Oxford University Press.*
3. *Data from: Bohannon RW. Reference Values for the Timed Up and Go Test: A Descriptive Meta-Analysis. J Geriatr Phys Ther 2006; 29:64.*

UpToDate®

Gait Speed and Survival in Older Adults

Studenski S, et al. *JAMA*. 2011; 305(1): 50-58. doi:10.1001/jama.2010.1923.
https://jamanetwork.com/journals/jama/article-abstract/644554

- Data from 34485 community dwelling adults 65 and older (pooled analysis – 9 cohort studies)
- Baseline gait speed data follow up for 6 to 21 years
- Mean age 73.5 years, 59.6% women, 79.8% white, mean gait speed 0.92 (0.27)m/s
- 17528 deaths - gait speed was associated with survival in all included studies



Discriminative Ability and Predictive Validity of the Timed Up and Go in Identifying Older People Who Fall: Systematic Review and Meta-Analysis

Schone D, et al. *J Am Geriatric Soc*. 2013. Feb; 61(2): 202-8. doi.10.1111/jgs.12106.Epub 2013 Jan25.

- 53 studies with 12,832 participants
- Findings suggested that timed up and go was not useful for discriminating "fallers" from "non-fallers" in healthy high functioning older adults
- In adults 60+ timed testing did not show a difference in those with falls and those without falls who live independently
- It was felt to be of more value in less healthy lower functioning older individuals
- The study suggested that the overall predictive ability and diagnostic accuracy of the timed up and go was moderate at best with no cut-points recommended
- Authors suggested a quick multi-factorial fall risk screen should be considered in addition to help identify older adults at risk for fall

Timed GUG

- **Gait speed was associated with survival** in Studenski S, et al. study published in JAMA in 2011
- Schone D, et al. published in J Am Geriatric Soc. from 2013 suggested that…
  - For adults 60+, the timed testing **did not show a difference in those with falls and those without falls who live independently**
  - Timed testing was felt to be of more value in **less healthy lower functioning** older individuals
- Perhaps the timed aspect of the GUG is more meaningful when there are…
  - Co-morbidity or frailty concerns present
  - A lack of information on an older applicant
- Although gait speed has been associated with survival, perhaps when there is significant underwriting evidence of a robust older applicant with no significant chronic conditions, the timed aspect of the GUG becomes less meaningful

Objectives

- Differentiate chronological aging vs. physiological aging and normal aging vs. successful aging
- Review US population statistics and leading causes of death at older ages
- Explore the Impact of multi-morbidity, functional disability, frailty, polypharmacy and falls on mortality and review the get up and go screen (GUG)
- **Discuss mild cognitive impairment (MCI) and dementia, associated mortality and screening tools including mini-Cog, clock draw test (CDT), and the delayed word recall (DWR)**
- Review of industry studies related to build, albumin, NT-probnp and anemia in older adults
- Explore underwriting tools available at older ages
- Review the ongoing risk associated with COVID-19 and this population group

- Workshop will be entirely case-based with discussion

Mild Cognitive Impairment (MCI) and Dementia

- Mild Cognitive Impairment (MCI) –A measurable deficit in cognition in at least one domain, without dementia or impairment in daily functioning (amnestic - most common and typically precedes Alzheimer's dementia)
- MCI is common in older adults
  - 65-69 years (8.4%), 70-74 years (10.1%), 75-79 years (14.8%) 80-84 years (25.2%)
- Older people with MCI are approximately three times more likely to develop dementia over the next two to five years compared with age-matched controls
- Age is the primary predictor of progression from MCI to Alzheimer disease (AD) but other factors associated with increased prevalence of MCI include – lower educational level, hypertension, midlife diabetes, obesity, stroke or heart disease, apolipoprotein E (epsilon 4), neuropsychiatric symptoms
- (AD) and other dementias are associated with increased mortality
- The average life expectancy after a diagnosis of AD has been reported to be between 8 and 10 years but may range from 3 to 20 years
  - Depends on how impaired the person is at the time of diagnosis
  - Survival also relates to age at onset of symptoms

Peterson, R. (2021). Mild Cognitive Impairment: Prognosis and Treatment. In *UpToDate*, J. Wilterdink (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/mild-cognitive-impairment-prognosis-and-treatment

Peterson, R. (2020). Mild Cognitive Impairment: Epidemiology, Pathology, and Clinical Assessment. In *UpToDate*, J. Wilterdink (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/mild-cognitive-impairment-epidemiology-pathology-and-clinical-assessment

Wolk, D. (2021). Clinical Features and Diagnosis of Alzheimer Diseae. In *UpToDate*, J. Wilterdink (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/clinical-features-and-diagnosis-of-Alzheimer-disease

Dementia -Major Neurocognitive Disorder DSM-5

- Decline in more than one cognitive domain
- Interferes with daily living and independence
- DSM-5 – all 6 cognitive domains given equal weight
- Alzheimer disease (AD) accounts to 60-80% of all cases of dementia
- Other less common causes include vascular dementia, dementia with Lewy bodies, frontotemporal dementia, Parkinson disease dementia, progressive supranuclear palsy, corticobasal degeneration, multisystem atrophy, Huntington disease dementia, alcohol related dementia, chronic traumatic encephalopathy, normal pressure hydrocephalus (NPH)
- AD and vascular dementia are commonly present together (mixed dementia)

Larson, E. (2019). Evaluation of Cognitive Impairment and Dementia. In *UpToDate*, J. Wilterdink (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/evaluation-of-cognitive-impairment-and-dementia

DSM-IV and DSM-5 criteria for dementia

DSM-IV criteria for dementia	DSM-5 criteria for major neurocognitive disorder (previously dementia)
A1. Memory impairment	**A.** Evidence of significant cognitive decline from a previous level of performance in one or more cognitive domains*: - Learning and memory - Language - Executive function - Complex attention - Perceptual-motor - Social cognition
A2. At least one of the following: - Aphasia - Apraxia - Agnosia - Disturbance in executive functioning	
B. The cognitive deficits in A1 and A2 each cause significant impairment in social or occupational functioning and represent a significant decline from a previous level of functioning.	**B.** The cognitive deficits interfere with independence in everyday activities. At a minimum, assistance should be required with complex instrumental activities of daily living, such as paying bills or managing medications.
C. The cognitive deficits do not occur exclusively during the course of delirium.	**C.** The cognitive deficits do not occur exclusively in the context of a delirium.
	D. The cognitive deficits are not better explained by another mental disorder (eg, major depressive disorder, schizophrenia).

For diagnostic criteria of dementia subtypes such as Alzheimer disease or frontotemporal dementia, please refer to UpToDate topics on the clinical manifestations and diagnosis of individual dementia subtypes.

DSM: Diagnostic and Statistical Manual of Mental Disorders.

* Evidence of decline is based on concern of the individual, a knowledgeable informant, or the clinician that there has been a significant decline in cognitive function and a substantial impairment in cognitive performance, preferably documented by standardized neuropsychological testing or, in its absence, another quantified clinical assessment.

References:

1. *American Psychiatric Association Diagnostic and Statistical Manual, 4th ed, APA Press, Washington, DC 1994.*
2. *American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), American Psychiatric Association, Arlington, VA 2013.*

UpToDate®

Cognitive Screening Tools

- Mini-Cog
- Clock Drawing Test (CDT)
- Mini-Mental State Examination (MMSE)
- Short Portable Mental Status Questionnaire (SPMSQ)
- Delayed Word Recall (DWR)
- Montreal Cognitive Assessment (MOCA)
- St. Louis University Mental Status Examination (SLUMS)
- Enhanced Mental Skills Test (EMST)
- Minnesota Cognitive Acuity Screen (MCAS)

Many short cognitive screens with varying sensitivities
and specificities for identifying dementia that perform less well as screens for MCI

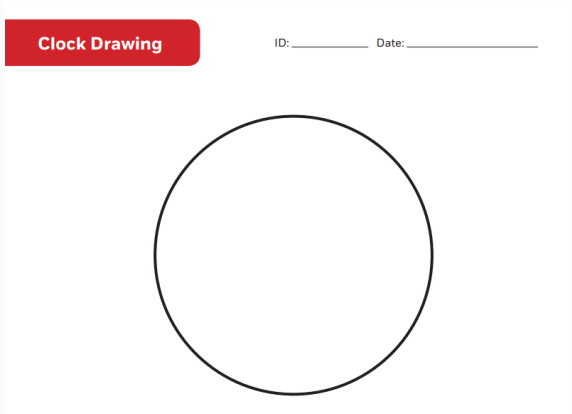
Life insurance screening tools typically include the mini-cog, CDT and/or DWR

The APS in an older adult may include other cognitive screens – such as the MMSE, MOCA or SLUMS

Cognitive screens often performed in older adults applying for long term care can include EMST and MCAS testing

Gold standard – neuropsychological testing

Mini-Cog



https://www.alz.org/media/Documents/mini-cog.pdf

- Includes recall of 3 unrelated words and a clock draw test (CDT)
- 3-word DWR – 1 point for each word
- CDT
  - All numbers should be present in correct order with hands displaying requested time
  - No points off for length of the hands, circle is already provided
  - Score - 0 points for an abnormality or 2 points if done correctly
- Total score out of 5 - Impaired if cannot recall the 3 words or if recall only 1 or 2 words and have an abnormal CDT(cut-point of <3 for dementia screening)
- Sensitivity 76 to 100% but specificity only 54 to 85% for dementia and worse for MCI - sensitivity 39 to 84% specificity 73 to 88%

Mendez, M. (2019). Mental Status Scales to Evaluate Cognition. In *UpToDate*, J. Wilterdink (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/mental-status-scales-to-evaluate-cogntion

Clock-Drawing Test (CDT)

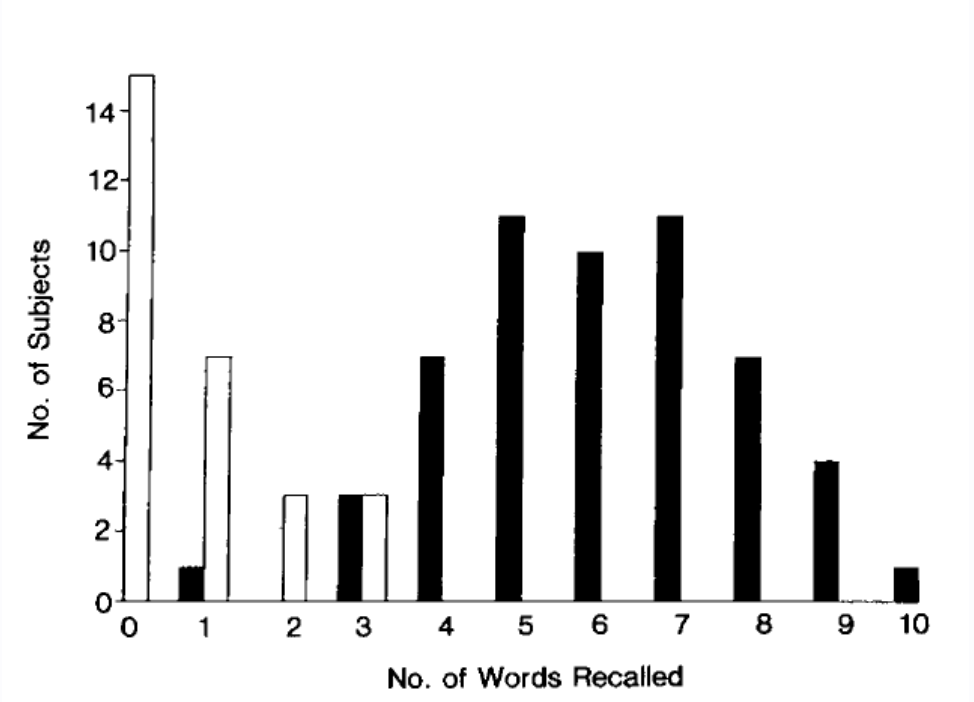
- Utilizes visuospatial, executive function, motor, attention, language comprehension, and numerical knowledge
- Many scoring systems
  - Scoring complexity varies related to numbers, hands and placement, spacing, organization
  - No particular scoring system appears clearly better for screening for dementia
- Sensitivity of 67 to 98% and specificity 69 to 94% for dementia detection
- Performs less well for mild cognitive impairment (MCI) – sensitivity 41 to 85% and specificity 44 to 85%

Mendez, M. (2019). Mental Status Scales to Evaluate Cognition. In *UpToDate*, J. Wilterdink (Ed.), UpToDate, Waltham, MA. (Accessed on September 11, 2022), from https://www.uptodate.com/contents/mental-status-scales-to-evaluate-cogntion

A Verbal Memory Test With High Predictive Accuracy for Dementia of Alzheimer Type

David S. Knopman, MD:Soren Ryberg, MD. *Arch Neurol.1989;46(2): 141-145*.
doi:10.1001/archneur.1989.00520380041011

- Recent memory deficit is the most common early finding in people with Alzheimer's disease (AD)
- Delayed word recall (DWR) - devised for large scale screening to be performed at the bedside and to help distinguish patients with AD from normal older adults
- A set of 10 common nouns presented one word at a time (words taken from lists B and C of the Rey Auditory Verbal List Learning Test)
  - In response to reading each word, the participant was required to make up a sentence using the word
  - A second exposure to the list immediately occurred using the same format
  - After a 5 minute interval, recall of the items was tested
- Small study size -participants included 28 patients with possible or probable AD and 55 "normal" older adults
- Both groups were matched for age and education
- Overall predictive accuracy was 95.2%, scores were not correlated with education or age
- Used a cut-off ≥3 vs <3



Histogram depicting distribution of scores of normal subjects (filled bars) and probable/possible patients with Alzheimer's disease (open bars)

Mortality Risk Assessment in the Elderly: The Utility of DWR, Part II

Laura Vecchione, MD; Eric Golus, FSA, MAAA – *J Insur Med 2007; 39:264-269*

- Part II of a prior study published in 2006. Participants were applicants from an employer sponsored long term care insurance program -aged 70 and older who were underwritten between 1995-2006 (prior study included up to 2003) and who underwent cognitive testing with delayed word recall (DWR) – Part II included omitted cases from the first study and an additional 3 years of applicants
- Total # of applicants – 22,108– 3 decisions
  - Accepted (12,928)
  - Declined for medical reasons
  - Declined for cognitive impairment alone (1,703)
- Total # of participants – 14,631 - those declined for non-cognitive reasons were excluded from the study
- An error was made in the prior study – omitting 2196 cases that should have been included – these were included along with an additional 854 lives underwritten after 2003
- 1995-2006, average duration 6.9 years, 4,388 deaths
- DWR scores were grouped into those who scored 0-5 vs those who scored 6-10
- Overall mortality ratio (MR) for the entire study group was 141% (+/- 4%)
- MR for DWR 0-5 was 196% (+/-9%) and for DWR 6-10 the MR was 114% (+/- 5%)
- Women with DWR 0-5 had a MR of 200%, DWR 6-10 had a MR of 113%
- Men with DWR 0-5 had a MR of 192%, DWR 6-10 had a MR of 117%

Objectives

- Differentiate chronological aging vs. physiological aging and normal aging vs. successful aging
- Review US population statistics and leading causes of death at older ages
- Explore the Impact of multi-morbidity, functional disability, frailty, polypharmacy and falls on mortality and review the get up and go screen (GUG)
- Discuss mild cognitive impairment (MCI) and dementia, associated mortality and screening tools including mini-Cog, clock draw test (CDT), and the delayed word recall (DWR)
- **Review of industry studies related to build, albumin, NT-probnp and anemia in older adults**
- Explore underwriting tools available at older ages
- Review the ongoing risk associated with COVID-19 and this population group

- Workshop will be entirely case-based with discussion

2014 CRL Build Study of Life Insurance Applicants

Michael Fulks, MD; Vera F. Dolan, MSPH; Robert L. Stout, PhD – *J Insur Med 2016; 46:13-19*

- Determine the impact of build on insurance applicant mortality accounting for smoking lab and BP values
- 2,051,370 applicants tested at CRL between 1993 and 2007 with build and cotinine results available and BMIs between 15 and 47
- Exclusions- HbA1c ≥6.5% SBP≥141mmHg albumin≤3.3g/dl or total cholesterol ≤130mg/dl
- Median duration of follow up was 7 years (0-18)
- Data provided on applicants including ages 60-89 years old

2014 CRL Build Study of Life Insurance Applicants

Michael Fulks, MD; Vera F. Dolan, MSPH; Robert L. Stout, PhD – J Insur Med 2016; 46:13-19

"As Americans have broadened, the BMI band with the lowest relative risk has also broadened and moved higher, leaving lower BMI bands with a lower percentage of healthy lives and higher relative risk"

Table 3. Female Non-smokers Age 60 to 89

BMI group	Vital status			Covar = age			Covar = age and other test-mortality score		
				MR	95% CI		MR	95% CI	
	Alive	Dead	Distn	(Cox)	Lower	Upper	(Cox)	Lower	Upper
15 to 17	432	61	1.0%	**2.36**	1.81	3.09	**2.33**	1.79	3.05
18 to 19	2082	160	4.6%	**1.53**	1.28	1.83	**1.51**	1.26	1.81
20 to 21	5274	277	11.4%	**1.17**	1.01	1.35	**1.19**	1.03	1.38
22 to 24*	11,661	478	24.9%	**1.00**			**1.00**		
25 to 29	16,754	700	35.8%	**1.11**	0.99	1.25	**1.08**	0.96	1.21
30 to 34	7220	316	15.5%	**1.30**	1.13	1.50	**1.18**	1.02	1.36
35 to 39	2362	129	5.1%	**1.79**	1.47	2.18	**1.55**	1.28	1.89
40 to 41	365	22	0.8%	**2.07**	1.35	3.17	**1.72**	1.12	2.65
42 to 47	375	21	0.8%	**2.14**	1.38	3.32	**1.66**	1.07	2.58
Total	46,525	2164							

(reference group BMI 22 to 24)*

Table 4. Male Non-smokers Age 60 to 89

BMI group	Vital status			Covar = age			Covar = age and other test-mortality score		
				MR	95% CI		MR	95% CI	
	Alive	Dead	Distn	(Cox)	Lower	Upper	(Cox)	Lower	Upper
15 to 17	125	25	0.2%	**2.37**	1.59	3.52	**2.16**	1.45	3.21
18 to 19	500	50	0.8%	**1.29**	0.97	1.71	**1.22**	0.92	1.62
20 to 21	2364	200	3.7%	**1.20**	1.03	1.40	**1.13**	0.97	1.32
22 to 24*	13,184	863	20.3%	**1.00**			**1.00**		
25 to 29	34,245	1767	52.1%	**0.92**	0.85	1.00	**0.91**	0.84	0.99
30 to 34	12,011	648	18.3%	**1.08**	0.97	1.19	**1.04**	0.94	1.16
35 to 39	2423	142	3.7%	**1.25**	1.04	1.49	**1.16**	0.97	1.38
40 to 41	275	25	0.4%	**1.98**	1.33	2.95	**1.76**	1.18	2.63
42 to 47	214	17	0.3%	**1.76**	1.09	2.85	**1.49**	0.92	2.41
Total	65,341	3737							

(reference group BMI 22 to 24)*

2014 CRL Build Study of Life Insurance Applicants

Michael Fulks, MD; Vera F. Dolan, MSPH; Robert L. Stout, PhD – J Insur Med 2016; 46:13-19

Smokers had less relative risk at greater BMI and more risk at lower BMI compared with nonsmokers

Table 6. Smokers Age 60 to 89

BMI group	Vital status			Covar = age and sex			Covar = age, sex and other test-mortality score		
				MR	95% CI		MR	95% CI	
	Alive	Dead	Distn	(Cox)	Lower	Upper	(Cox)	Lower	Upper
15 to 17	151	50	1.9%	**2.32**	1.72	3.14	**2.05**	1.52	2.77
18 to 19	448	99	5.1%	**1.54**	1.23	1.94	**1.52**	1.21	1.91
20 to 21	933	153	10.1%	**1.19**	0.98	1.44	**1.16**	0.96	1.41
22 to 24*	2320	308	24.5%	**1.00**			**1.00**		
25 to 29	3921	439	40.6%	**0.87**	0.75	1.01	**0.89**	0.76	1.02
30 to 34	1413	150	14.5%	**0.88**	0.72	1.07	**0.88**	0.73	1.07
35 to 39	251	33	2.6%	**1.06**	0.74	1.52	**1.05**	0.73	1.51
40 to 41	34	6	0.4%	**1.71**	0.76	3.84	**1.46**	0.65	3.29
42 to 47	32	5	0.3%	**1.52**	0.63	3.68	**1.36**	0.56	3.29
Total	9503	1243							

(reference group BMI 22 to 24)*

Albumin and All-Cause Mortality Risk in Insurance Applicants

Michael Fulks, MD; Robert L. Stout, PhD; Vera F. Dolan, MSPH

J Insur Med 2010;42:11–17

- Determine the relationship between albumin levels and all-cause mortality in life insurance applicants
- 1,704,566 insurance applicants were enrolled where CRL had test blood samples
- 53,211 deaths were observed over medial 12-year follow-up
- Results were stratified by 6 age-sex groups
- The middle 50% band of albumin values in each subpopulation (25th to 74th percentile) was assigned a mortality ratio of 100%.

Albumin and All-Cause Mortality Risk in Insurance Applicants

Michael Fulks, MD; Robert L. Stout, PhD; Vera F. Dolan, MSPH

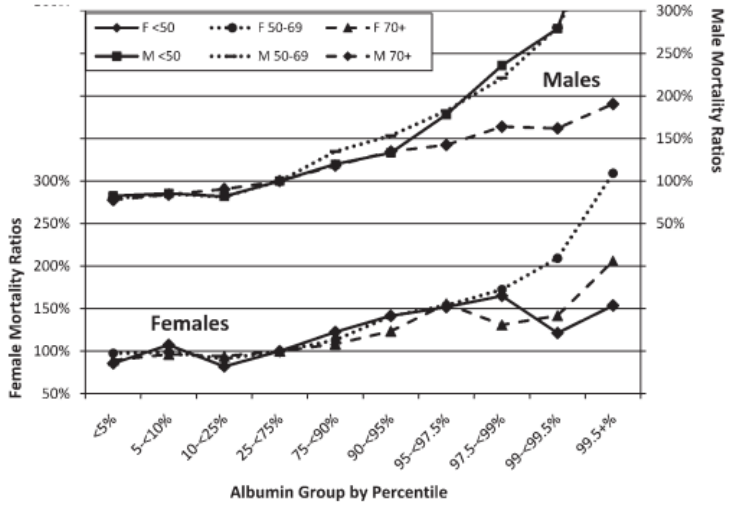
J Insur Med 2010;42:11–17

Table 3. Mortality in Females Ages 70+

Percentile Band	Albumin Values	Vital Status Alive	Vital Status Dead	Mortality Ratio	Lower 95% CI	Upper 95% CI
<5%	>4.7	621	166	89%	78%	102%
5–<10%	4.7–>4.6	547	161	96%	84%	110%
10–<25%	4.6–>4.4	3871	1105	94%	89%	99%
25–<75%	4.4–>4	5818	1800	100%		
75–<90%	4–>3.8	2527	869	108%	102%	115%
90–<95%	3.8–>3.75	651	268	123%	112%	137%
95–<97.5%	3.75–>3.6	337	196	156%	139%	174%
97.5–<99%	3.6–>3.5	239	107	131%	112%	153%
99–<99.5%	3.5–>3.3	153	77	142%	118%	170%
99.5+%	≤3.3	55	52	206%	169%	250%

Table 6. Mortality in Males Ages 70+

Percentile Band	Albumin Values	Vital Status Alive	Vital Status Dead	Mortality Ratio	Lower 95% CI	Upper 95% CI
<5%	>4.85	644	181	78%	68%	88%
5–<10%	4.85–>4.7	517	161	84%	73%	96%
10–<25%	4.7–>4.5	2265	777	90%	85%	96%
25–<75%	4.5–>4.1	8760	3451	100%		
75–<90%	4.1–>3.95	3136	1572	118%	113%	123%
90–<95%	3.95–>3.8	828	509	135%	126%	144%
95–<97.5%	3.8–>3.7	742	499	142%	133%	152%
97.5–<99%	3.7–>3.5	138	119	164%	144%	187%
99–<99.5%	3.5–>3.4	102	86	162%	139%	189%
99.5+%	≤3.4	42	49	191%	158%	230%



"Albumin level predicted mortality risk in this healthy population of insurance applicants in an age- and sex-specific manner both at high values (reduced risk) and low values (increased risk) relative to the middle 50% of albumin values"

NT-proBNP Predicts All-Cause Mortality in a Population of Insurance Applicants, Follow-up Analysis and Further Observations

Michael Fulks, MD; Valerie Kaufman, MD, FACC, DBIM; Michael Clark, MD, FACC, DBIM; Robert Stout, PhD – J Insur Med 2017;47:107-113

- NT-proBNP can be elevated in congestive heart failure and left ventricular strain as a result of various cardiac conditions including coronary artery disease, cardiomyopathy, congenital heart disease and diastolic dysfunction
- Life and disability applicants ages 50-89 tested at CRL for NT-proBNP levels from 2004 through 2015 who answered the test authorization question "any history of heart disease"(97.8% responded with 6.3% answering "yes")
- 245,322 applicants with 2,079 deaths with median follow up of 2.7 years with a mean follow up of 3.5 years
- Distribution of NT-proBNP values vary substantially by sex and age
- "The relative all-cause mortality risk increases with increasing levels of NT-proBNP, although the value at which risk begins to increase varies by age and sex"

NT-proBNP Predicts All-Cause Mortality in a Population of Insurance Applicants, Follow-up Analysis and Further Observations

Michael Fulks, MD; Valerie Kaufman, MD, FACC, DBIM; Michael Clark, MD, FACC, DBIM; Robert Stout, PhD – J Insur Med 2017;47:107-113

" NT-probnp is a strong independent predictor of all cause mortality in the absence or presence of known heart disease but the range of values associated with the risk varies by sex"

Table 3. Relative Risk for All-cause Mortality by NT-proBNP Level with ≤75 pg/mL as Reference Range with 95% Confidence Intervals

	≤75 (ref)	76-175	176-300	301-500	501-1,000	>1,000
Male age 50-69	1	1.85 *1.51-2.26*	2.54 *1.77-3.64*	6.55 *4.47-9.60*	6.63 *4.16-10.5*	16.15 *10.4-25.0*
Male age 70-89	1	1.72 *1.38-2.15*	2.84 *2.20-3.67*	3.23 *2.37-4.39*	5.07 *3.72-6.91*	7.17 *5.20-9.90*
Female age 50-69	1	0.88 *0.59-1.31*	1.58 *0.91-2.72*	2.65 *1.22-5.80*	4.11 *1.75-9.64*	8.24 *2.58-26.3*
Female age 70-89	1	1.49 *1.10-2.01*	1.96 *1.41-2.72*	2.29 *1.57-3.35*	4.14 *2.79-6.15*	7.7 *5.10-11.6*

Hemoglobin Screening Independently Predicts All-Cause Mortality

Michael Fullks, MD; Vera Dolan, MSPH; Robert Stout, PhD – J Insur Med 2015; 45: 75-80

Hemoglobin (Hb) results on insurance applicants tested from 1993 to 2007

Hb values of < 12g/dl and possibly <13 g/dl in women 50+ and Hb values <13 g/dl in all males were associated with progressively increasing mortality risk, independent of other values

Table 5. Females Age 50+ - Comparison of Age- and Smoking-Adjusted Mortality (By Cox) Including 95% CI With and Without Adjustment for Other Test Results

Hemoglobin (g/dL)	*Age and Smoking Only*	*Age, Smoking and Other Test Results*		
	MR	MR	Lower CI	Upper CI
>6 to 10	3.2	2.7	1.3	5.5
>10 to 12	1.3	1.3	0.9	1.8
>12 to 13	1.3	1.3	1.0	1.7
>13 to 14 (ref)	1.0	1.0	-	-
>14 to 15	1.4	1.3	1.0	1.8
>15 to 16	1.8	1.8	1.2	2.7
>16 to 18	*1.3*	*1.3*	*0.5*	*3.5*
>18 to 20	NS	NS	-	-

Table 6. Males All Ages - Comparison of Age- and Smoking-Adjusted Mortality (By Cox) Including 95% CI With and Without Adjustment for Other Test Results

Hemoglobin (g/dL)	*Age and Smoking Only*	*Age, Smoking and Other Test Results*		
	MR	MR	Lower CI	Upper CI
>6 to 10	5.2	3.9	1.6	9.5
>10 to 12	3.1	2.3	1.6	3.4
>12 to 13	1.8	1.5	1.1	2.0
>13 to 14	1.1	1.0	0.8	1.3
>14 to 15 (ref)	1.0	1.0	-	-
>15 to 16	1.1	1.0	0.8	1.3
>16 to 18	1.4	1.3	1.0	1.7
>18 to 20	*2.3*	*1.6*	*0.4*	*6.6*

ref = reference band
NS = data not sufficient
MR in italics = wide confidence intervals due to few deaths

Objectives

- Differentiate chronological aging vs. physiological aging and normal aging vs. successful aging
- Review US population statistics and leading causes of death at older ages
- Explore the Impact of multi-morbidity, functional disability, frailty, polypharmacy and falls on mortality and review the get up and go screen (GUG)
- Discuss mild cognitive impairment (MCI) and dementia, associated mortality and screening tools including mini-Cog, clock draw test (CDT), and the delayed word recall (DWR)
- Review of industry studies related to build, albumin, NT-probnp and anemia in older adults
- **Explore underwriting tools available at older ages**
- Review the ongoing risk associated with COVID-19 and this population group

- Workshop will be entirely case-based with discussion

Older Age Underwriting Tools

- Application and paramedical exam
  - Build, Bp, pulse, EKG, level of activity, reported medical conditions, alcohol use and smoking history
- Older age supplement
  - Driving, IADLs, ADLs, social activities
  - Get up and go (GUG), clock draw, delayed word recall (DWR), other cognitive screens
- Current insurance labs
  - Cholesterol, albumin, NT-probnp, HbA1c, other screening labs
- Prescription data
  - Medication compliance, number of medications, stability in dosing
- Motor vehicle report (MVR)
- Lab data
  - Prior labs ordered and/or resulted
- Medical claims data
  - Diagnosis and procedural codes, emergency room visits, hospitalizations
- Attending physician statements (APS)
  - Physicals and Medicare assessments, (in)stability/trends in medical and psychological impairments, biometrics, labs including Hb etc

Objectives

- Differentiate chronological aging vs. physiological aging and normal aging vs. successful aging
- Review US population statistics and leading causes of death at older ages
- Explore the Impact of multi-morbidity, functional disability, frailty, polypharmacy and falls on mortality and review the get up and go screen (GUG)
- Discuss mild cognitive impairment (MCI) and dementia, associated mortality and screening tools including mini-Cog, clock draw test (CDT), and the delayed word recall (DWR)
- Review of industry studies related to build, albumin, NT-probnp and anemia in older adults
- Explore underwriting tools available at older ages
- **Review the ongoing risk associated with COVID-19 and this population group**

- Workshop will be entirely case-based with discussion

Older Individuals and Their Risk for COVID-19 Related Mortality

"Elders as a group are more vulnerable to infectious disease epidemics, and the potential for global epidemics in the future could wipe out any life expectancy gains seen in elderly populations"

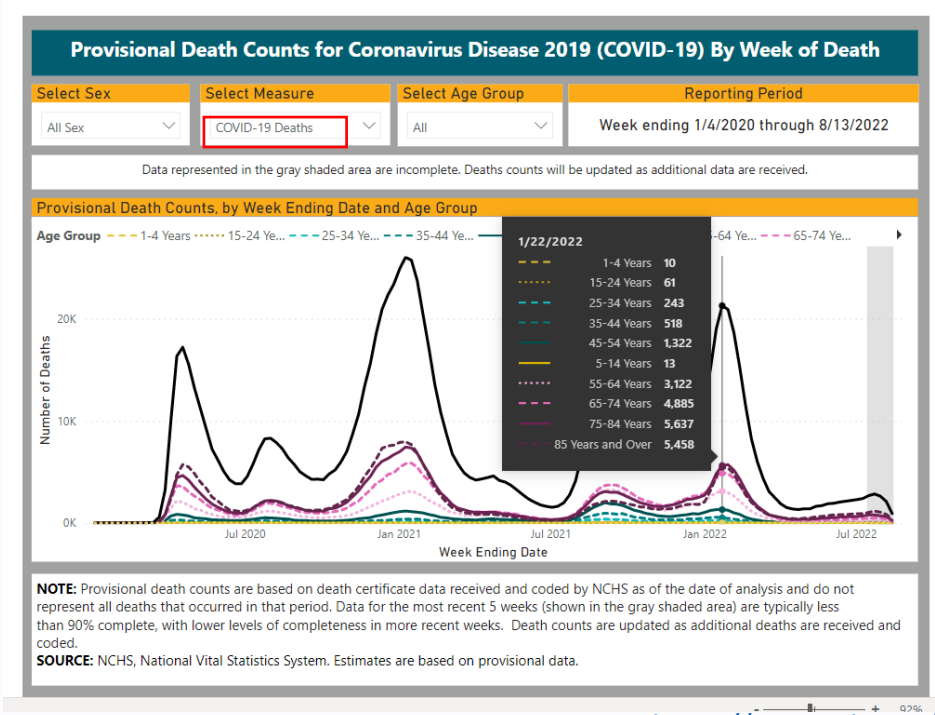
Linda Goodwin **(2006)**

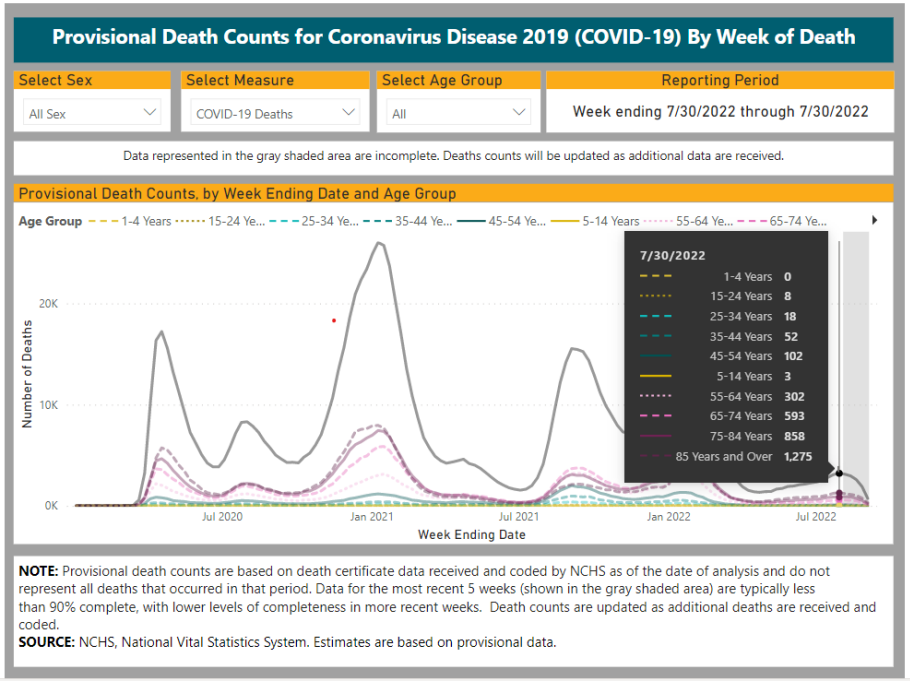
Goodwin, L (2006) *Brackenridge's Medical Selection of Life Risks Fifth Edition*, Chapter 7

The Current COVID-19 Landscape

- COVID-19 deaths have fallen over 2022
- There remains mortality risk in the older age population

- Week of 1/22/22 the percentage of COVID 19 Deaths age ≥ 65 was 75%
- Week of 7/30/22 the percentage of COVID 19 Deaths age ≥ 65 was 85%





https://www.cdc.gov/nchs/nvss/vsrr/covid_weekly/index.htm#SexAndAgeAccessed 9/14/22

Is Older Age Associated With COVID-19 Mortality in the Absence of Other Risk Factors? General Population Cohort Study of 470,034 Participants

Frederick K. Ho, Fanny Petermann-Roch, Stuart R. Gray, Bhautesh D. Jani, S. Vittal Katikireddi, Claire L. Niedzwiedz, Hamish Foster, Claire E. Hastie, Daniel F Mackay, Jason M. R. Gill, Catherine O'Donnell, Paul Welsh, Frances Mair, Naveed Sattar, Carlos A. Celis-Morales, Jill P. Pell. Institute of Health and Wellbeing. University of Glasgow, Glasgow, United Kingdom. Institute of Cardiovascular and Medical Sciences, University of Glasglow, Glasgow, United Kingdom

- UK biobank population cohort study
- To study whether chronological age was an independent risk factor for severe COVID-19 or that simply, risk factors for severe COVID-19 are more common in older adults
- Death information were based off death certificates identified as COVID-19 related deaths
- Of the 470,034 participants identified for the analysis, 438 died of COVID-19
- **Caveat: no one age ≥ 85 was enrolled in this study**

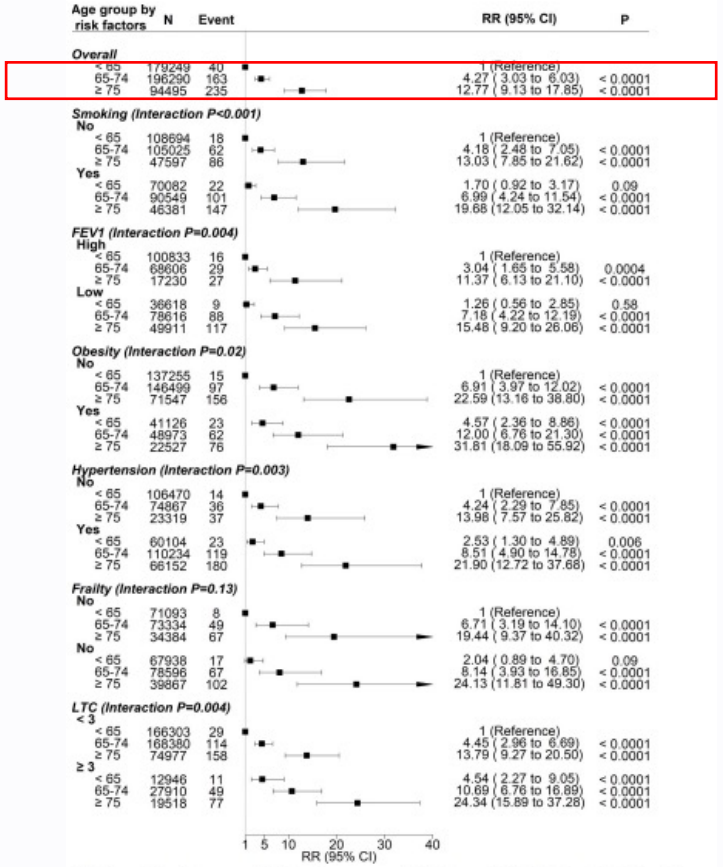


Fig 2. Associations between combinations of age group and risk factors and COVID-19 mortality. Adjusted for sex, ethnicity, deprivation, duration of follow-up; N number; RR relative risk; CI confidence interval; FEV forces expiratory volume; LTC long-term condition.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7644030/

Is Older Age Associated With COVID-19 Mortality in the Absence of Other Risk Factors? General Population Cohort Study of 470,034 Participants

Frederick K. Ho, Fanny Petermann-Roch, Stuart R. Gray, Bhautesh D. Jani, S. Vittal Katikireddi, Claire L. Niedzwiedz, Hamish Foster, Claire E. Hastie, Daniel F Mackay, Jason M. R. Gill, Catherine O'Donnell, Paul Welsh, Frances Mair, Naveed Sattar, Carlos A. Celis-Morales, Jill P. Pell. Institute of Health and Wellbeing. University of Glasgow, Glasgow, United Kingdom. Institute of Cardiovascular and Medical Sciences, University of Glasglow, Glasgow, United Kingdom

- Results:
  - Over one-third of older adult excess mortality risk was as a result of **poorer lung function, hypertension, muscle weakness, and multiple long-term conditions (LTCs)**
    - These factors were more common and more strongly associated with higher COVID-19 mortality
  - Participants aged ≥75 **without** additional risk factors were at 4-fold relative risk (95% CI 1.57–9.96, P = 0.004) **compared with all participants aged <65 years**
  - Higher COVID-19 mortality among older adults was **partially** explained by other risk factors
  - Healthy older adults were at much lower relative risk than their age matched cohorts
  - Older age was found to be an independent risk factor for COVID-19 mortality

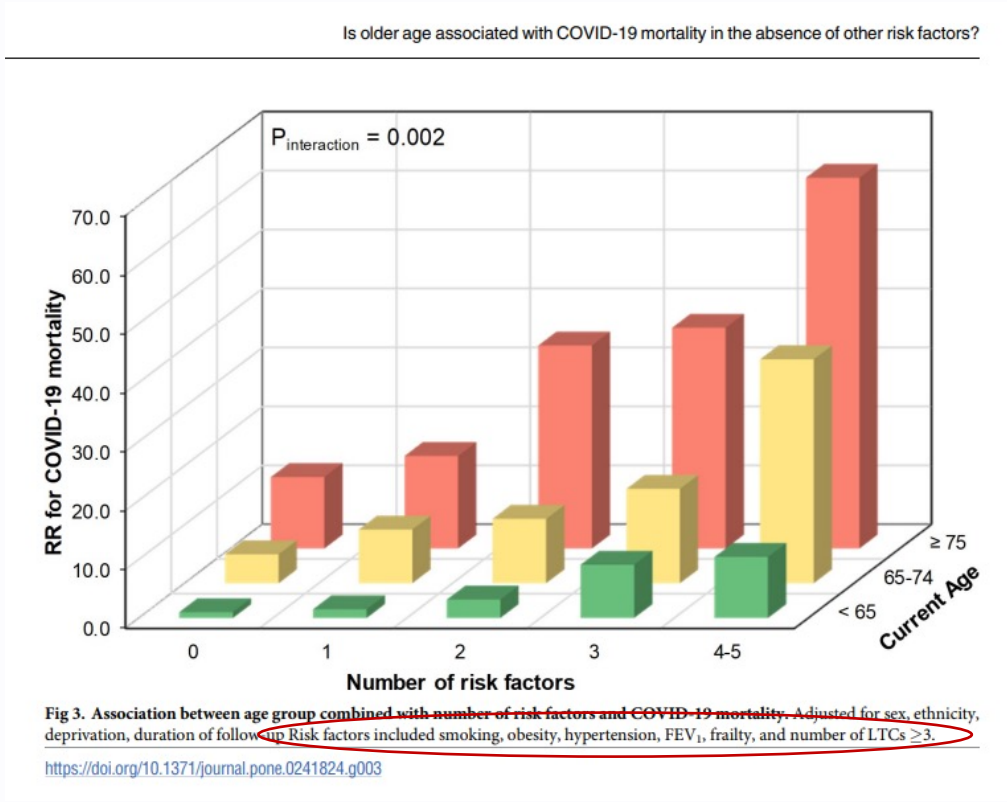


Fig 3. Association between age group combined with number of risk factors and COVID-19 mortality. Adjusted for sex, ethnicity, deprivation, duration of follow-up Risk factors included smoking, obesity, hypertension, FEV_1, frailty, and number of LTCs ≥3.

https://doi.org/10.1371/journal.pone.0241824.g003

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7644030/

Conclusions

- By 2030 those Americans 65 and older are projected to make up 21% of population
- Assessing mortality risk in the older age population is complex
- The aging process is not uniform; there is significant heterogeneity observed among older adults which should be understood when assessing an individual's risk
- The number and severity of chronic diseases (multimorbidity), the degree of independence/dependance (disability), and indicators of vitality/frailty are often the best predictors of outcome in the older age population
- Frailty and prefrailty are prevalent at older ages and the insurance medical director can leverage biometrics, older age supplement information, cognitive screening, the GUG and APS information to help identify frailty concerns
- Industry studies published in the Journal of Insurance Medicine support use of build, albumin, hemoglobin, NT-probnp, and DWR when assessing mortality at older ages