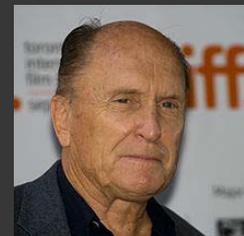
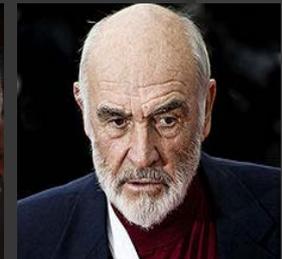
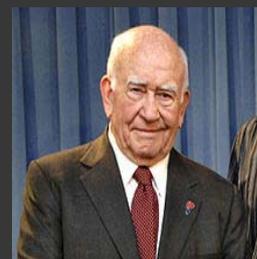


PRE-OPERATIVE RISK STRATIFICATION – PHYSIOLOGIC AGE

Kirsten Wennermark, MD
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Over 80

- Kirk Douglas: 12/9/1916
- Betty White: 1/17/22
- George H.W. Bush: 6/12/1924
- Jimmy Carter: 10/1/1924
- Angela Lansbury: 10/16/1925
- Dick Van Dyke: 12/13/1925
- Jerry Lewis: 3/16/1926
- Andy Griffith: 6/1/1926
- Jerry Stiller: 6/8/1927
- Mel Brooks: 6/28/1928
- Edward Asner: 11/15/29
- Gene Hackman: 1/30/1930
- Clint Eastwood: 5/31/1930
- Sean Connery: 8/25/1930
- Doris Roberts: 11/4/1930
- Robert Duvall: 1/5/1931
- James Earl Jones: 1/17/1931
- William Shatner: 3/22/1931



Case Presentation

- ① 81y/o VA patient presented with shortness of breath and decreased exercise tolerance. Normal exercise routine consisted of daily weight-lifting and swimming laps for 2 hours. Reduced exercise tolerance to only 1.5 hours of swim laps daily.
- ① PMH: well-controlled HTN
- ① PSH: Elbow surgery at age 14
- ① Labs: initial H/H 6.0/17.1 (6/17/11) -> 10/28.1 (11/22/11)
- ① Workup resulted in findings of: autoimmune hemolytic anemia and an enlarged spleen
- ① Referred to surgery for Laparoscopic Splenectomy

Risk stratification

- Age
- Comorbidities
- Nutritional status
- Functionality
- Type of Surgery
- ASA Classification
- Eyeball test
- Katz Index
- Edmonton Frail Scale (EFS)
- Comprehensive geriatric assessment (CGA)

Eyeball Test

- ⦿ Appearance
 - Stated age, older, younger
- ⦿ Mobility
 - Walking unassisted, cane, walker, wheelchair
- ⦿ Other supplemental equipment
 - Oxygen tank

Frailty

- Chronologic age does not always reflect physiologic age, and elderly people have a range of physiologic status that varies from robust to frail.
- Describes an elderly person who is at heightened vulnerability to adverse health status change because of multisystem reduction in reserve capacity.

Katz Index

- ◎ Activities of Daily Living (ADLs)
 - Internationally validated measure of dependency in elderly patients

ACTIVITIES POINTS (1 OR 0)	INDEPENDENCE: (1 POINT) NO supervision, direction or personal assistance	DEPENDENCE: (0 POINTS) WITH supervision, direction, personal assistance or total care
BATHING POINTS: _____	(1 POINT) Bathes self completely or needs help in bathing only a single part of the body such as the back, genital area or disabled extremity.	(0 POINTS) Needs help with bathing more than one part of the body, getting in or out of the tub or shower. Requires total bathing.
DRESSING POINTS: _____	(1 POINT) Gets clothes from closets and drawers and puts on clothes and outer garments complete with fasteners. May have help tying shoes.	(0 POINTS) Needs help with dressing self or needs to be completely dressed.
TOILETING POINTS: _____	(1 POINT) Goes to toilet, gets on and off, arranges clothes, cleans genital area without help.	(0 POINTS) Needs help transferring to the toilet, cleaning self or uses bedpan or commode.
TRANSFERRING POINTS: _____	(1 POINT) Moves in and out of bed or chair unassisted. Mechanical transferring aides are acceptable.	(0 POINTS) Needs help in moving from bed to chair or requires a complete transfer.
CONTINENCE POINTS: _____	(1 POINT) Exercises complete self control over urination and defecation.	(0 POINTS) Is partially or totally incontinent of bowel or bladder.
FEEDING POINTS: _____	(1 POINT) Gets food from plate into mouth without help. Preparation of food may be done by another person.	(0 POINTS) Needs partial or total help with feeding or requires parenteral feeding.
TOTAL POINTS = _____ 6 = High (patient independent) 0 = Low (patient very dependent)		

Katz, S Ford et al. Studies of illness in the aged: the index of ADL: a standardized measure of biological and psychological function. JAMA. 1963; 185: 914-919.

Frail Patients Are at Increased Risk for Mortality and Prolonged Institutional Care After Cardiac Surgery

Dana H. Lee, BSc; Karen J. Buth, MSc; Billie-Jean Martin, MD;
Alexandra M. Yip, MSc, OT(C); Gregory M. Hirsch, MD, FRCSC

- Frailty defined as any impairment in activities of daily living (Katz Index), ambulation, or a documented history of dementia.
- Of 3826 patients, 157 (4.1%) were frail.
- Findings: Frailty is a risk for postoperative complications and an independent predictor of in-hospital mortality.

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Variable, n (%)	Nonfrail (n=3669)	Frail (n=157)	<i>P</i>
Mortality	164 (4.5)	23 (14.7)	0.0001
Discharge location (patients discharged alive)			
Home	3189 (91.0)	69 (51.5)	0.0001
Institution	316 (9.0)	65 (48.5)	...
Blood transfusion	1239 (33.8)	97 (61.8)	0.0001
Low cardiac output syndrome	373 (10.2)	34 (21.7)	0.0001
Sepsis	120 (3.3)	18 (11.5)	0.0001
Pneumonia	266 (7.3)	32 (20.4)	0.0001
Permanent stroke	70 (1.9)	5 (3.2)	0.23
Delirium	335 (9.1)	23 (14.7)	0.020
Postoperative RF	361 (9.8)	36 (22.9)	0.0001
Prolonged ventilation	584 (15.9)	57 (36.3)	0.0001
Prolonged LOS	1075 (29.3)	87 (55.4)	0.0001

Edmonton Frail Scale (EFS)

The Edmonton Frail Scale:		Score: ___/17		
Frailty domain	Item	0 point	1 point	2 points
Cognition	Please imagine that this pre-drawn circle is a clock. I would like you to place the numbers in the correct positions then place the hands to indicate a time of 'ten after eleven'	No errors	Minor spacing errors	Other errors
General health status	In the past year, how many times have you been admitted to a hospital?	0	1-2	≥2
	In general, how would you describe your health?	'Excellent', 'Very good', 'Good'	'Fair'	'Poor'
Functional independence	With how many of the following activities do you require help? (meal preparation, shopping, transportation, telephone, housekeeping, laundry, managing money, taking medications)	0-1	2-4	5-8
Social support	When you need help, can you count on someone who is willing and able to meet your needs?	Always	Sometimes	Never
Medication use	Do you use five or more different prescription medications on a regular basis?	No	Yes	
	At times, do you forget to take your prescription medications?	No	Yes	
Nutrition	Have you recently lost weight such that your clothing has become looser?	No	Yes	
Mood	Do you often feel sad or depressed?	No	Yes	
Continence	Do you have a problem with losing control of urine when you don't want to?	No	Yes	
Functional performance	I would like you to sit in this chair with your back and arms resting. Then, when I say 'GO', please stand up and walk at a safe and comfortable pace to the mark on the floor (approximately 3 m away), return to the chair and sit down'	0-10 s	11-20 s	One of >20 s patient unwilling, or requires assistance
Totals	Final score is the sum of column totals			

Rolfson DB, Etal. Validity and reliability of the Edmonton Frail Scale. Age Ageing. 2006 Sep; 35(5):526-9.

Edmonton Frail Scale (EFS)

- ◎ EFS scores
 - 17 total possible points
 - 0/17 (not frail) to 17/17 (very frail)
- ◎ Quick and easy to administer
- ◎ No special training needed

Frailty is associated with postoperative complications in older adults with medical problems

Monidipa Dasgupta^{a,*}, Darryl B. Rolfson^b, Paul Stolee^{c,d}, Michael J. Borrie^e, Mark Speechley^{d,f}

- Archives of Gerontology and Geriatrics 2009.
- 125 patients, at least 70 years old
- EFS administered at pre-surgical clinic
- Elective non-cardiac surgery

Frailty is associated with postoperative complications in older adults with medical problems

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Findings:

- EFS less than 4 associated with lower risk of having a complication, and higher chance of being discharged home. $P < 0.02$
- EFS exceeding 7 were associated with increased complications and a lower chance of being discharged home. $P < 0.02$

The Edmonton Frail Scale and complications

FS score	<4	≥4	≤7	>7	Entire cohort
N	51	74	109	16	125
Number with compl. (%) ^a	5 (9.8)	26 (35)	22 (20)	9 (56)	31 (25)
Age-adjusted OR of any compl. ^a (95% CI)	0.27 (0.09–0.80)	n/a	n/a	5.02 (1.55–16.25)	n/a
Age-adjusted OR of cardiac compl (95% CI)	0.42 (0.11–1.62)	n/a	n/a	3.75 (1.04–13.51)	n/a
Age-adjusted OR of pulmonary compl (95% CI)	0.34 (0.09–2.32)	n/a	n/a	6.61 (1.51–28.29)	n/a
Age-adjusted OR of delirium (95% CI)	0.61 (0.18–2.12)	n/a	n/a	2.43 (0.65–9.07)	n/a
Sens ^b	0.84	n/a	n/a	0.29	n/a
Spec ^c	0.49	n/a	n/a	0.93	n/a
+LR ^d	0.33	n/a	n/a	3.90	n/a
Mean LOS (±S.D.) ^e	5.86 ± 2.87	7.54 ± 4.40	6.7 ± 4.5	7.60 ± 2.97	7.44 ± 7.55
Number discharged back home (%) ^f	39 (80)	42 (57)	75 (69)	6 (40)	81 (67.5)

Comprehensive Geriatric Assessment (CGA)

- Systematic approach aiming to assess frailty using multiple scoring systems
- Barthel Index of Activities of Daily Living
 - Personal ADLs (PADLs)
 - 10 items, score 0-20
 - Assess fecal continence, feeding, transferring from bed to chair, bathing/showering
- Nottingham Extended Activities of Daily Living
 - Independence ADLs (IADLs)
 - 22 items, score 0-66
 - Assess mobility, kitchen/domestic/leisure activities

Comprehensive Geriatric Assessment (CGA)

- ◎ Cumulative Illness Rating Scale (CIRS)
 - 14 organ systems, graded 0-4 for each comorbidity based on severity
- ◎ Mini Nutritional Assessment (MNA)
 - 18 items, score 0-30
 - Grades appetite, weight loss, diet, self-perceived health, arm and leg circumference
- ◎ Mini Mental Status Exam (MMSE)
 - 20 item test of cognitive function, score 0-30
- ◎ Geriatric Depression Scale (GDS)
 - 30 item test, yes or no, score 0-30

Comprehensive geriatric assessment can predict complications in elderly patients after elective surgery for colorectal cancer: A prospective observational cohort study

Siri R. Kristjansson^{a,*}, Arild Nesbakken^b, Marit S. Jordhøy^{c,d}, Eva Skovlund^e, Riccardo A. Audisio^f, Hans-Olaf Johannessen^g, Arne Bakka^h, Torgeir B. Wyller^a

- 178 patients, >70 years, all stages of colorectal cancer
- Pre-operative CGA was performed
- Categorized
 - Fit: 21 patients, 12%
 - Intermediate: 81 patients, 46%
 - Frail: 76 patients, 43%

Number of frail patients according to the individual components of CGA.

Frailty criterion	<i>n</i>
PADL-dependency	28
Severe co-morbidity	41
8 or more daily medications	11
Malnutrition	16
Cognitive impairment	12
Depression	18

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- Outcome measure was complications within 30 days
- Findings: CGA can identify frail patients who have a significantly increased risk of severe complications after elective surgery for colorectal cancer

Association between complications and CGA classification, ASA classification, age groups, tumor stage, tumor location, type of surgery, and sex (bivariate analyses).

	Any complication	<i>p</i> -Value (χ^2)	Complications grade II or above	<i>p</i> -Value (χ^2)
CGA classification				
Fit (<i>n</i> = 21)	10 (48%)		7(33%)	
Intermediate (<i>n</i> = 81)	39 (48%)	.001	29(36%)	.002
Frail (<i>n</i> = 76)	58 (76%)		47(62%)	
ASA classification				
I (<i>n</i> = 1)	0 (0%)		0(0%)	
II (<i>n</i> = 81)	45 (56%)		34(42%)	
III (<i>n</i> = 76)	50 (66%)	.11	38(50%)	.12
IV (<i>n</i> = 4)	3 (75%)		3(75%)	
Missing (<i>n</i> = 16)	9 (56%)		8(50%)	
Age groups				
70–74 (<i>n</i> = 43)	25 (58%)		23(54%)	
75–79 (<i>n</i> = 45)	28 (62%)		20(44%)	
80–84 (<i>n</i> = 56)	34 (61%)	.84	25(45%)	.44
85–89 (<i>n</i> = 24)	16 (67%)		11(46%)	
90+ (<i>n</i> = 10)	4 (40%)		4(40%)	
Tumor stage^a				
Stage 0 (<i>n</i> = 8)	3 (38%)		1(13%)	
Stage I (<i>n</i> = 43)	27 (63%)		22(51%)	
Stage II (<i>n</i> = 57)	33 (58%)	.74	27(47%)	.68
Stage III (<i>n</i> = 45)	30 (67%)		22(49%)	
Stage IV (<i>n</i> = 21)	11 (52%)		9(43%)	
Unclassified (<i>n</i> = 4)	3 (75%)		2(50%)	
Tumor location				
Colon (<i>n</i> = 126)	67 (53%)	.004	49(39%)	.002
Rectum (<i>n</i> = 52)	40 (77%)		34(65%)	
Type of surgery				
Open (<i>n</i> = 118)	78 (66%)		63(53%)	
Laparoscopic (<i>n</i> = 52)	24 (46%)	.049	16(31%)	.023
Converted (<i>n</i> = 8)	5 (63%)		4(50%)	
Sex				
Male	46 (61%)	1.0	36(47%)	.88
Female	61 (60%)		47(46%)	

Accumulated Frailty Characteristics Predict Postoperative Discharge Institutionalization in the Geriatric Patient

- 2011 Journal of the American College Surgeons
- Authors: **Dan Wu, Arek Wiktor, Tom Robinson**
- Frailty determined by: burden of comorbidity, function, nutrition, cognition, geriatric syndromes, extrinsic frailty
- Findings: Accumulation of frailty characteristics in a geriatric patient increased the risk of discharge institutionalization.

Summary

- Chronologic age is not equivalent to physiologic age
- Multiple ways to assess frailty that range from simple eyeball test to comprehensive geriatric assessment
- Frailty assessment when risk-stratifying a patient for surgery can identify those patients at higher risk for complications and post-operative institutionalization.

References

- ASA PS classifications from the American Society of Anesthesiologists
- Rockwood, K et al. A brief clinical instrument to classify frailty in elderly people. *Lancet*. 1999; 353: 205-206.
- Katz, S Ford et al. Studies of illness in the aged: the index of ADL: a standardized measure of biological and psychological function. *JAMA*. 1963; 185: 914-919.
- Lee D et al. Frail patients are at increased risk for mortality and prolonged institutional care after cardiac surgery. *Circulation* 2010; 121: 973-978.
- Rolfson DB, Etal. Validity and reliability of the Edmonton Frail Scale. *Age Ageing*. 2006 Sep; 35(5):526-9.
- Dasgupta M et al. Frailty is associated with postoperative complications in older adults with medical problems. *Archives of Gerontology and Geriatrics*. 48 (2009) 78-83.
- Kristjansson et al. Comprehensive geriatric assessment can predict complications in elderly patients after elective surgery for colorectal cancer: A prospective observational cohort study. *Crit Rev Oncol/Hematol* 2009.
- Robinson, Wu, Wiktor et al. Accumulated Frailty characteristics predict postoperative discharge institutionalization in the geriatric patient. *J Am Coll Surg* 2011.