Velocidad de la Marcha en Ancianos ¿Es un marcador precoz de fragilidad?

Pan American Health Organization
Regional Office of the World Health Organization

V Curso ALMA Colombia
18 al 21 de junio 2006

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“Fragilidad es uno de esos conceptos abstractos que no sabemos exactamente como definirlo, pero que lo reconocemos cuando lo vemos.”

Anónimo

“Fragilidad es uno de esos conceptos como PORNOGRAFIA” que no sabemos exactamente como definirlo, pero que lo reconocemos cuando lo vemos.”

Howard Bergman

Que es fragilidad?

Cuales son sus componentes?

Fragilidad es un síndrome complejo de vulnerabilidad incrementada con una inadecuada respuesta al stress que provoca eventos adversos tales como discapacidad, caídas, aumento de morbilidad y mortalidad

Bergman H, et al. Chapter on frailty. In: D J. Ekerdt, Editor, *The encyclopedia of aging* (4th Ed.), Macmillan Reference, USA (2004).
Fried L et al. Frailty in older adults: evidence for a phenotype, *J. Gerontol A Biol Sci Med Sci.* 56 (2001), pp. M146–M156

Fenotipo de fragilidad (Fried & Waltson)

Al menos 3 de 5:

1. Fuerza de presión manual
2. Fatigabilidad
3. Pobre actividad física
4. Velocidad de a Marcha Lenta
5. Pérdida de peso no intencional

Crítica a las aproximaciones existentes:

- Fried fenotipo
  - Mejor estudiado y más coherente
  - No captura la complejidad
  - Role de los factores cognitivos y psicosociales
  - No incluye factores sociales
- Frailty index
  - Mortalidad es el único “end point”
  - Demasiadas “variables” diluyen el concepto

Qué es Fragilidad?

Cuáles son los componentes?

Y entonces que???

Es posible detectar y modificar la fragilidad?

Cuales son los factores de riesgo?

Puede ser retrasada la fragilidad?

Pueden ser prevenidos los “outcomes” negativos?



“Envejecer (ser un anciano) es malo para las personas en todo respecto”

Papyrus Prisse, circa 1580 BC

Anciano⟶



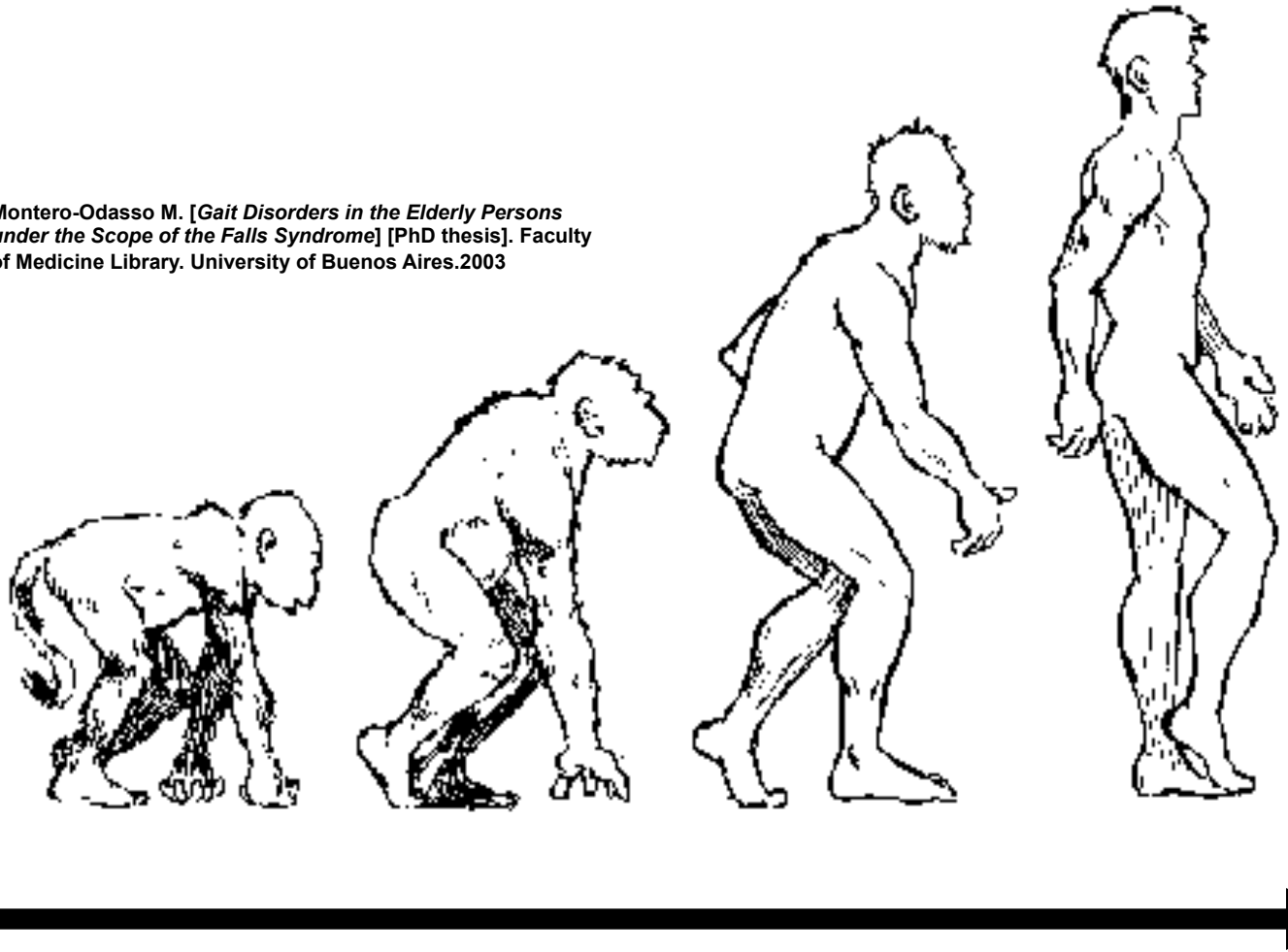
...Si conseguía mantener su cuerpo en posición vertical, modificar sus manos en un sentido y los pies en otro, seguir mejorando su cerebro y emplearlo lo mejor posible, podía tener una probabilidad de éxito...

Desmond Morris

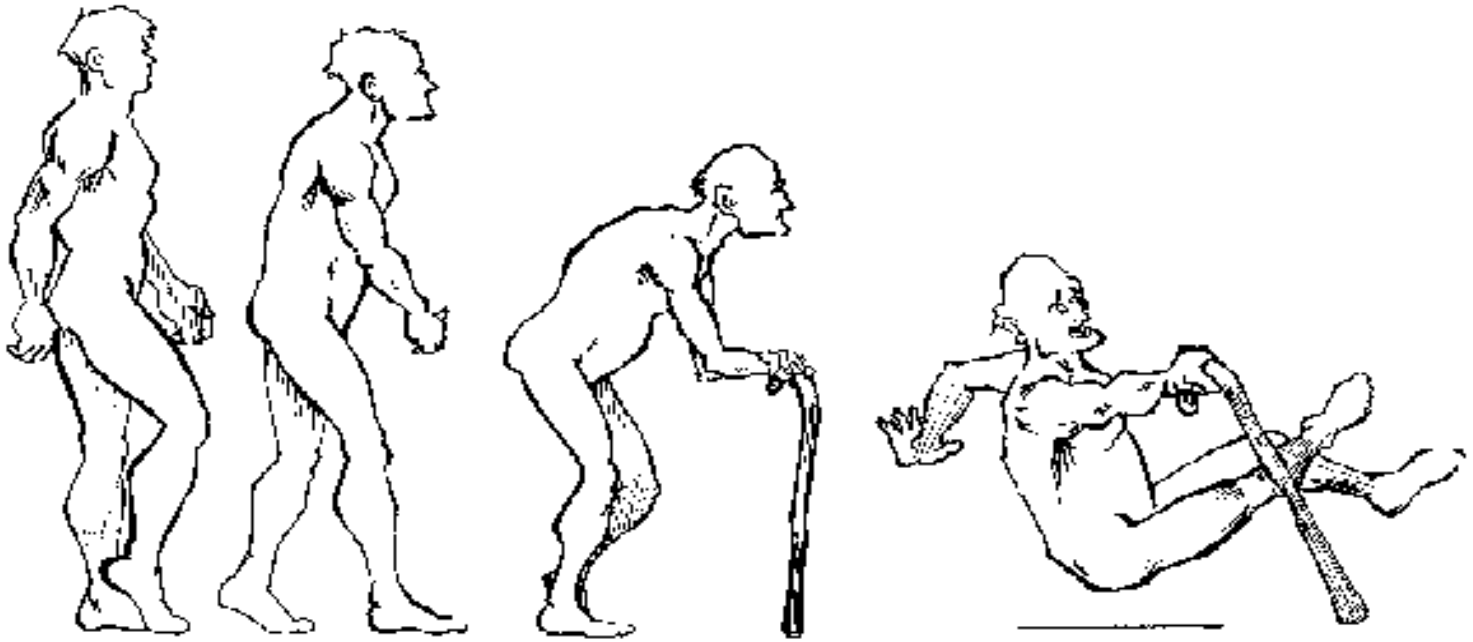
"El Mono Desnudo"

Un estudio del animal humano 1967

Montero-Odasso M. [*Gait Disorders in the Elderly Persons under the Scope of the Falls Syndrome*] [PhD thesis]. Faculty of Medicine Library. University of Buenos Aires.2003



5 millones de años

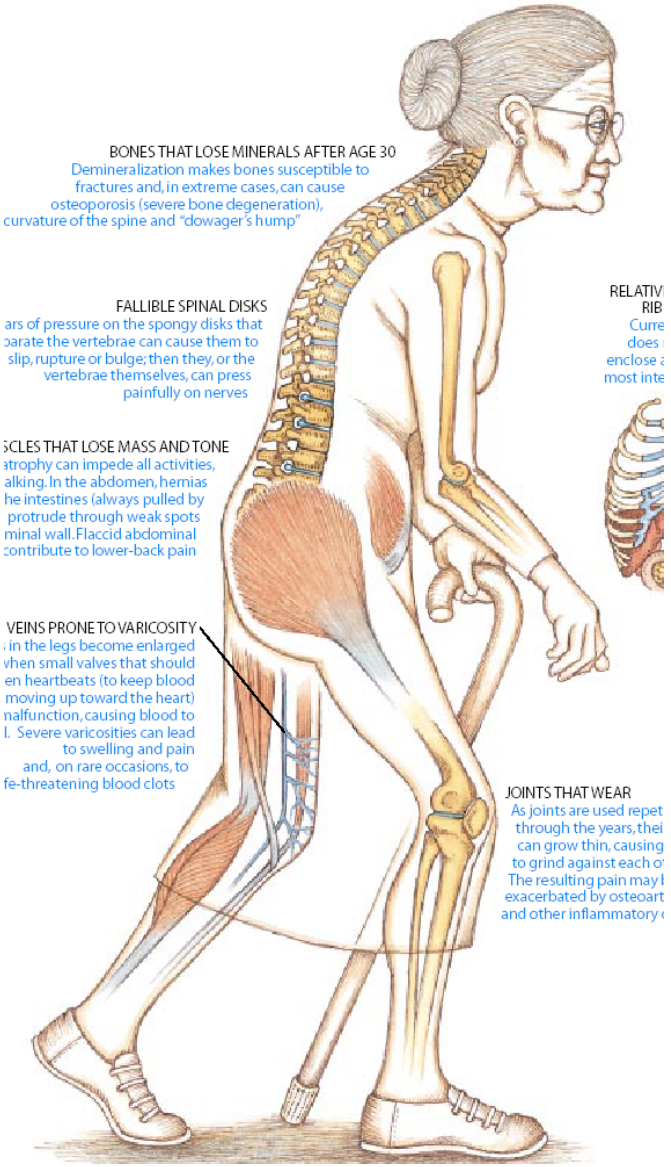


Montero-Odasso M. [*Gait Disorders in the Elderly Persons under the Scope of the Falls Syndrome*] [PhD thesis]. Faculty of Medicine Library. University of Buenos Aires.2003

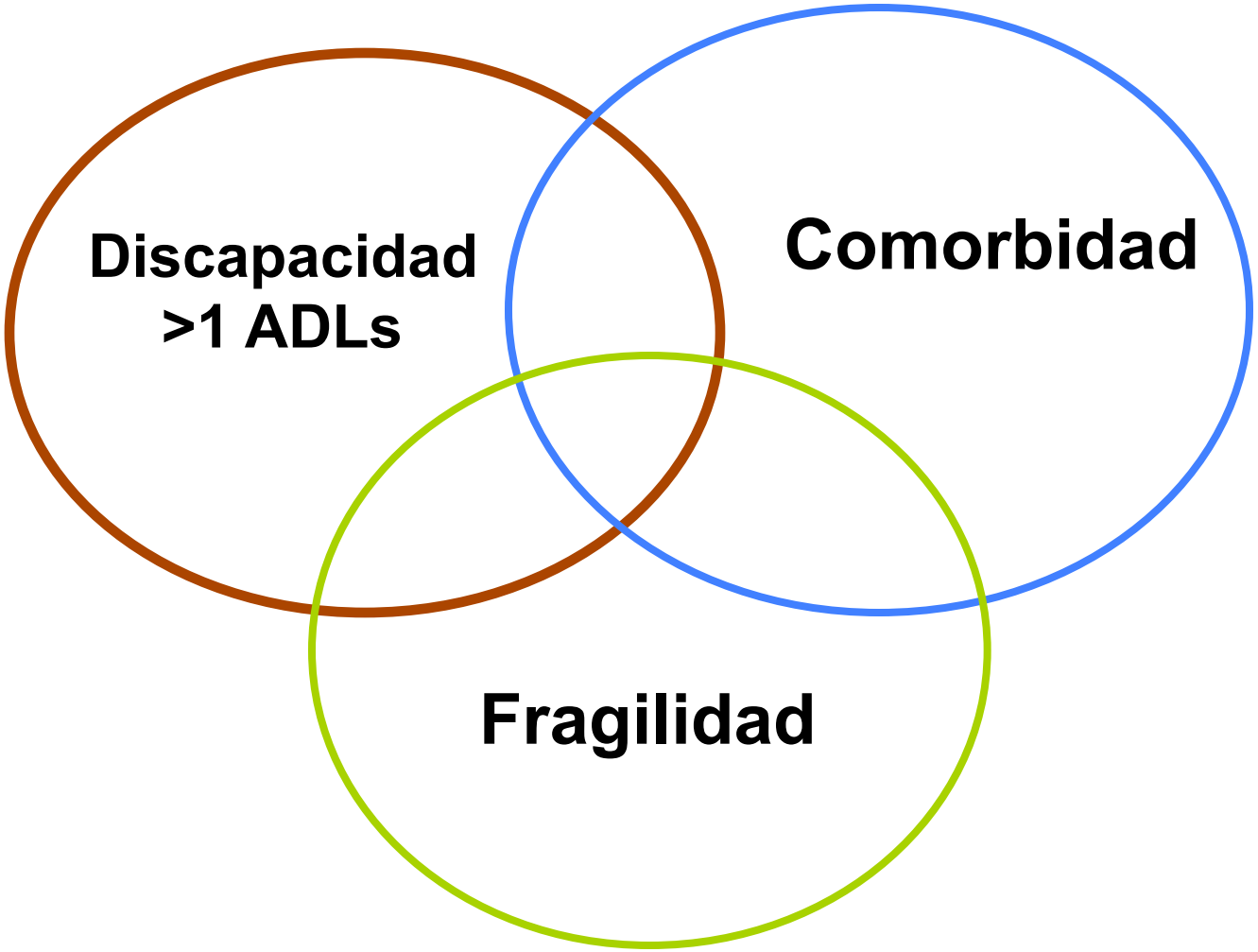
75 años

Porqué velocidad de la marcha?:

- Representa alto nivel evolutivo
- Refleja varios sistemas
- Associada a eventos adversos
- Confiable-(Reliable)
- Validada
- Instrumentable-(Feasible)

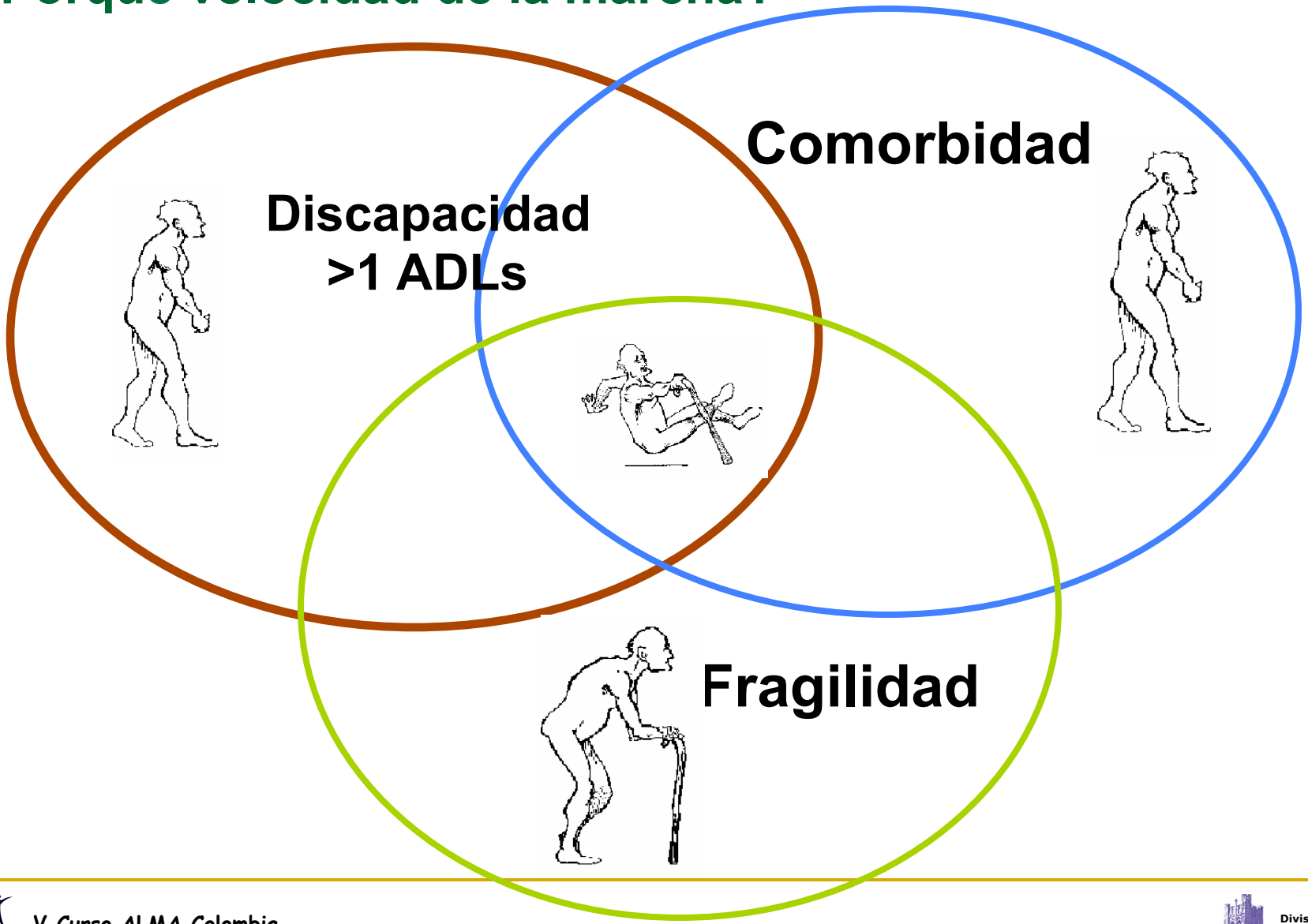


Porqué velocidad de la marcha?



Fried L et al. Journal of Gerontol Med Scies. 2001

Porqué velocidad de la marcha?



Fisiopatología propuesta de la fragilidad

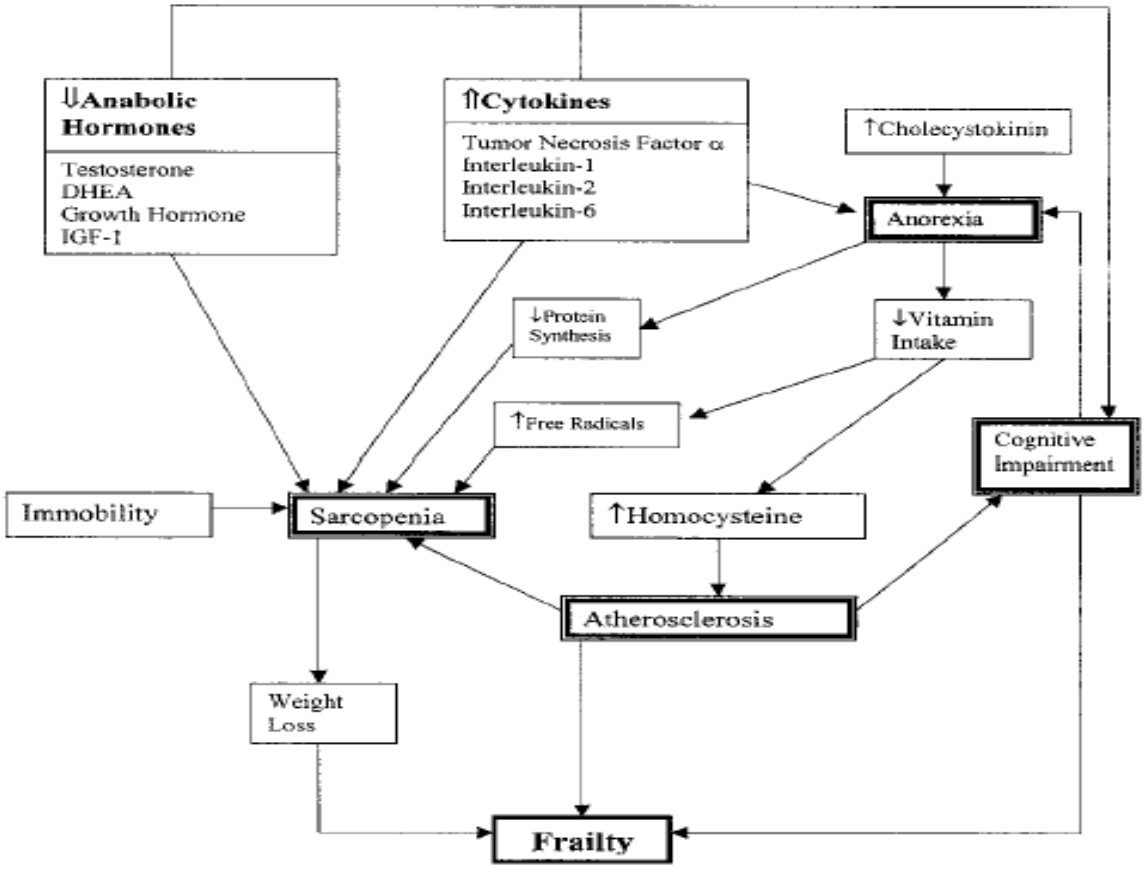


Figure 3. Metabolic causes of frailty. DHEA = dehydroepiandrosterone; IGF-1 = insulin-like growth factor-1.

Morley J. Journal of Gerontol Med Scies. 2003

Fisiopatología propuesta de la fragilidad

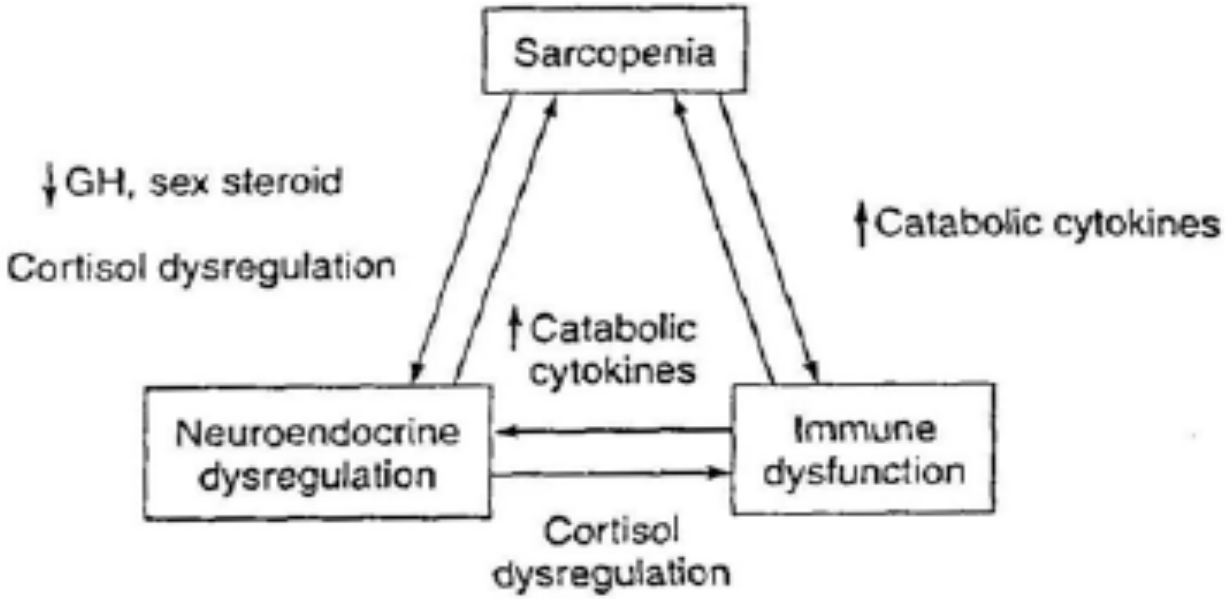


Figure 116-3 Age-related physiologic changes that are proposed as central to the syndrome of frailty. These changes underlie much of the poor response to stressors and the vulnerable state exhibited by frail individuals.

Adaptdo de Fried at al. 2003

Como aproximarnos a esta fisopatología?

Visión Tradicional: Evaluación de múltiples dominios

1) Dominio Cognitivo: depresión, demencia
2) Dominio Sensorial: visual, auditivo y propioceptivo
3) Dominio Desempeño Físico: desempeño de mmii, equilibrio, marcha
4) Dominio Nutricional: IMC
5) Dominio Medicación: polifarmacia, bzp, psicotrópicos

- No entendemos todavía porque ancianos con los mismos factores de riesgo no manifiestan los síndromes geriátricos

- ¿Existiría un vía final común?
- ¿Sarcopenia?
- ¿Trastornos de movilidad y marcha?
- ¿Deterioro Cognitivo?

- Es la sarcopenia un marcador de fragilidad física?

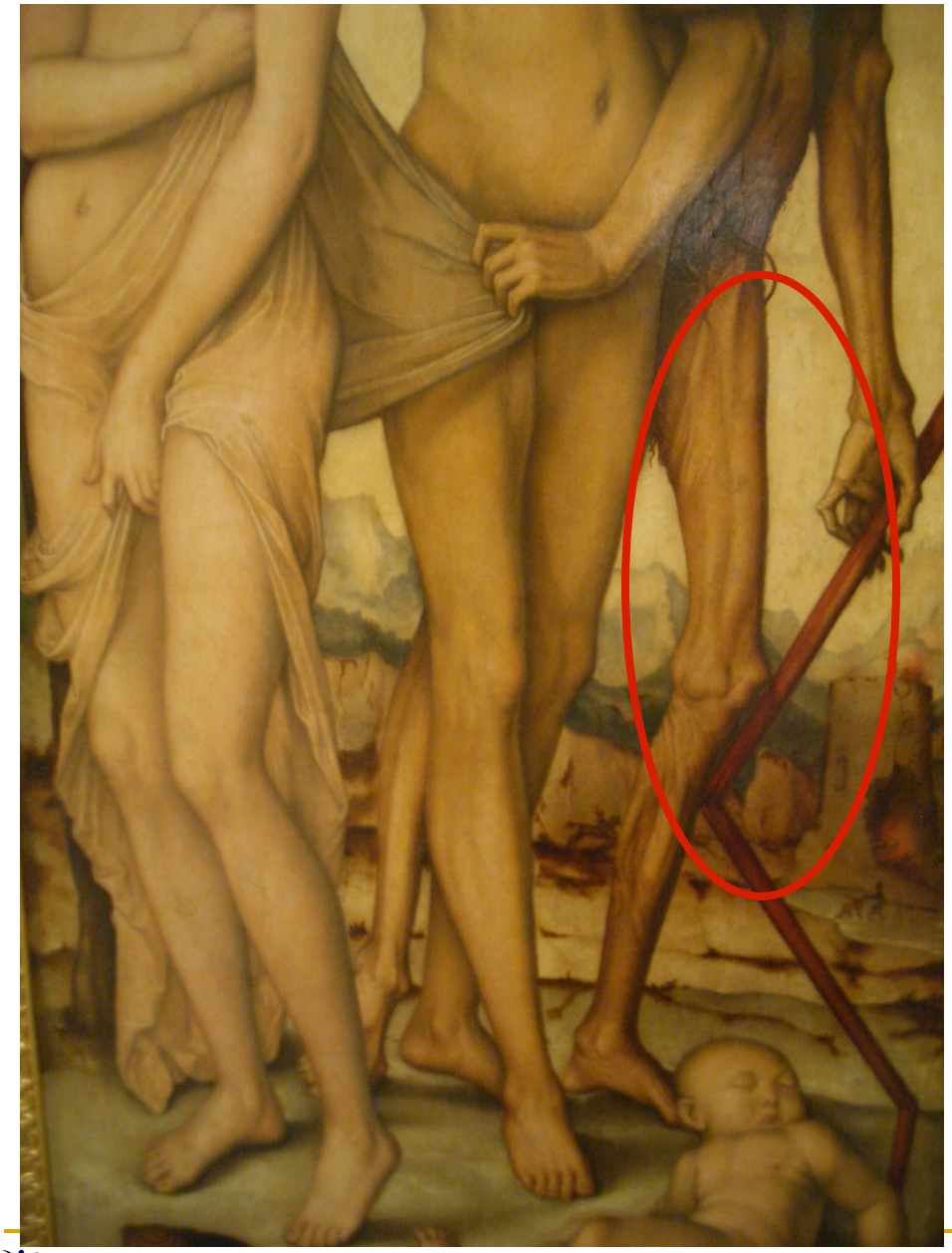
Cambios en la marcha asociados a la edad



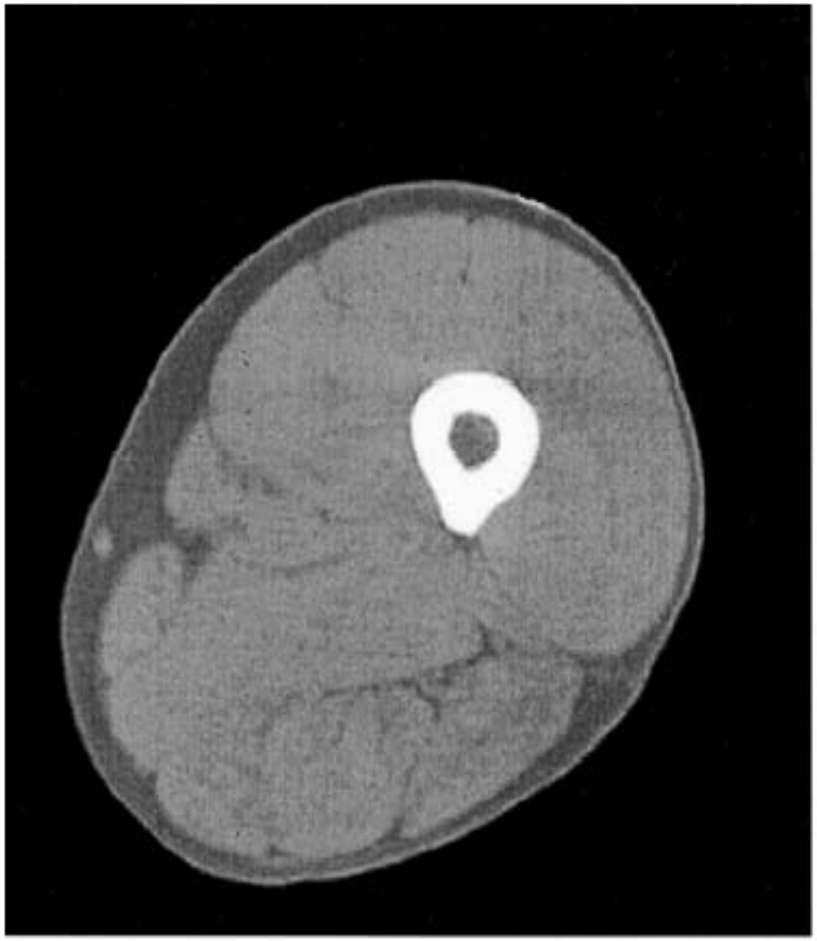
- Long de paso: 1.5 m
- Depende de musculos flexores de la cadera
  ↑iliopsoas
- GV= long paso x cadencia/ 120
- Solo 15% problemas de la marcha son por la edad “per se”

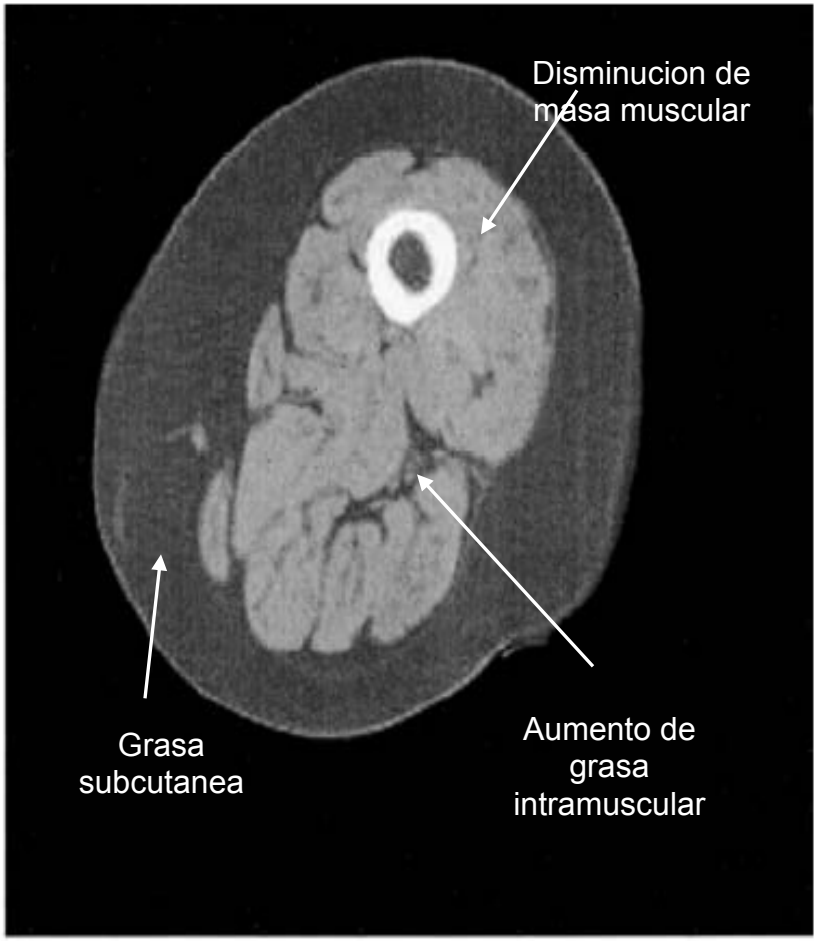


Van Herman [Las edades y la muerte. Museo del Prado-Madrid]



- Perdida de masa y fuerza muscular
- Sarcopenia





Young, active

Old, sedentary

Hipótesis

Discapacidad en los miembros inferiores esta relacionada a la sarcopenia siendo esta una característica de la fragilidad física

Que evidencia existe???

Cual es el grado de evidencia???

LOWER-EXTREMITY FUNCTION IN PERSONS OVER THE AGE OF 70 YEARS AS A PREDICTOR OF SUBSEQUENT DISABILITY

JACK M. GURALNIK, M.D., PH.D., LUIGI FERRUCCI, M.D., PH.D., ELEANOR M. SIMONSICK, PH.D., MARCEL E. SALIVE, M.D., M.P.H., AND ROBERT B. WALLACE, M.D.

Abstract *Background.* Functional assessment is an important part of the evaluation of elderly persons. We conducted this study to determine whether objective measures of physical function can predict subsequent disability in older persons.

Methods. This prospective cohort study included men and women 71 years of age or older who were living in the community, who reported no disability in the activities of daily living, and who reported that they were able to walk one-half mile (0.8 km) and climb stairs without assistance. The subjects completed a short battery of physical-performance tests and participated in a follow-up interview four years later. The tests included an assessment of standing balance, a timed 8-ft (2.4-m) walk at a normal pace, and a timed test of five repetitions of rising from a chair and sitting down.

Results. Among the 1122 subjects who were not disabled at base line and who participated in the four-year follow-up, lower scores on the base-line performance tests were associated with a statistically significant, graduated increase in the frequency of disability in the activities of daily living and mobility-related disability at follow-up. After adjustment for age, sex, and the presence of chronic disease, those with the lowest scores on the performance tests were 4.2 to 4.9 times as likely to have disability at four years as those with the highest performance scores, and those with intermediate performance scores were 1.6 to 1.8 times as likely to have disability.

Conclusions. Among nondisabled older persons living in the community, objective measures of lower-extremity function were highly predictive of subsequent disability. Measures of physical performance may identify older persons with a preclinical stage of disability who may benefit from interventions to prevent the development of frank disability. (N Engl J Med 1995;332:556-61.)

The New England Journal of Medicine

A PROGRAM TO PREVENT FUNCTIONAL DECLINE IN PHYSICALLY FRAIL, ELDERLY PERSONS WHO LIVE AT HOME

THOMAS M. GILL, M.D., DOROTHY I. BAKER, PH.D., R.N.-C.S., MARGARET GOTTSCHALK, P.T., M.S., PETER N. PEDUZZI, PH.D., HEATHER ALLORE, PH.D., AND AMY BYERS, M.P.H.

ABSTRACT

Background Functional decline in physically frail, elderly persons is associated with substantial morbidity. It is uncertain whether such functional decline can be prevented.

Methods We randomly assigned 188 persons 75 years of age or older who were physically frail and living at home to undergo a six-month, home-based intervention program that included physical therapy and that focused primarily on improving underlying impairments in physical abilities, including balance, muscle strength, ability to transfer from one position to another, and mobility, or to undergo an educational program (as a control). The primary outcome was the change between base line and 3, 7, and 12 months in

such as hospitalization, admission to a nursing home, and use of formal and informal home services,[3-6] it places a substantial burden on elderly persons, informal caregivers, and health care resources.[7,8] Therefore, interventions designed to prevent functional decline have the potential not only to generate large health care savings[9] but also to lead to important reductions in the physical, emotional, social, and financial problems attributable to disability.

Previously studied interventions have focused largely on the restoration of function in disabled elderly persons undergoing rehabilitation after an acute medical event, such as a stroke or hip fracture. There have been relatively few attempts to evaluate strategies

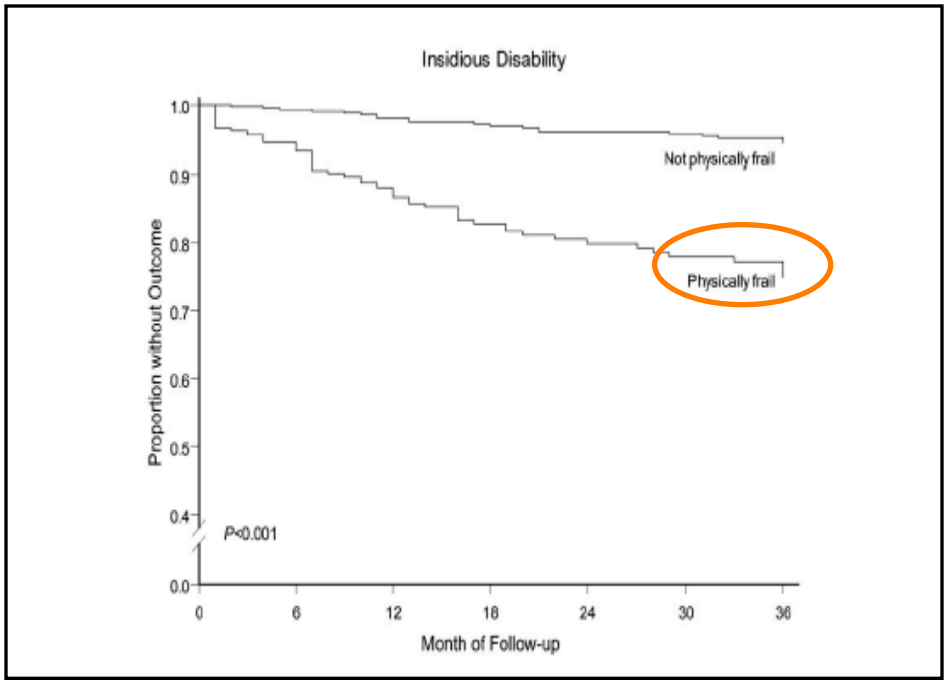
Table 1. Presence and Type of Disability at Four Years of Follow-up, According to Scores on Base-Line Measures of Performance.

Test and Score*	Status at Four Years		
	No disability	Mobility-related disability	Disability in ADL†
	percent of subjects		
8-ft (2.4-m) walk			
1	35.6	31.1	33.3
2	59.9	24.6	15.5
3	71.8	19.9	8.3
4	80.4	13.5	6.2
Repeated rising from a chair			
1	59.7	25.3	15.1
2	67.0	21.9	11.1
3	74.9	16.4	8.7
4	79.3	13.9	6.8
Standing balance			
1	37.7	31.2	31.2
2	53.4	30.5	16.0
3	67.8	20.9	11.3
4	77.7	15.4	6.9

*Scores ranged from 1 to 4, with 1 indicating the poorest performance, and 4 the best performance. $P<0.001$ for the association between the scores on each performance measure and subsequent disability status, by the chi-square test.

†ADL denotes activities of daily living.

- Velocidad de la marcha es afectada por la comorbilidad
- Velocidad de la marcha es un marcador validado de movilidad[1]
- Velocidad de la marcha es un fuerte marcador de discapacidad[2]



Disability vs. Mobility disability

(based on gait velocity < 0.7 m/s)[2]

[1]Montero-Odasso M et al. J Nutr Health Aging 2004;8(5):340-343.
[2]Gill T. et al. Am J Med 2004;117:484–491.

Physical Performance Measures in the Clinical Setting

Stephanie Studenski, MD, MPH,† Subashan Perera, PhD,*‡ Dennis Wallace, PhD,‡‖ Julie M. Chandler, PhD, PT,¶ Pamela W. Duncan, PhD, PT,*§ Earl Rooney, MD, MHA,†#†† Michael Fox, ScD,*§ and Jack M. Guralnik, MD, PhD**

OBJECTIVES: To assess the ability of gait speed alone and a three-item lower extremity performance battery to predict 12-month rates of hospitalization, decline in health, and decline in function in primary care settings serving older adults.

DESIGN: Prospective cohort study.

SETTING: Primary care programs of a Medicare health maintenance organization (HMO) and Veterans Affairs (VA) system.

PARTICIPANTS: Four hundred eighty-seven persons aged 65 and older.

MEASUREMENTS: Lower extremity performance Established Population for Epidemiologic Studies of the Elderly (EPESE) battery including gait speed, chair stands, and

mance measures predicted decline in function and health status in both health systems. Performance measures, alone or in combination with self-report measures, were more able to predict outcomes than self-report alone.

CONCLUSION: Gait speed and a physical performance battery are brief, quantitative estimates of future risk for hospitalization and decline in health and function in clinical populations of older adults. Physical performance measures might serve as easily accessible "vital signs" to screen older adults in clinical settings. J Am Geriatr Soc 51:314–322, 2003.

Key words: geriatric assessment; risk assessment; locomotion; health maintenance organizations; hospitalization; activities of daily living

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Gait Velocity as a Single Predictor of Adverse Events in Healthy Seniors Aged 75 Years and Older

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[1]Division of Geriatric Medicine, McGill University, Montreal, Canada.
[2]Geriatric Medicine Program, [3]Internal Medicine Department, and
[4]Informatics and Biostatistics Department, Hospital Italiano de Buenos Aires, Argentina.
[5]Geriatric Fellowship, Faculty of Medicine, University of Buenos Aires, Argentina.

Purpose. Although gait velocity (GV) measurement could predict poor outcomes, few studies regarding its usefulness as a single test in well functioning elderly persons have been pursued. The aim of this study was to asses whether GV could be sufficient to predict adverse events such as hospitalization for any cause, requirement for a caregiver, nursing home placement, falls, fractures, or death in healthy elderly persons.

Methods. Ours was a cohort study comprising 102 well functioning participants aged 75 and older. Demographic features, health status, and functional capacity were assessed at baseline and followed for adverse outcomes. Measurements included evaluation of cognition, activities of daily living, and mobility. The time required to walk the middle 8 meters of 10 meters was defined as GV. Three GV groups were distinguished: high GV (>1.1 m/s), median GV (1–0.7 m/s), and low GV (<0.7 m/s).

Estudio EFA

HIPOTESIS

Velocidad de marcha lenta es una manifestación preclínica de fragilidad física

Estudio EFA

METODOS

- Diseño: Estudio de cohorte study (2000 - 2003).
- Seguimiento: 2 anos.
- Selección: 140 miembros sanos HMO >75 y/o fueron seleccionados aleatoriamente e invitados a participar.
- Exclusiones:
  Demencia y Depresión
  Crónica inestable (i.e. non-compensated CHF, COPD, DBT,etc)
  Stroke previo
  Enfermedad Terminal
  Enfermedades neurológicas
  Discapacidad en actividades de vida diaria

Estudio EFA objetivos

•**Evaluar si una medida simple como la velocidad de la marcha, en ancianos con alta funcionalidad (<75a) podria predecir eventos adversos totales e individuales como:**

1. Hospitalizacion (cualquier causa)
2. Requerimiento de un cuidador
3. Institucionalizacion
4. Caidas
5. Fracturas
6. Muerte

•**Evaluar si esta medida simple puede ser <u>precoz y suficiente</u> para predecir estos eventos.**

Table 2. Two year follow up characteristics univariate analysis (N=101)

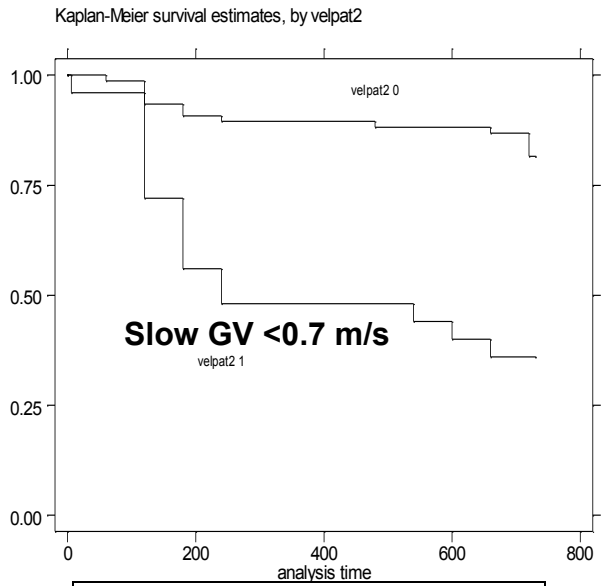
Gait Velocity	>1.1m/s (N=34)	0.7-1.0 m/s (N=41)	<0.7 m/s (N=25)	RR (95%CI)	*P* value
Subjects with any Adverse events % (N)	20% (7)*	34% (14)†	72% (18)*†	* 3.5 (1.7-7.0) † 2.1 (1.3-3.4)	<.002 <.001
New fall % (N)	12% (4)*	24% (10) †	60% (16)* †	* 5.4 (2.0-14.3) † 2.6 (1.4-4.9)	<.0005
Hospitalization % (N)	8.8% (3)*	17% (7) †	52% (13)* †	* 5.9 (1.9-18.5) † 3.0(1.4-3.6)	<.005
Need for a Caregiver % (N)	3% (1)*	17% (7) †	28% (7)* †	* 9.5 (1.3-72.5) † 1.64(0.7-4.1)	<.007
Nursing Home Placement % (N)	0	0	12% (3)	N/A	
Fracture % (N)	3% (1)*	10% (4)†	8% (2))* †	* 2.7 (0.3-28.4) † 0.8 (0.8-4.2)	
Death % (N)	0	10% (4)	8% (2)	N/A	

Slow Gait Velocity: <0.7 m/s, abn. POMA: abnormal POMA (score below 20/28), abn. GetUp&Go: abnormal GetUp&Go (score below 4/5 or more than 10 seconds)
N/A: non applicable

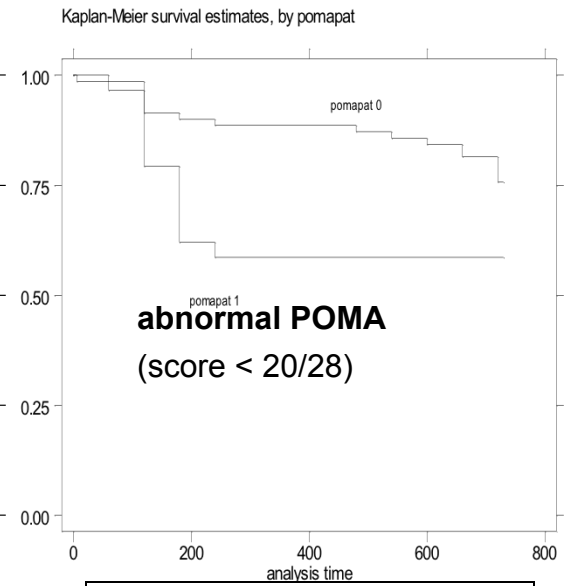


Western

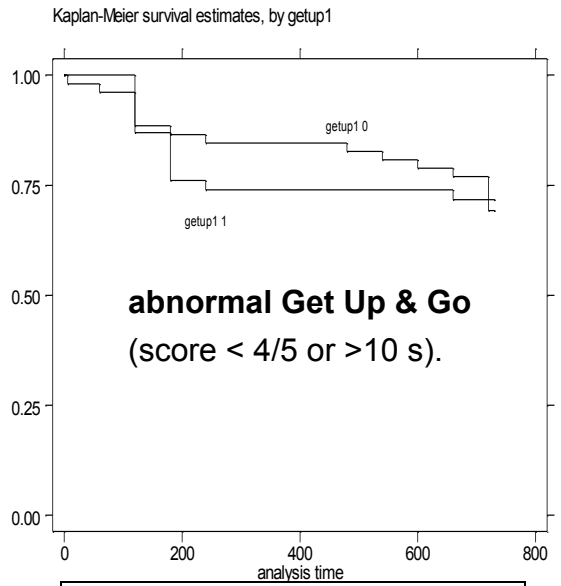
Analisis de sobrevida al tiempo de nueva caida.



Gait Velocity, p (Log-rank test) <0,001



POMA, p (long rank test) = 0.0509



GetUp&Go, p(long rank test) = 0.8661

Mean time to a new fall:
1-Low gait velocity: 411 days (SD: 286); normal gait velocity: 663 days (SD: 183); p<0,001.
2-Abnormal POMA: 490 days (SD:292.25); normal POMA: 650 days (SD: 194.5) p=0.0509
3-Abnormal GetUp&Go: 578.47 days (SD:255.34) normal GetUp&Go: 623 days (SD: 222) p=0.8661

Montero-Odasso M et al *J Gerontol A Biol Sci Med Sci* 2005;62:1124-1133

Comparative Predictive Ability of Gait Velocity vs. Get Up & Go vs. POMA After 2 Years of Follow-Up in well functioning elderly people

Outcome	Low Gait Velocity *OR 95%CI*	abn. POMA *OR 95%CI*	abn. Get Up & Go *OR 95%CI*
Total events	**10.1 (2.2-46)***	**2 (0.6-6.4)**	**0.7 (0.3-2.1)**
New falls	**10.9 (2.0-58)***	**1.4 (0.4-5.4)**	**0.8 (0.3-2.4)**
Hospitalization	**12.3 (1.9-79)***	**1.1 (0.3-4.2)**	**0.7 (0.2-2.4)**
Fracture	**2.4 (0.2-33)**	**2.4 (0.4-16.4)**	**2.3 (0.3-16.4)**
Death	**1.8 (0.3-4)**	**1 (0.1-10.5)**	**0.2 (0.01-2.6)**

Notes: Low gait velocity: <0.7 m/s, abn. POMA (abnormal Performed Oriented Mobility Assessment; score <20/28), abnormal Get Up & Go (score <4/5 or >10 s) Data were adjusted for demographics and functioning variable s and are shown as odds ratios (95% confidence intervals) from a multiple logistic regression analysis.

*Statistically significant.

Montero-Odasso M et al *J Gerontol A Biol Sci Med Sci* 2005;62:1124-1133v

Estudio EFA conclusion

• **VM** en ancianos con buena y alta funcionalidad es predictora de eventos adversos futuros luego de 2 anos de seguimiento.

•VM permitió detectar ancianos de la comunidad de riesgo a eventos adversos.

•Nuestros datos soportan el concepto qu la VM como prueba única y simple de movilidad es suficiente para predecir eventos adversos en ancianos con alta funcionalidad.

•Puede ser un marcador de fragilidad?

Prognostic Value of Usual Gait Speed in Well-Functioning Older People—Results from the Health, Aging and Body Composition Study

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OBJECTIVES: To define clinically relevant cutpoints for usual gait speed and to investigate their predictive value for health-related events in older persons.

DESIGN: Prospective cohort study.

SETTING: Health, Aging and Body Composition Study.

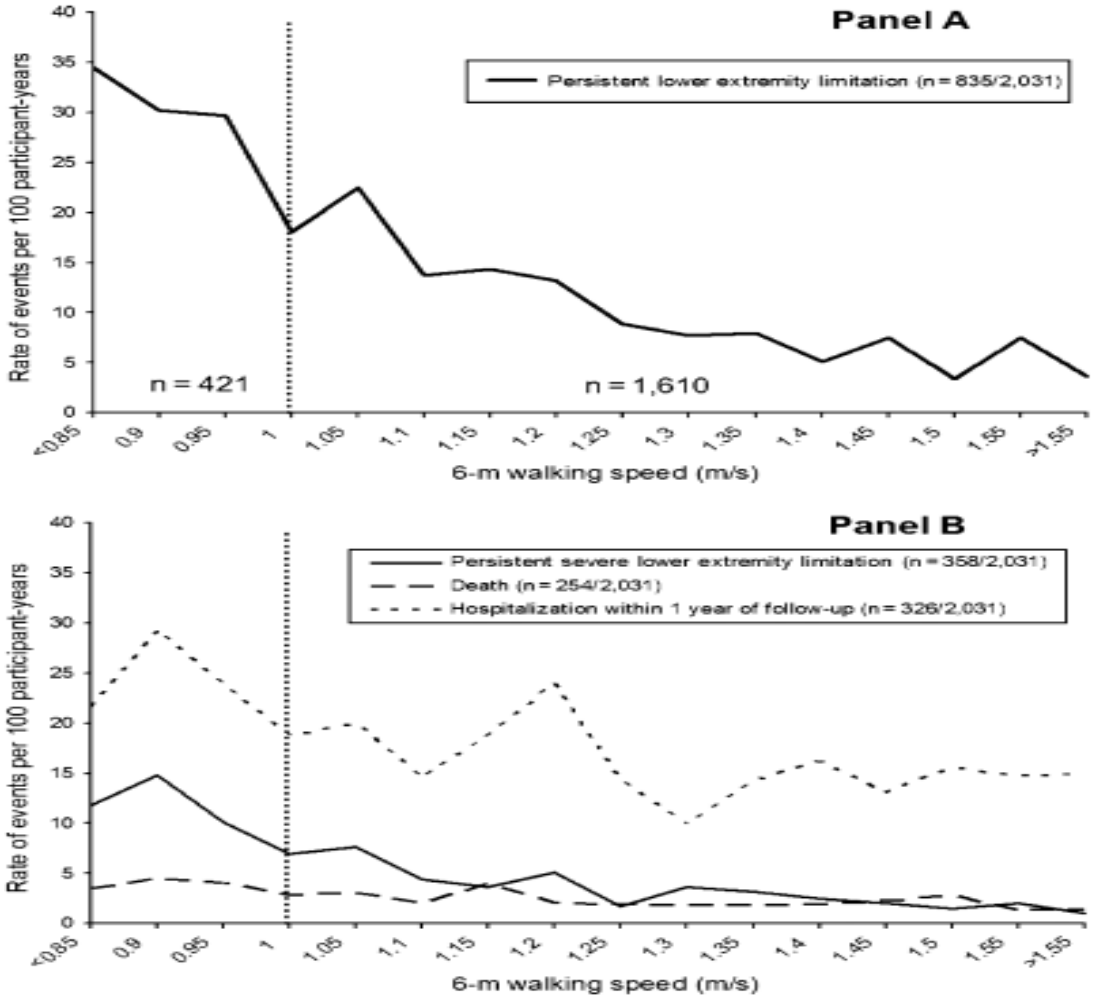
PARTICIPANTS: Three thousand forty-seven well-functioning older persons (mean age 74.2).

MEASUREMENTS: Usual gait speed on a 6-m course was assessed at baseline. Participants were randomly divided into two groups to identify (Sample A; n = 2,031) and then validate (Sample B; n = 1,016) usual gait-speed cutpoints. Rates of persistent lower extremity limitation events (mean follow-up 4.9 years) were calculated according to gait speed in Sample A. A cutpoint (defining high- (<1 m/s) and low risk (≥1 m/s) groups) was identified based on persistent lower extremity limitation events. The predictive value of the identified cutpoints for major health-related events

RESULTS: A graded response was seen between risk groups and health-related outcomes. Participants in the high-risk group had a higher risk of persistent lower extremity limitation (rate ratio (RR) = 2.20, 95% confidence interval (CI) = 1.76–2.74), persistent severe lower extremity limitation (RR = 2.29, 95% CI = 1.63–3.20), death (RR = 1.64, 95% CI = 1.14–2.37), and hospitalization (RR = 1.48, 95% CI = 1.02–2.13) than those in the low-risk group.

CONCLUSION: Usual gait speed of less than 1 m/s identifies persons at high risk of health-related outcomes in well-functioning older people. Provision of a clinically meaningful cutpoint for usual gait speed may facilitate its use in clinical and research settings. J Am Geriatr Soc 53:1675–1680, 2005.

Key words: physical performance; gait speed; lower extremity limitation; death; hospitalization

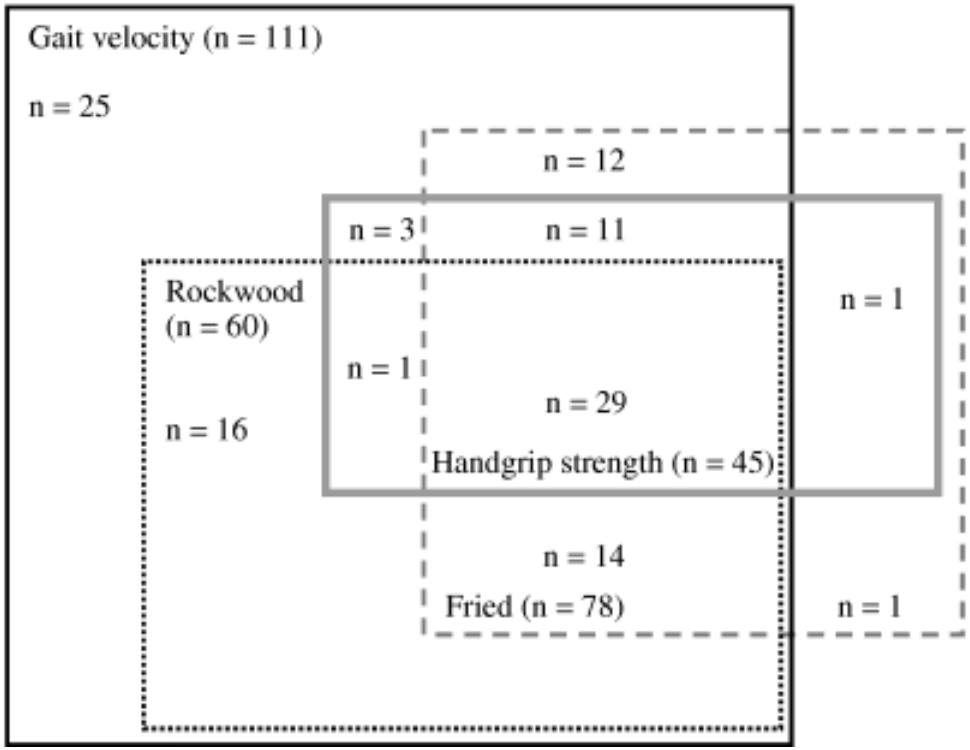


A. Rate of persistent lower extremity limitation events (primary outcome) per 100 participant-years according to 6-m walking speed (per 0.05-m/s increase).

B. Rate of persistent severe lower extremity limitation, death, and hospitalization events (secondary outcomes) per 100 participant-years according to 6-m walking speed (per 0.05-m/s increase).

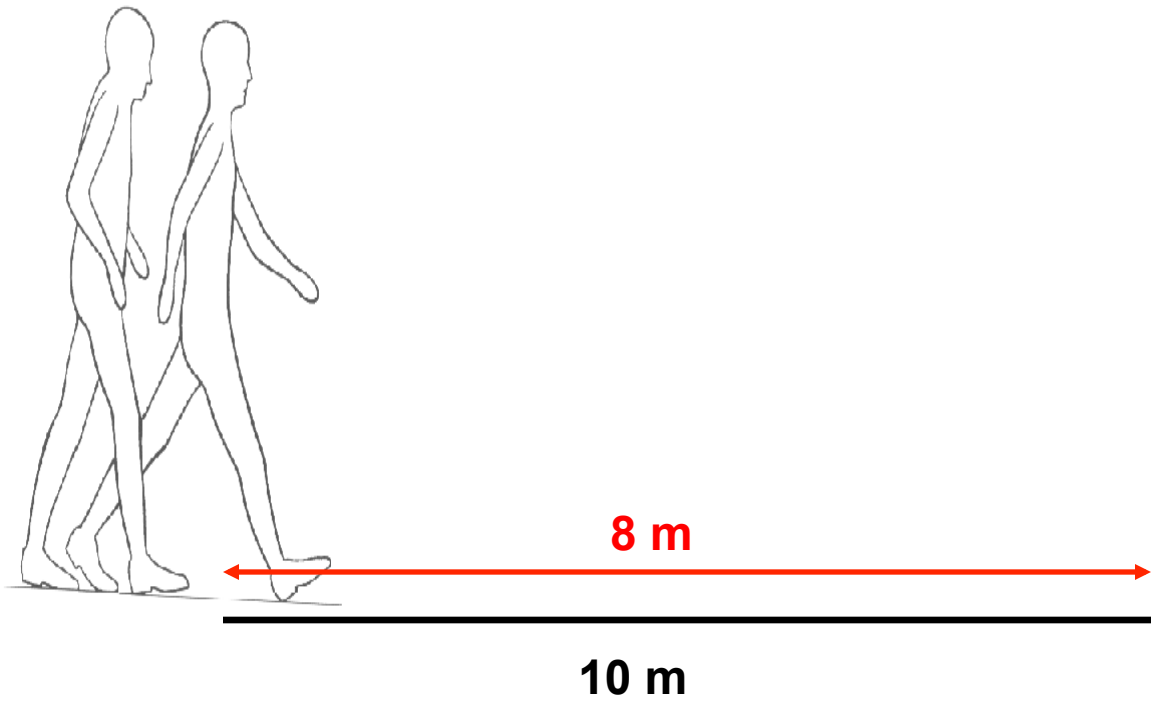
Estudio / Trial	Participantes	VM	Outcomes	Resultados
Guralnik et al., 1995 Cohorte-EPESE Study / 4a	1122 ancianos frágiles	2.4 m	Discapacidad	Discapacidad
Gill T et al., 1999 RCT- New Heaven Study / 2a	180 ancianos frágiles	3m	Discapacidad insidiosa	0.8 m/s predictor a 2 a
Studenski et al., 2003 Cohorte-EPESE- /1a	400 ancianos	5m	Hospitalización muerte	Discapacidad
Cesari et al., 2005 Cohorte- ABC Study / Cont	Base de datos 3000 ancianos con alta funcionalidad	6m	Hospitalización muerte	1 m/s predictor de hospit-instituc-muerte
Montero-Odasso et al., 2005 Cohorte-Estudio EFA / 2a	102 ancianos con alta funcionalidad	8m	Caídas Hospitalización Institucionalización Cuidador Muerte	0.8 m/s predictor precoz de caídas y eventos totales

Figure 1. Distribution of subjects (n=113) identified as frail according to four frailty criteria (Rockwood,[3] Fried,[4] slow gait velocity,[6] and low handgrip strength[5]) in a group of elderly hospitalized patients (N=125).



Van Iersel MB, Olde Rikkert MG.Frailty Criteria Give Heterogeneous Results When Applied In Clinical Practice. J *Am Geriatric Soc 2006;* 54:728-729.

Como medir VM



Montero-Odasso M et al *J Gerontol A Biol Sci Med Sci* 2005; 62:1124-1133



Paul Delvaux [Belgian Surrealist Painter, 1897-1994]

Requerimientos para la prueba

1. Corredor con 6 m.
2. Bien iluminado
3. Distancia debe incluir 4 ciclos de marcha para permitir detectar danos suttiles
4. cronometro

Como interpretarlo ?

1. VM >1.1 m/s es considerada normal
2. Se sugiere corte de < 0.8 m/s for detecting mobility impairment and predict falls.
3. VM < 0.6 m/s predice no solo caidas sino tambien eventos adversos

Conclusiones

VM en grupos diferentes de ancianos

Grupo	Gait Velocity (m/s)	Riesgo de caidas	Riesgo de eventos adversos
Robustos	>1.3	Muy bajo	No evidencia
Rápidos	1.1-1.3	Bajo	Evidencia controvesial
Inter1/2	0.7-1.0	Inter1/2	SI-Sanos?
Lentos	0.4-0.6	Alto	SI-fragiles
Very impaired	<0.4	Altisimo	SI-Frail persons

Bohannon RW. *Age Ageing* 1997;26:5-19
Studenski S et al *JAGS* 1998;43:324-326
Alexander NB, *JAGS 1996;*44: 434-451
Montero -Odasso M et al *J Gerontol A Biol Sci Med Sci* 2005

Propuesta de velocidad de la marcha como marcador precoz de fragilidad física

Daño sutil en cada dominio

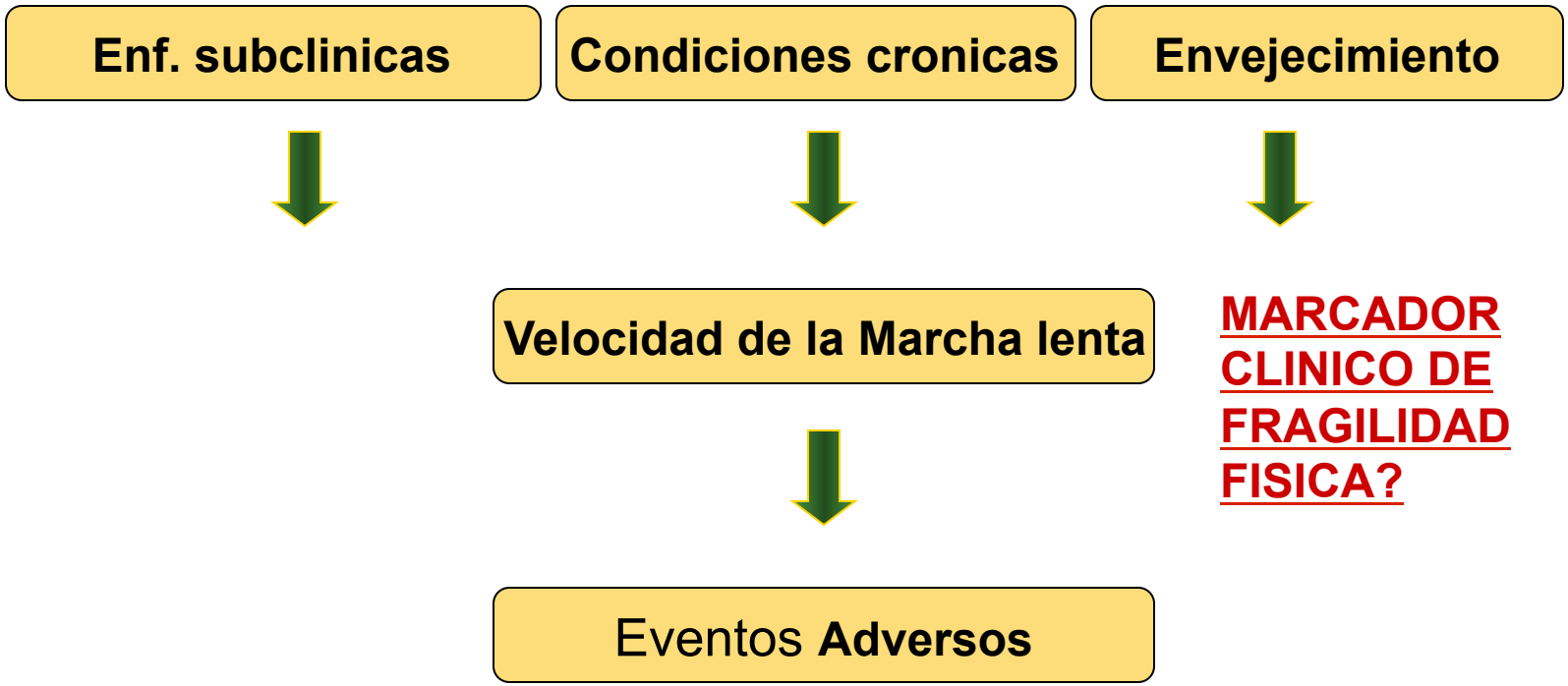
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Pérdida de complejidad de la marcha actuando como un via final común

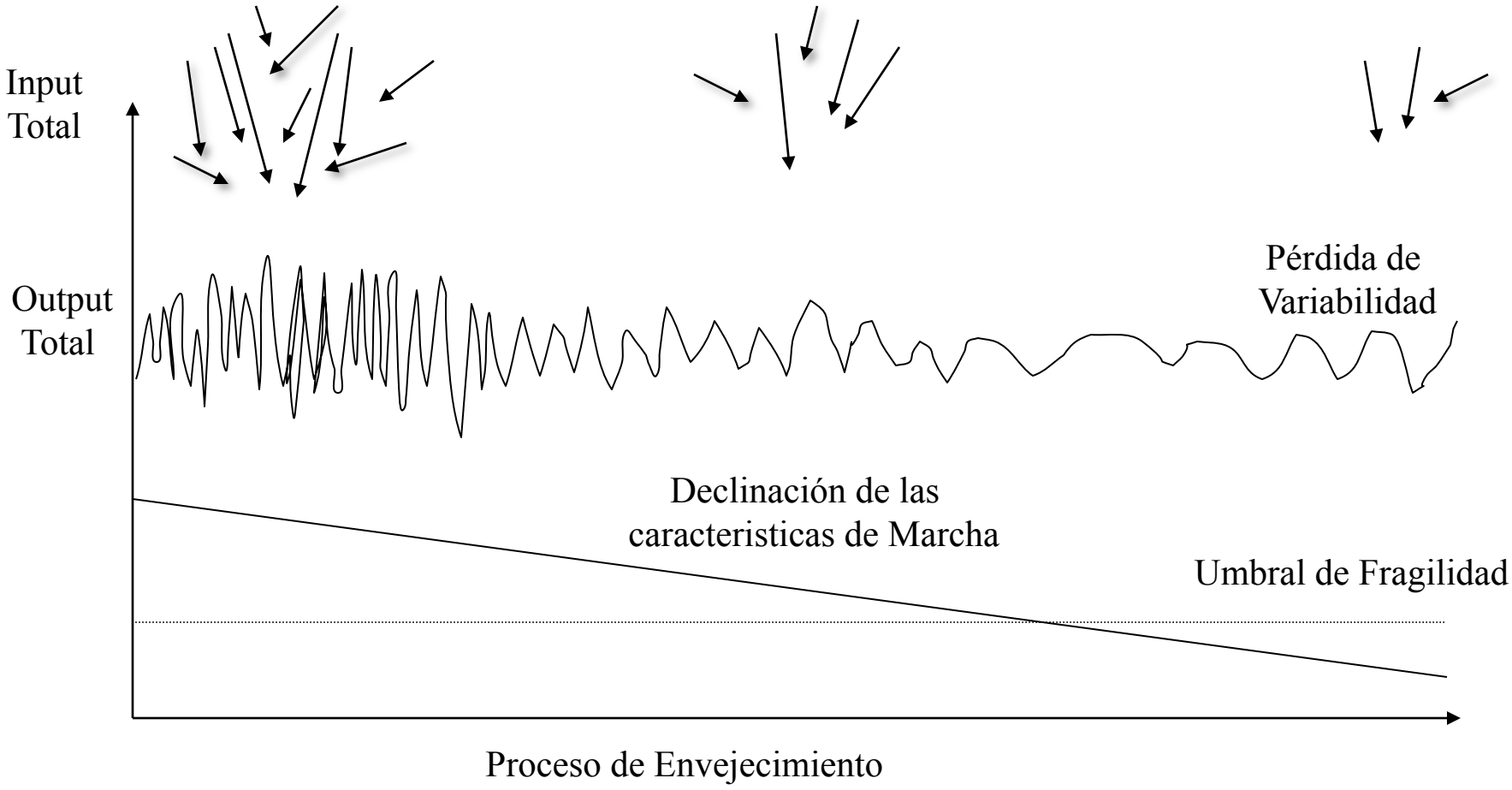
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Sindrome Geriatrico o Evento Adverso

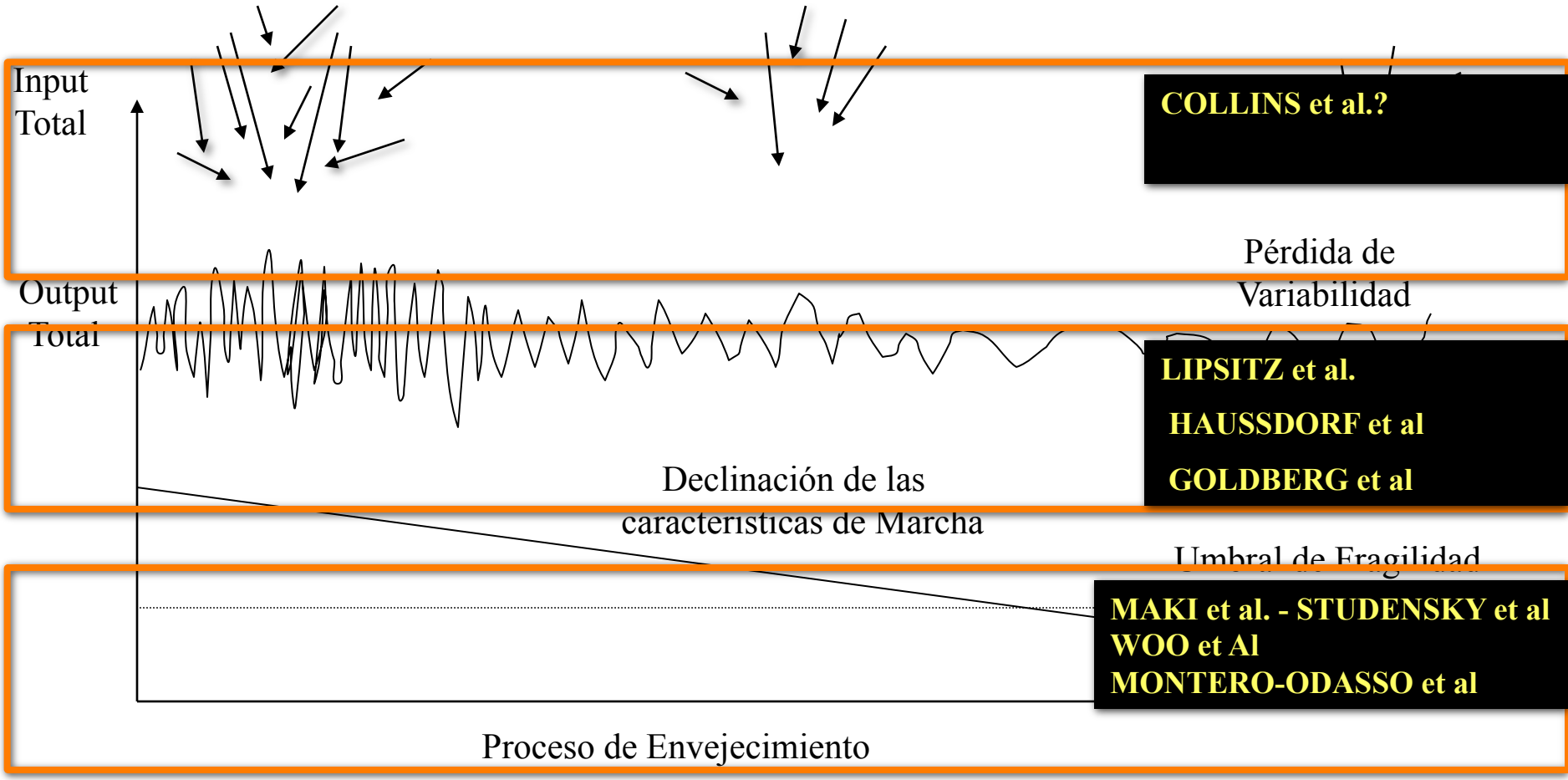
Propuesta de velocidad de la marcha como marcador precoz de fragilidad fisica



Conclusiones

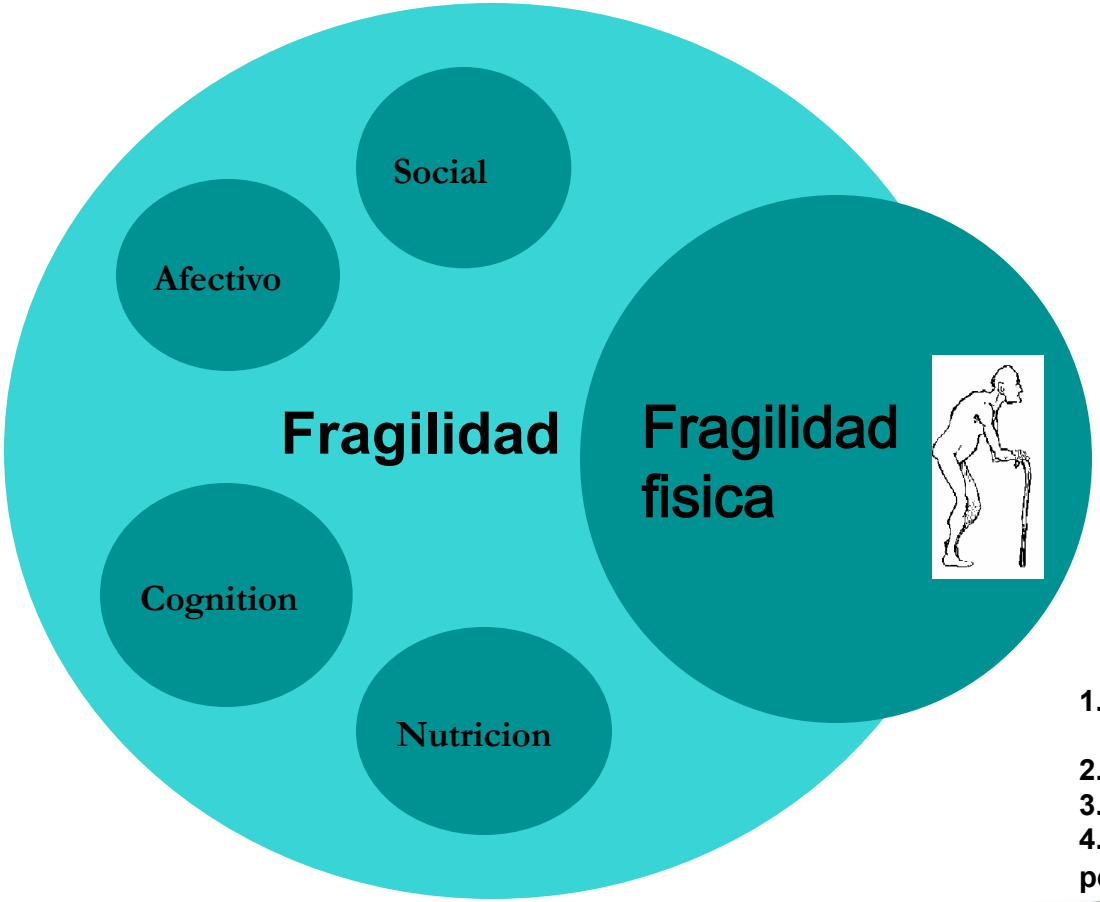


Conclusiones



Bohannon RW. *Age Ageing* 1997;26:5-19
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Propuesta operacional para la fragilidad

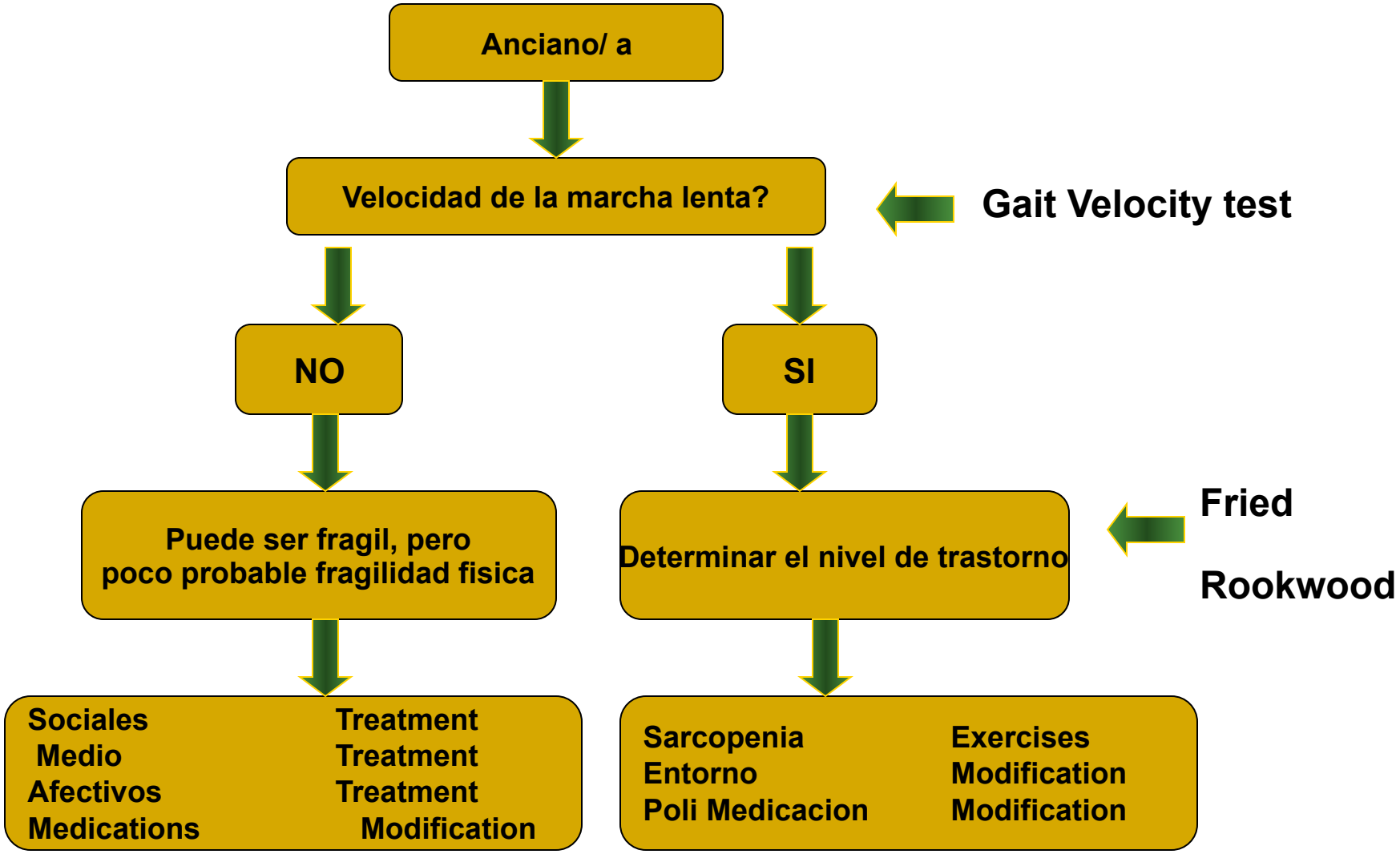


1. Sarcopenia
2. Baja movilidad
3. VM lenta
4. Mortalidad?
5. Discapacidad?

1.Ejercicios: que clase?
resistancia, equilibrion, tai chi, todos?
2.Suplementos Nutricional
3.Hormonas: Androgenos, GH, Vitamina D?
4.“Custom made” intervencio de acuerdo al perfil?

INTERVENCION

Propuesta operacional para la fragilidad



Conclusiones

- Los individuos frágiles son los que están al mas alto riesgo de eventos adversos totales como institucionalización, geriatría síndromes geriátricos, discapacidad dependencia y muerte

- Es un concepto en evolución
  "Fried's modelo" es a buen comienzo
  Fragilidad física se acerca mas al concepto de síndrome medico

- Importancia de operacional izar
  Detectar marcadores tempranos: vel de marcha, movilidad, etc.
  Potenciales intervenciónes: ejercicios, vitamin D, etc.

- Este grupo de ancianos son los que se beneficiarían mas de la evaluación geriátrica integral y de las intervenciones en equipo


Elderly
people