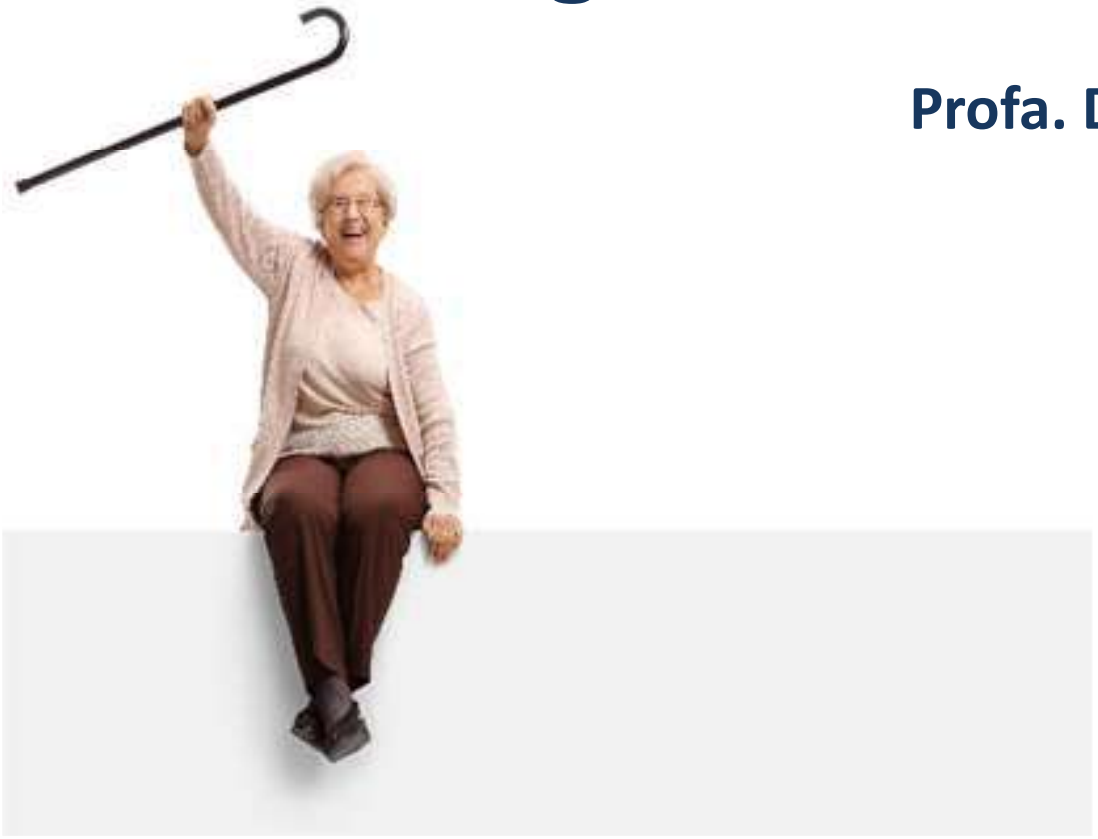
Bases para una atención baseada em evidencia a las personas mayores que sufren caídas

Tecnologia e Quedas em idosos



Profa. Dra. Monica Perracini, PT PhD

PGGERO
PROGRAMA DE PÓS GRADUAÇÃO EM GERONTOLOGIA
FCM UNICAMP

UNICID Universidade Cidade de São Paulo
Mestrado e Doutorado em FISIOTERAPIA



Screening
Predição

Estratificação
Avaliação

Intervenção
Prevenção 1ª e 2ª



Vários Tipos de Tecnologia

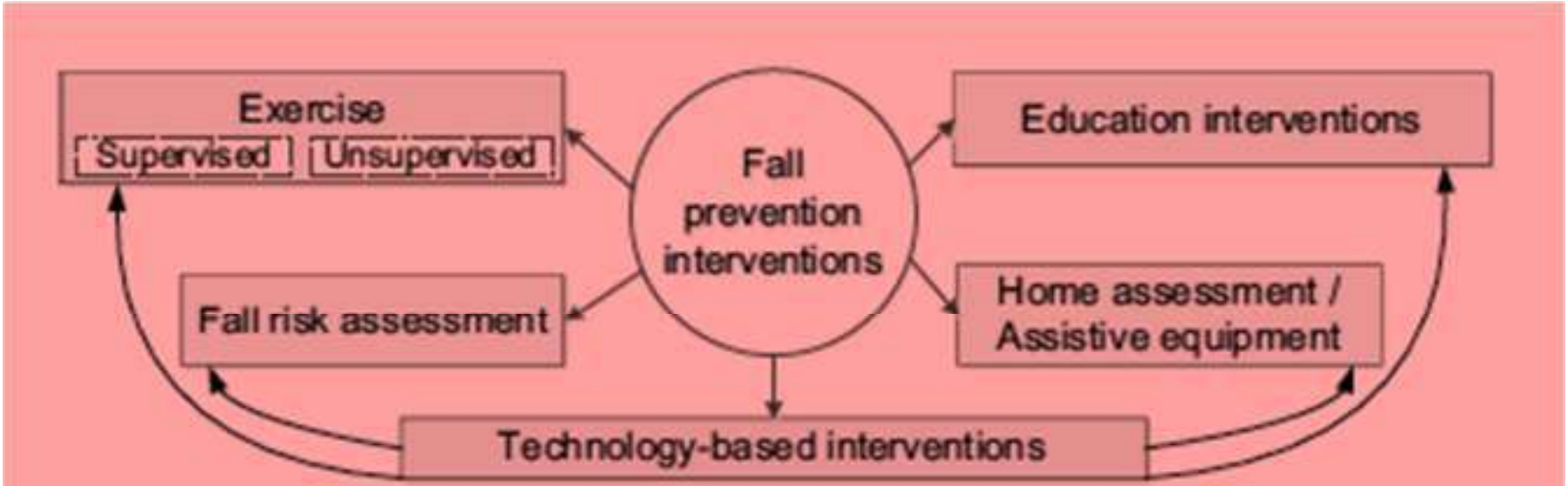


Fig. 1. Overview of falls prevention interventions.

Contents lists available at ScienceDirect

Journal of Biomedical Informatics

journal homepage: www.elsevier.com/locate/yjbin

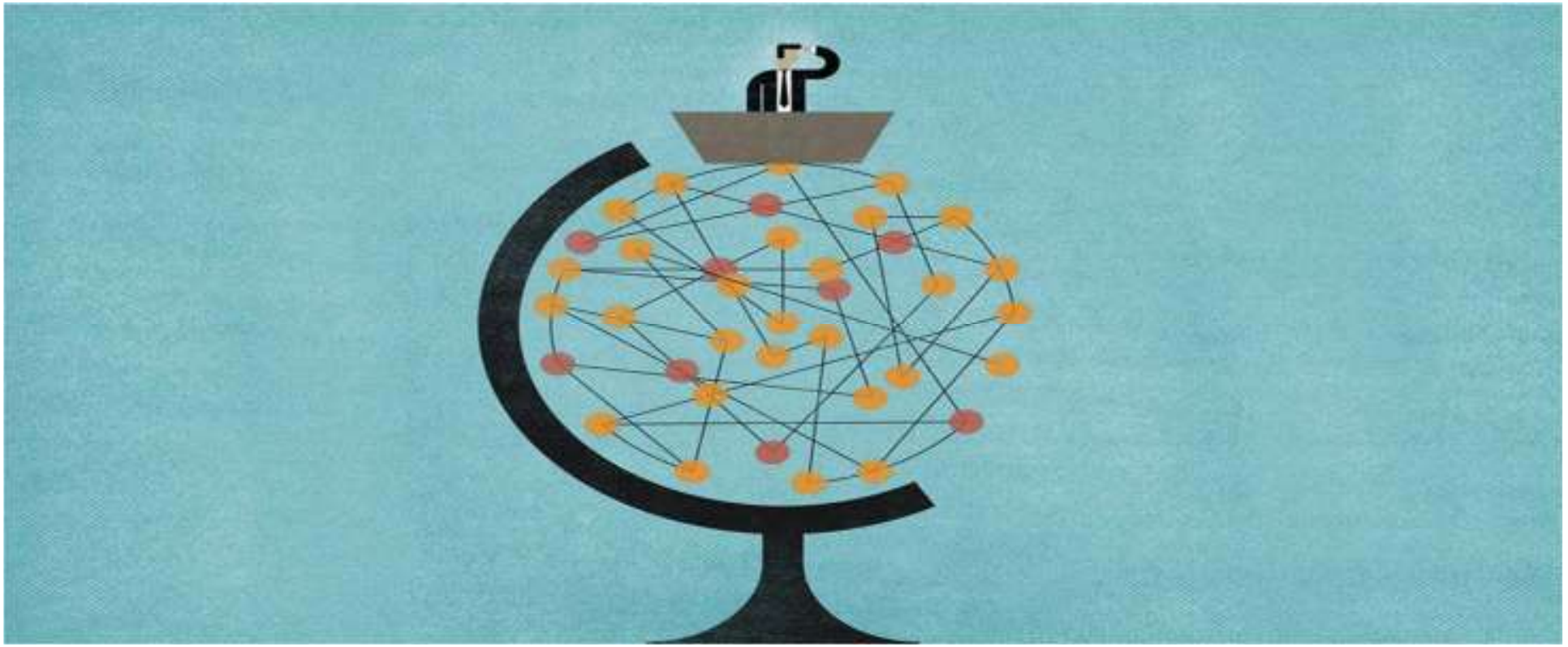
Methodological Review

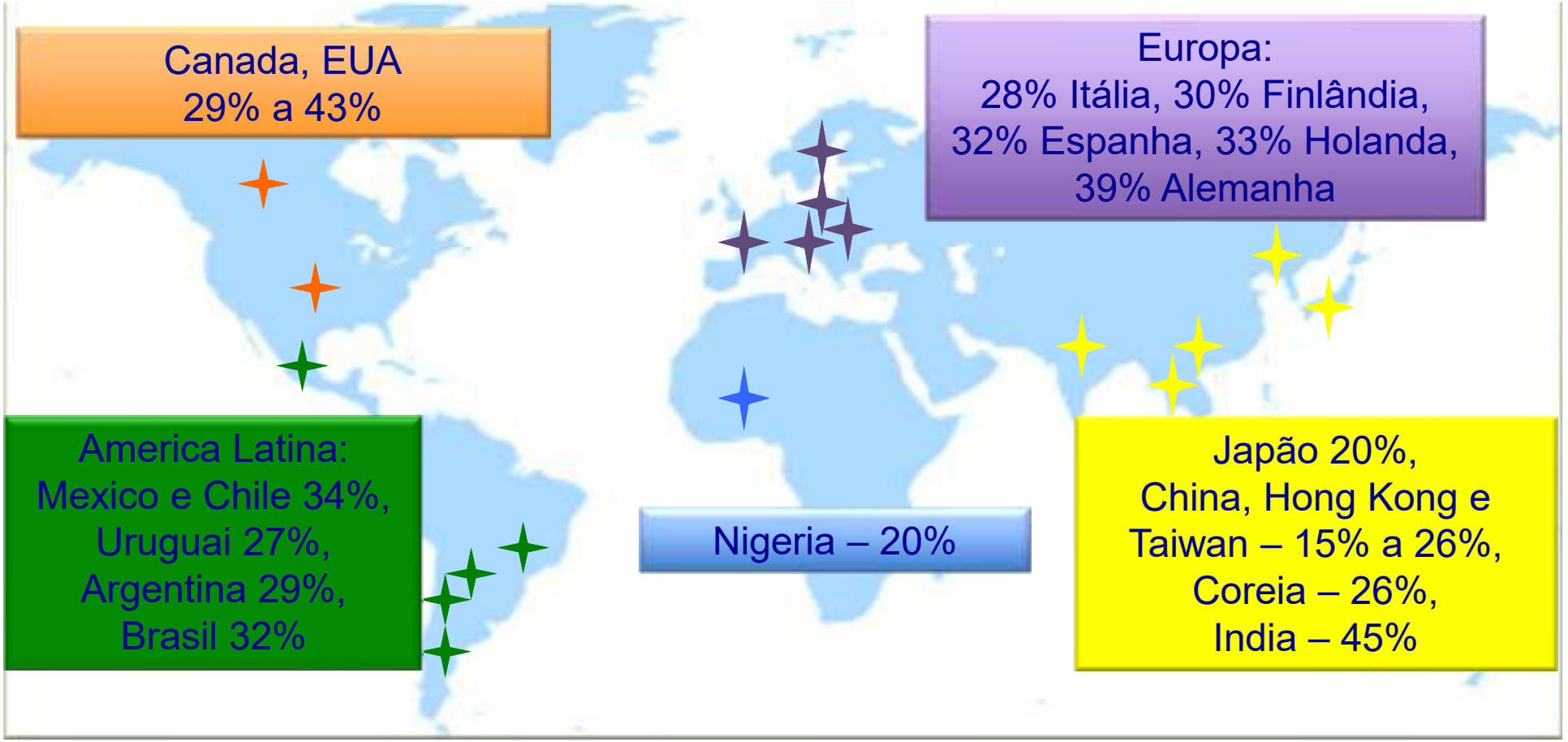
Fall prevention intervention technologies: A conceptual framework and survey of the state of the art

Julian Hamm [a], Arthur G. Money [b,*], Anita Atwal [b], Ioannis Paraskevopoulos [c]

[a] Department of Computer Science, Brunel University London, UK
[b] Department of Clinical Sciences, Brunel University London, UK
[c] Department of Computing and Information Systems, University of Greenwich, UK

Fenômeno Mundial





Prevalência de Quedas no mundo é muito variável – 20% e 45%

½ caidores recorrentes

↑ Idade –oldest olds (>85 anos) – 49% a 60%

Perracini,, Tiedemann, Clenson, Kalula, Scott, Sherrington 2015

Diferenças étnicas, ambientais, culturais













www.alamy.com - AF4X9X



Durante todo o ciclo de vida





ETHNOGERIATRICS AND SPECIAL POPULATIONS

Falls Incidence, Risk Factors, and Consequences in Chinese Older People: A Systematic Review

Marcella Man-San Kwan, MPH,† Jacqueline C.T. Close, MD,*† Alfred Kwok Wai Wong, MBBS,*† and Stephen R. Lord, DSc*†*

JAGS 59:536–543, 2011

10 > causas de anos vividos com incapacidade

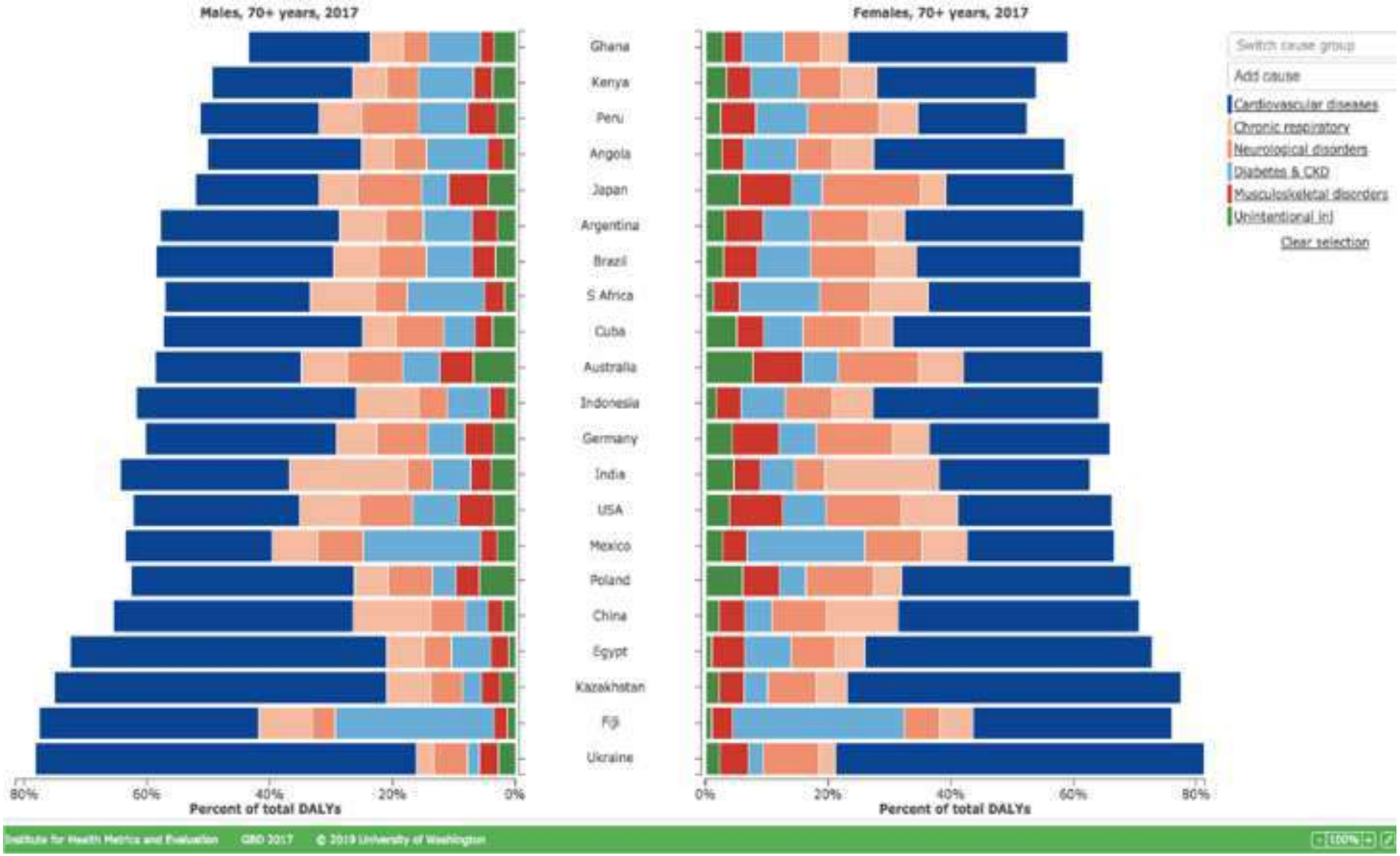
(YLDs – Years lived with disability)

Leading causes 2006	Mean % change in number of YLDs (1990–2006)	Mean % change in all-age YLD rate (1990–2006)	Mean % change in age-standardised YLD rate (1990–2006)
1 Low back pain	24·8	0·0	−10·3
2 Migraine	32·3	5·9	−0·4
3 Iron-deficiency anemia	20·0	−3·9	1·8
4 Major depression	30·9	4·8	−2·2
5 Age-related hearing loss	40·0	12·1	−0·2
6 Other musculoskeletal disorders	42·6	14·2	4·6
7 Neck pain	41·2	13·1	−0·9
8 Anxiety disorders	30·6	4·6	−0·1
9 Diabetes	72·9	38·4	20·2
10 Acne vulgaris	24·7	−0·2	2·7
11 Falls	25·1	0·2	−9·2
12 Refraction and accommodation	28·1	2·6	−4·6
13 COPD	38·5	10·9	−2·9
14 Osteoarthritis	55·8	24·8	6·2
15 Schizophrenia	36·0	8·9	−0·4
16 Asthma	16·1	−7·1	−7·0
17 Dermatitis	19·2	−4·6	−0·3
18 Opioid use disorders	24·6	−0·2	−4·6
19 Alcohol use disorders	31·4	5·2	−1·2
20 Other mental and substance	36·1	9·0	0·0
21 Ischaemic stroke	44·1	15·4	−1·8
22 Dysthymia	37·9	10·4	0·4

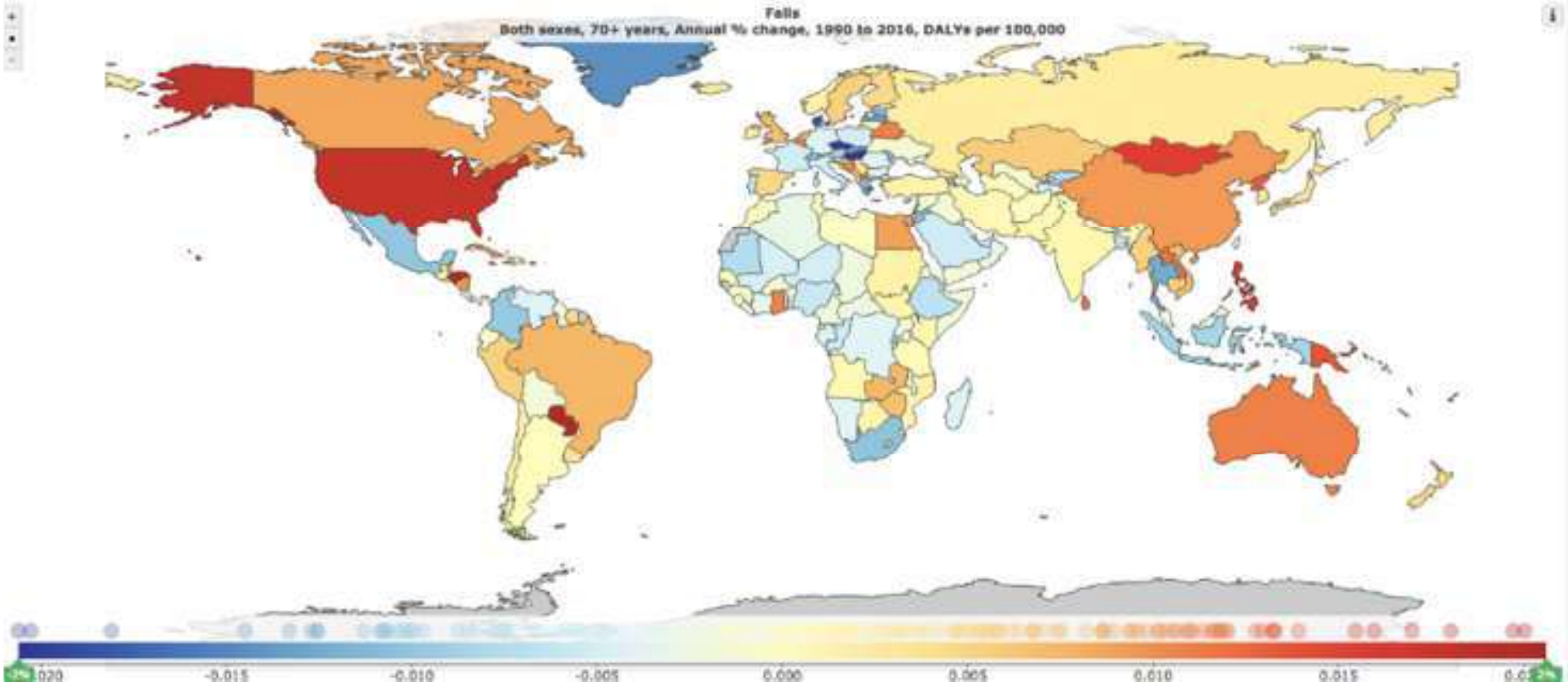
Leading causes 2016	Mean % change in number of YLDs (2006–16)	Mean % change in all-age YLD rate (2006–16)	Mean % change in age-standardised YLD rate (2006–16)
1 Low back pain	18·0	5·0	−2·0
2 Migraine	14·3	1·6	0·1
3 Age-related hearing loss	22·3	8·8	−1·7
4 Iron-deficiency anaemia	7·5	−4·4	−1·8
5 Major depression	11·2	−1·1	−4·9
6 Neck pain	21·9	8·4	0·1
7 Other musculoskeletal disorders	14·4	1·7	−3·5
8 Diabetes	23·6	10·0	−1·2
9 Anxiety disorders	13·1	0·6	−0·7
10 Falls	26·7	12·7	3·4
11 COPD	28·8	14·5	1·4
12 Osteoarthritis	31·5	16·9	2·4
13 Acne vulgaris	5·1	−6·5	2·1
14 Refraction and accommodation	14·9	2·2	−4·9
15 Schizophrenia	16·7	3·8	−0·9
16 Asthma	17·2	4·2	3·6
17 Ischaemic stroke	35·2	20·3	3·7
18 Dermatitis	11·6	−0·7	1·1
19 Opioid use disorders	18·0	4·9	2·7
20 Other mental and substance	17·8	4·8	0·1
21 Dysthymia	20·5	7·2	1·0
22 Alcohol use disorders	9·7	−2·4	−4·8

Lancet 2017; 390: 1211–59

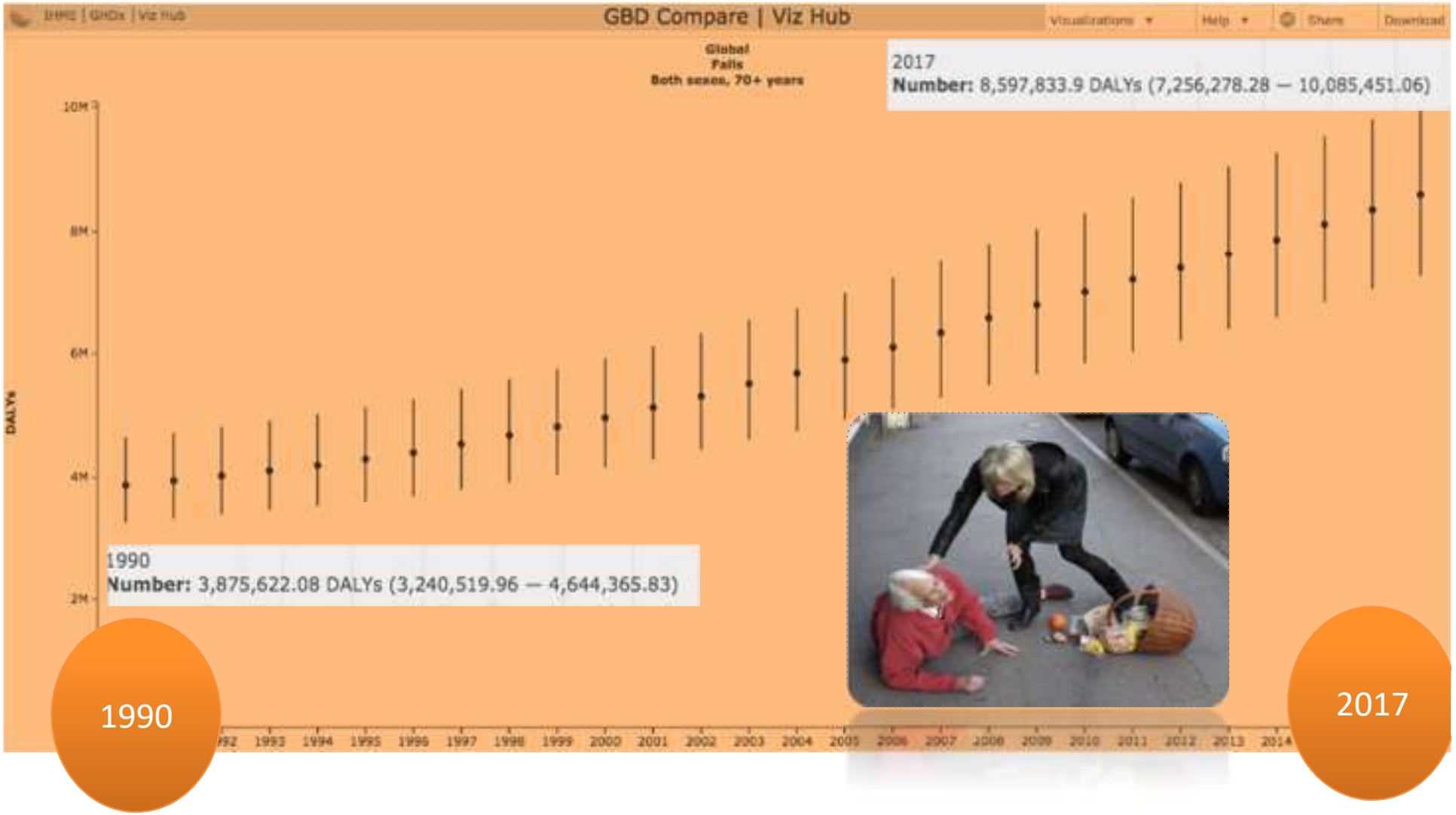
% DALYs e Quedas (70+)



Quedas 70+
DALYs por 100.00 habitantes
% de mudança

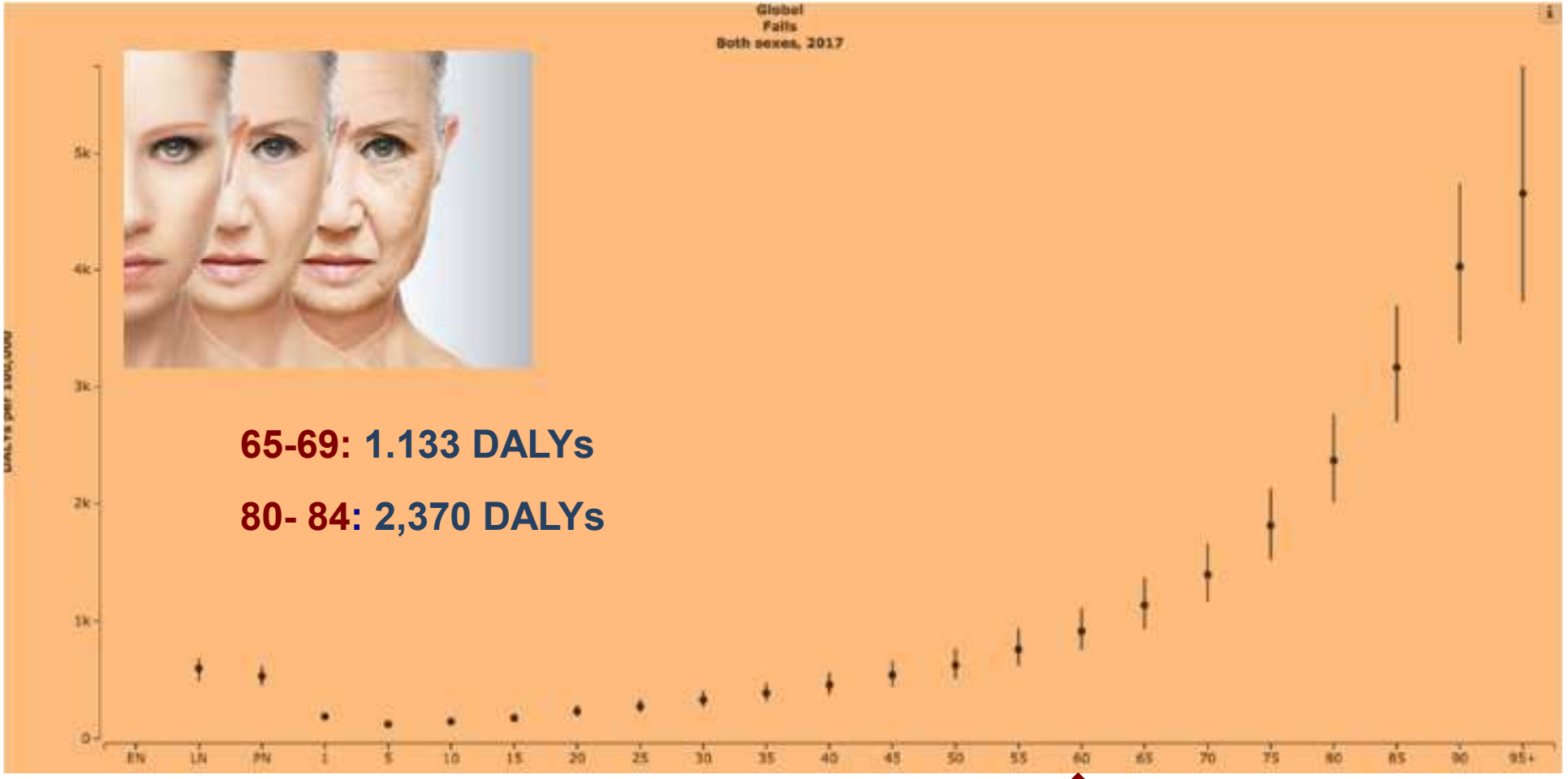


Crescimento DALYs nº. – Quedas em idosos 70+



http://www.healthdata.org/data-visualization/gbd-compare **Retrieved 25/10/2019**

DALYs – Quedas e Idade



65-69: 1.133 DALYs

80- 84: 2,370 DALYs

60+

http://www.healthdata.org/data-visualization/gbd-compare
Retrieved 25/10/2019

Centers of Disease and Prevention – EUA
Idosos por ano



2.8 milhões - serviço de emergência



800 mil hospitalizados

- **25% são hospitalizados e ↑ 10 dias de internação**

(Stinchcombe et al 2014)



7 milhões - lesões com tratamento médico

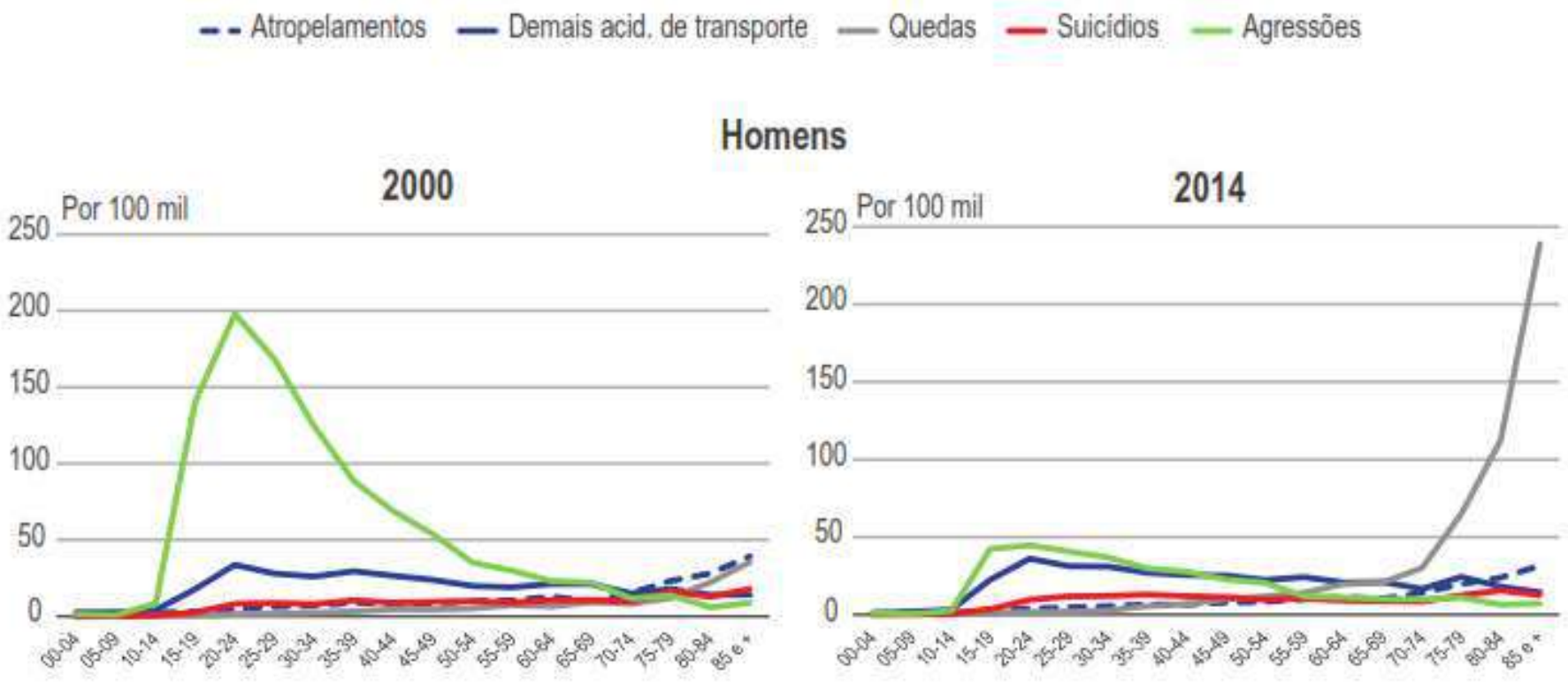
Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 65 / No. 37
September 23, 2016

A cada 20 minutos
1 pessoa idosa morre devido a uma Queda



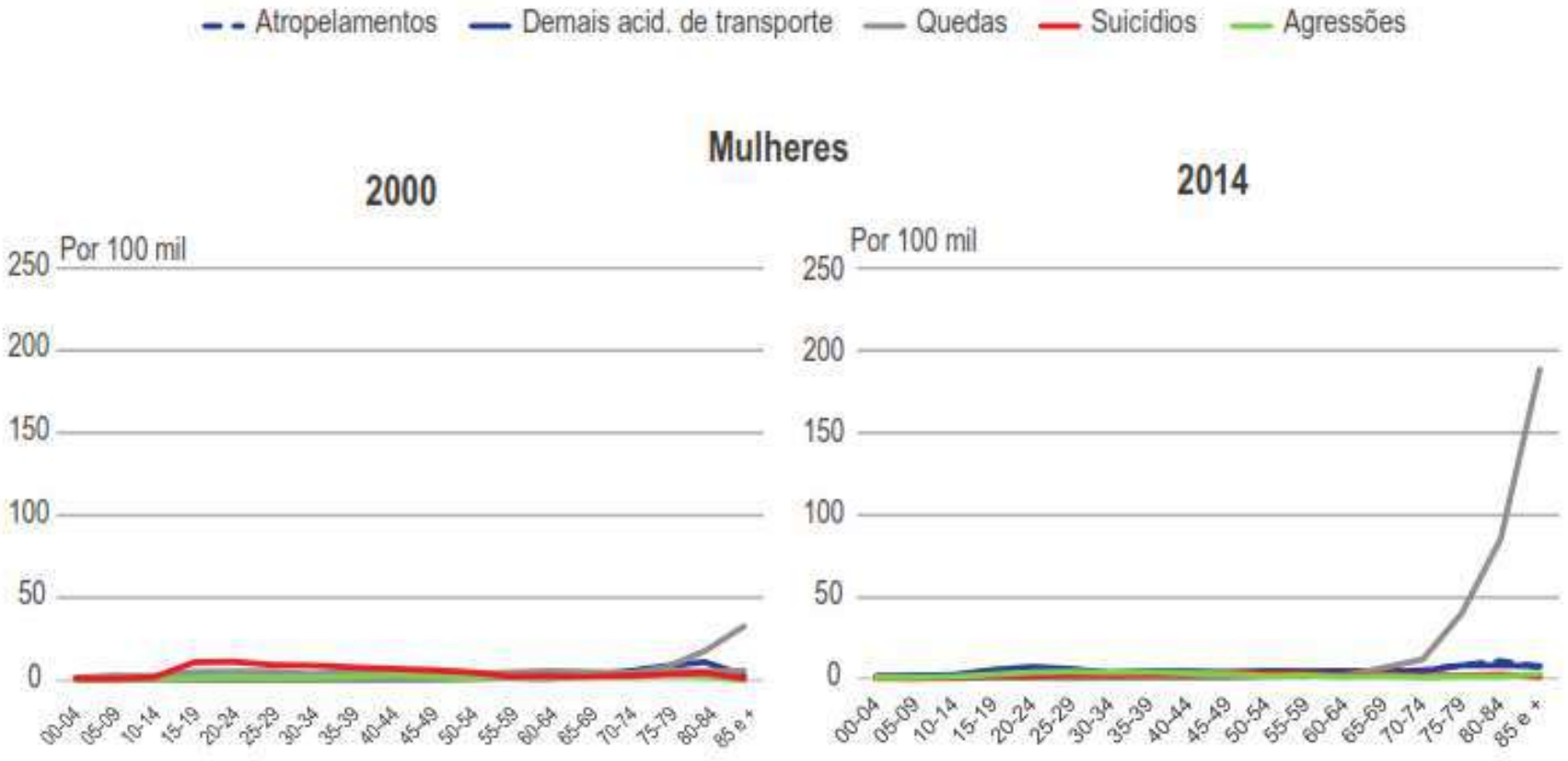
Cidade de São Paulo

Taxas de mortalidade por causas externas, por idade, segundo sexo e tipo de causa
Estado de São Paulo – 2000-2014



Fonte: Fundação Seade, 2016

Taxas de mortalidade por causas externas, por idade, segundo sexo e tipo de causa
Estado de São Paulo – 2000-2014



Fonte: Fundação Seade, 2016

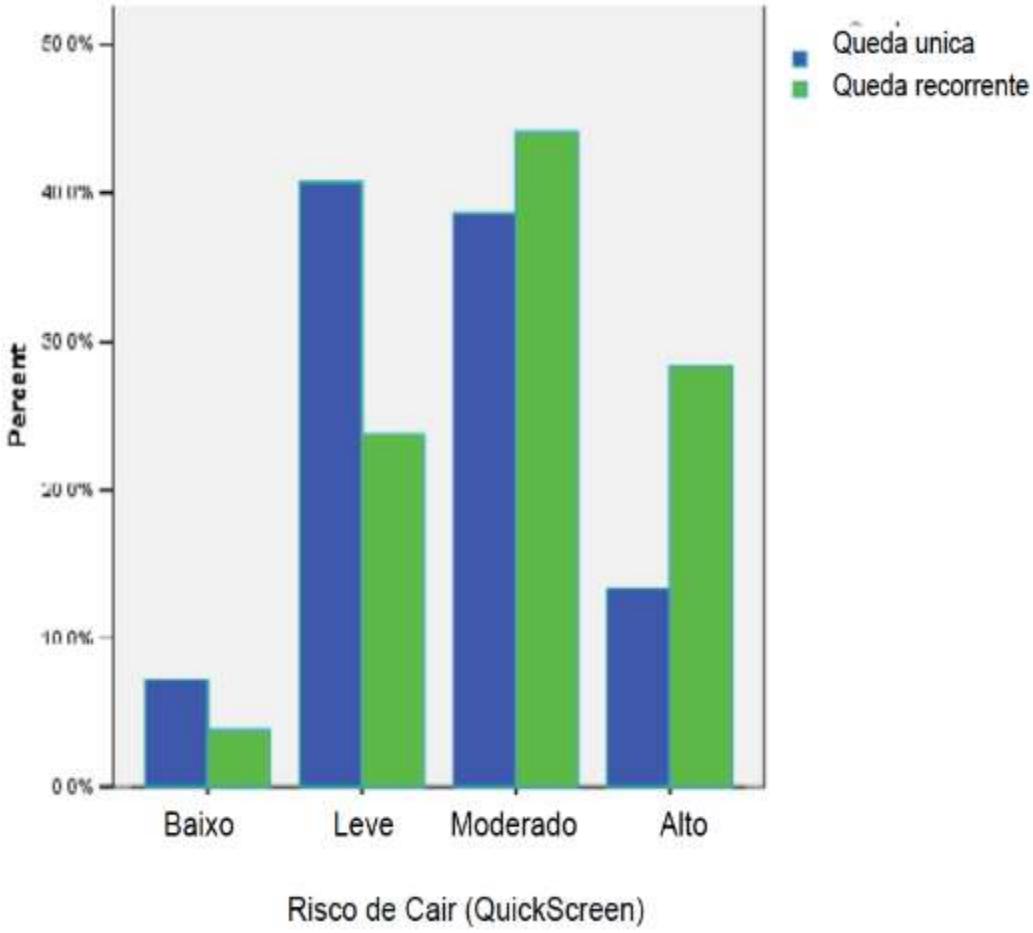
Alguns dados do PrevQuedas Brasil

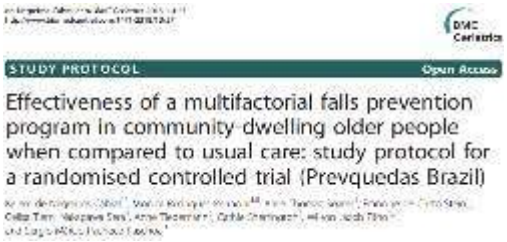
(idosos encaminhados para programa de prevenção)

612 idosos

Caiu
1x - 31,8%
2x - 24,8%
3x ou + - 43,5%

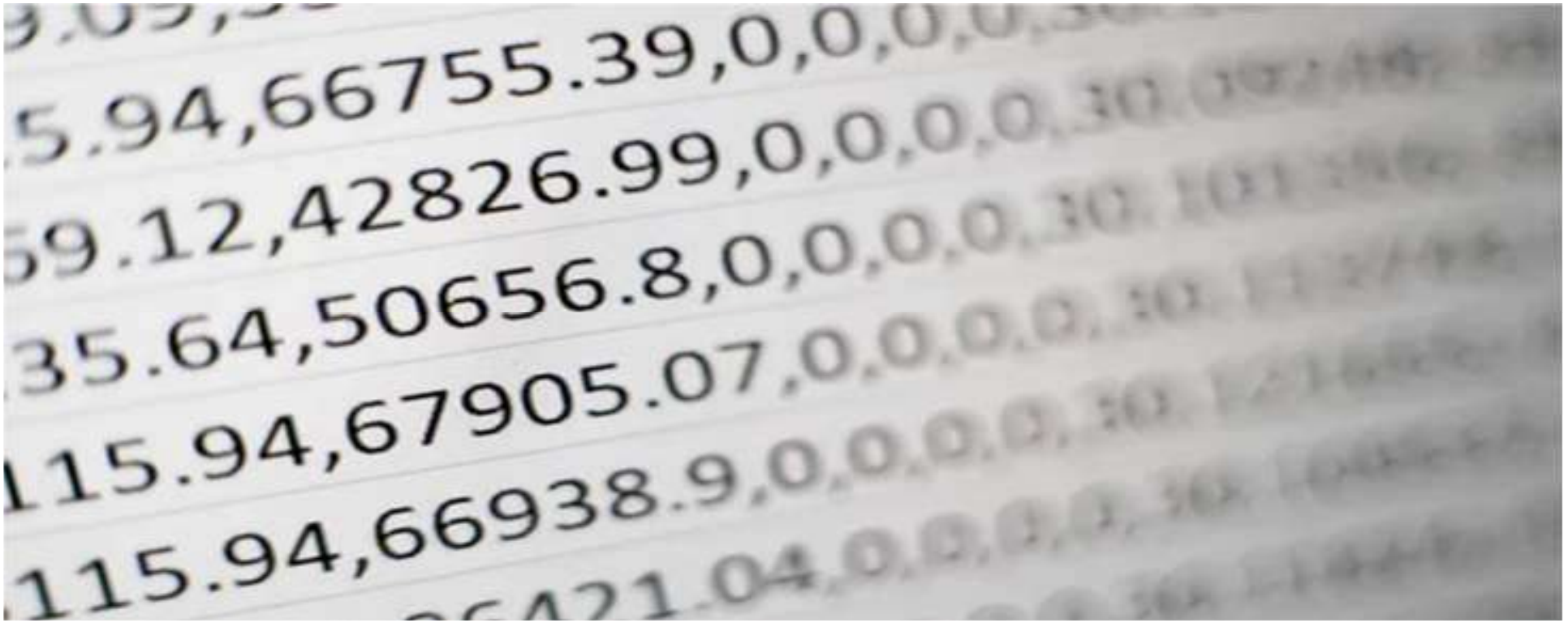
Caidores recorrentes - 68%
Alto risco – 23%




STUDY PROTOCOL Open Access

Effectiveness of a multifactorial falls prevention program in community dwelling older people when compared to usual care: study protocol for a randomised controlled trial (Prevquedas Brazil)

Quedas e lesões decorrentes de quedas vão aumentar?



↑ de quedas independente do aumento do numero de pessoas idosas

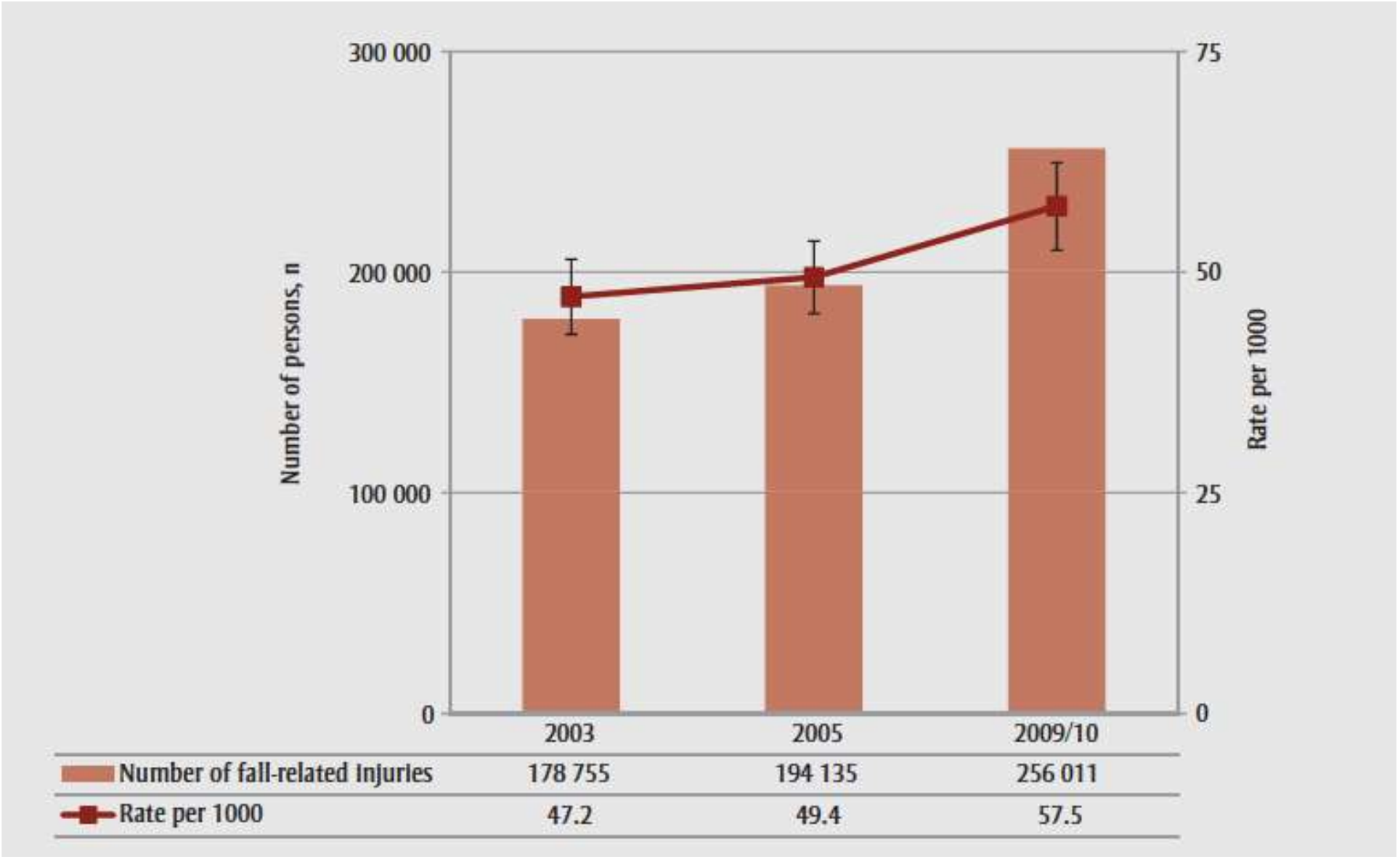
Table. Two-Year Prevalence of at Least 1 Fall, Stratified by Age, 1998 and 2010

	2-Year Prevalence, %[a]		
Age at Interview, y	1998	2010	*P* Value
65-69	22.3	32.0	<.01
70-74	25.3	34.5	<.01
75-79	30.5	38.4	<.01
80-84	37.6	44.3	<.01
85-89	45.8	46.7	.68
≥90	55.8	56.7	.79

[a] Weighted percentages were derived using Health and Retirement Study respondent population weights to adjust for differential probability of selection into the sample and differential nonresponse.

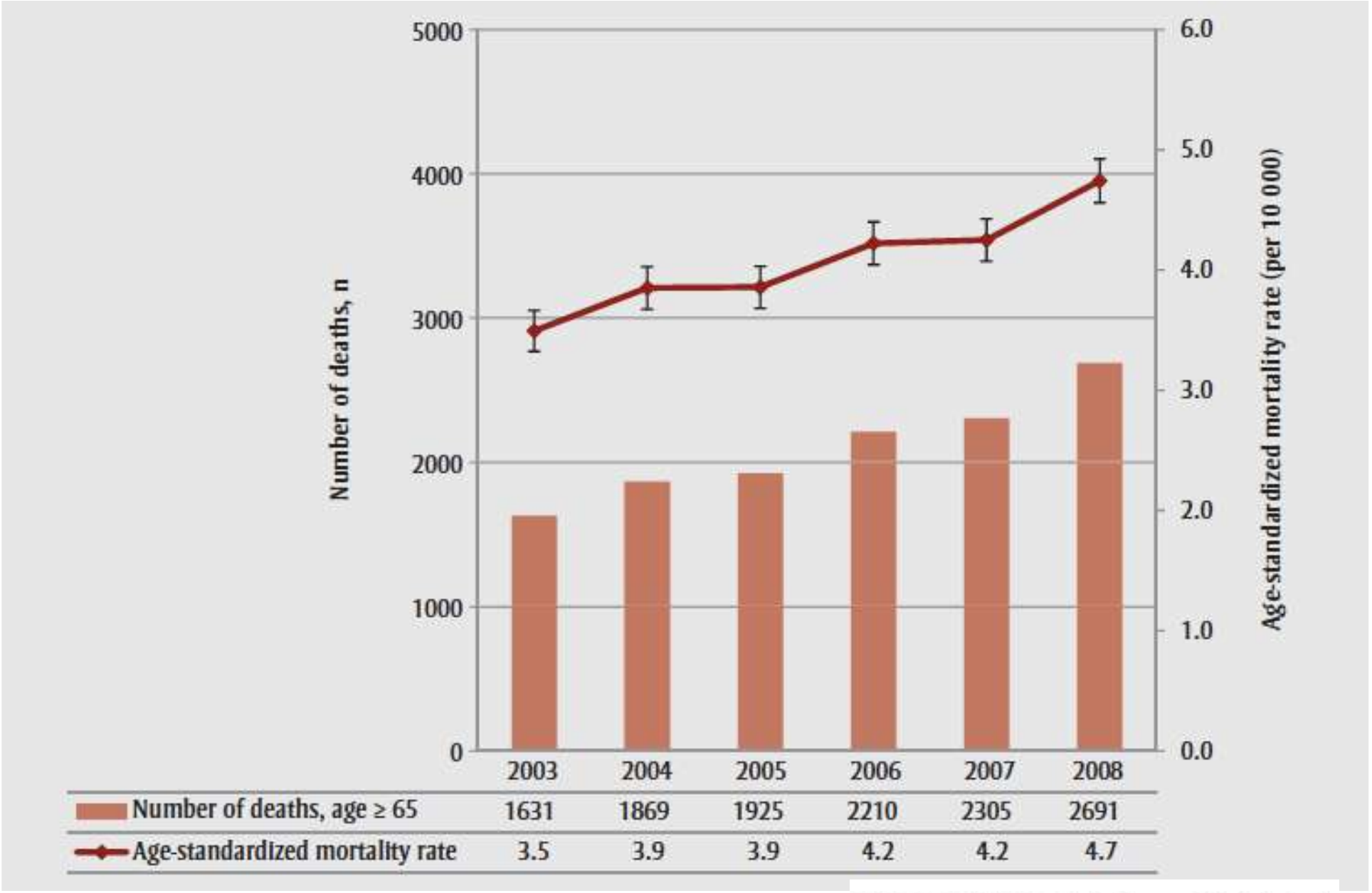
Cigolle et al JAMA 2015

Traumas decorrentes de quedas têm aumentado



	2003	2005	2009/10
Number of fall-related injuries	178 755	194 135	256 011
Rate per 1000	47.2	49.4	57.5

Vol 34, No 2-3, July 2014 – Chronic Diseases and Injuries in Canada


5000
4000
3000
2000
1000
0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Number of deaths, n
Age-standardized mortality rate (per 10 000)
2003 2004 2005 2006 2007 2008
Number of deaths, age ≥ 65 1631 1869 1925 2210 2305 2691
Age-standardized mortality rate 3.5 3.9 3.9 4.2 4.2 4.7

Custos das quedas e consequências

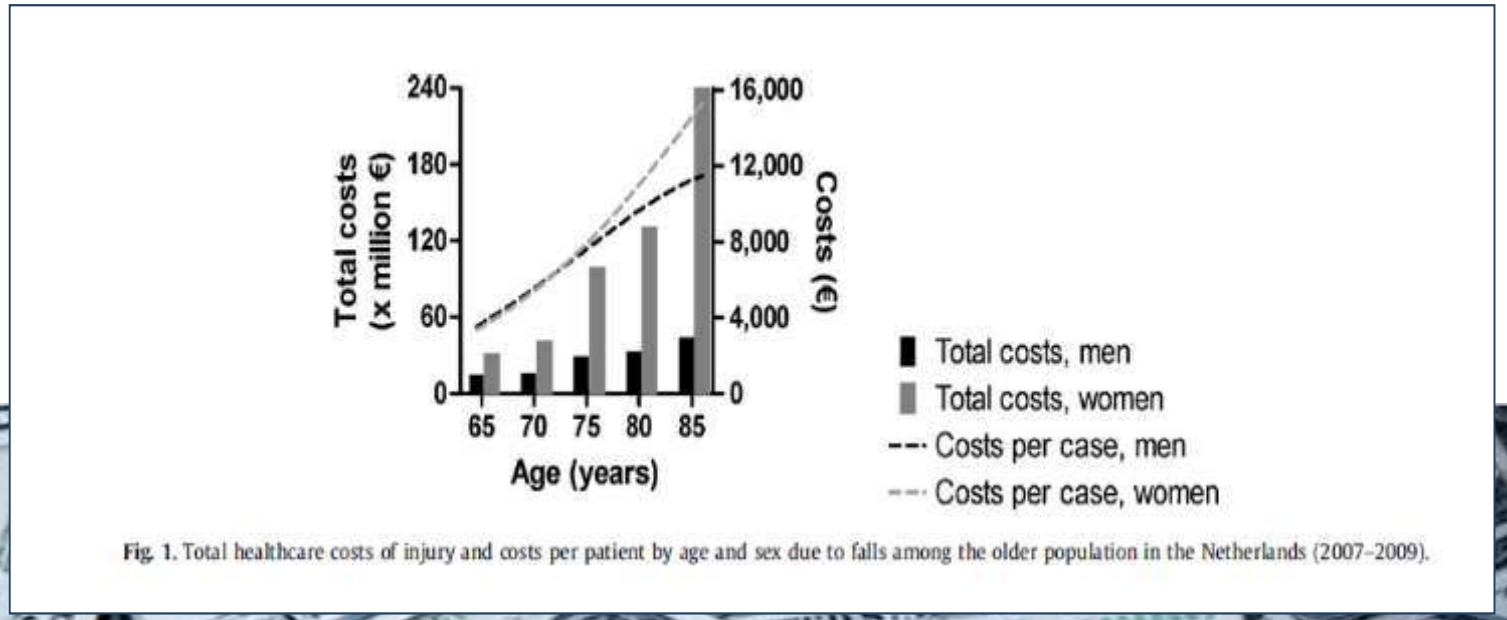


Fig. 1. Total healthcare costs of injury and costs per patient by age and sex due to falls among the older population in the Netherlands (2007–2009).

Injury, Int. J. Care Injured 43 (2012) 1199–1203

EUA
2010 – 30 bilhões
2020 – 54 bilhões
CDC, 2014



Recursos financeiros?

Recursos Humanos?

Efeito dominó







O que é considerado uma Queda em pessoas idosas?

O que é uma QUEDA?

Zecevic et al. The Gerontologist 2006, 46(3): 367-76

Table 1. Fall Definitions From Research and Prevention Literature Used for Content Analysis

Author	Year	Selected Fall Definitions
Lach et al.	1991	"... an unexpected loss of balance resulting in coming to rest on the floor, the ground, or an object below knee level." (p. 198)
Buchner et al.	1993	"Unintentionally coming to rest on ground, floor, or other lower level; excludes coming to rest against furniture, wall, or other structure." (p. 301)
Means et al.	1996	"... any involuntarily change from a position of bipedal support (standing, walking, bending, reaching, etc.) to a position of no longer being support by both feet, accompanied, by (partial or full) contact with the ground or floor." (p. 1032)
Berg, Alessio, Mills, & Tong	1997	"... losing your balance such that your hands, arms, knees, buttocks or body touch or hit the ground or floor." (p. 262)
Canadian Institute for Health Information	2002	"... an unintentional change in position where the elder ends up on the floor or ground."
Carter et al.	2002	"... inadvertently coming to rest on the ground or other lower level with or without loss of consciousness and other than as the consequence of sudden onset of paralysis, epileptic seizure, excess alcohol intake or overwhelming external force." (p. 999)
Cesari et al.	2002	"... a sudden loss of gait causing the hit of any part of the body to the floor ..." (p. M723)
Tideiksaar	2002	"... any event in which a person inadvertently or intentionally comes to rest on the ground or another lower level such as a chair, toilet or bed." (p. 15)

Relato de queda



Caso da Dona Neusa…

- **autoeficácia, medo de perder autonomia**
- **não quer incomodar**
- **“caiu” lentamente, deslizou no sofá!?**

Algumas questões para uso de Tecnologia

- questionados sobre suas dificuldades, monitorados?
- existem quedas inofensivas?
- melhor se mexer mais ou cair menos?


Mecanismo
Tropeçar
Falsear
Escorregar
Perder o equilibrio
Andando desatento
Tombar
Sintomas
Fraqueza
Cansaço
Desequilíbrio
Tontura/vertigem
Freezing
Dor
Desatenção/confusão
Visão borrada
Cultura
Etnia
Gênero
Atividade
Andando
Levantando
Sentando
Virando/inclinado o corpo
Subindo/descendo escada
Pulando obstáculo
Saindo do carro
Circunstâncias
Ambientais:
outdoors x indoors
Riscos ambientais?
Calçados
Uso inadequado de medicamentos
Comportamentais

TABLE 1—Distribution of Falls Among Older Persons by Activity and Location at Time of Fall: MOBILIZE Boston Study, September 2005–December 2009

Activity	Indoor Falls (n = 929), %	Outdoor Falls (n =808), %	Total Falls (n = 1737),%
Transitioning/not moving	25.8	6.1	16.6
Transitioning	15.4	3.5	9.8
Not moving	10.4	2.6	6.8
Using stairs	15.0	14.0	14.5
Ascending stairs	6.7	7.7	7.1
Descending stairs	8.3	6.3	7.4
Walking	35.5	45.4	40.1
Engaging in vigorous activity	4.0	13.9	8.6
Other	19.7	20.7	20.2
Doing household tasks	5.1	1.4	3.3
Gardening/lawn care	0.0	5.8	2.7
Bending	4.0	1.9	3.0
Traversing curb/single step	0.4	6.3	3.2
Other	7.5	4.6	6.2
Did not recall	2.7	0.7	1.8

Kelsey et al. American Journal of Public Health 2012



Risco ↑ de Cair – navegação no ambiente, tarefas com maior demanda sobre o controle postural

Verghese, Holtzer, Lipton, Wang. J Gerontol A Biol Sci Med Sci, 2009
Lord,S. Age and Ageing, 2006
Amboni, Barone, Hausdorff. Mov Disord, 2013



“slow motion”
“slow action”
“slow perception”
“slow reaction”

Wijlhuizen, Chorus, Hopman-Rock. Preventive Medicine 46 (2008) 612–614

Nível de AF e Quedas



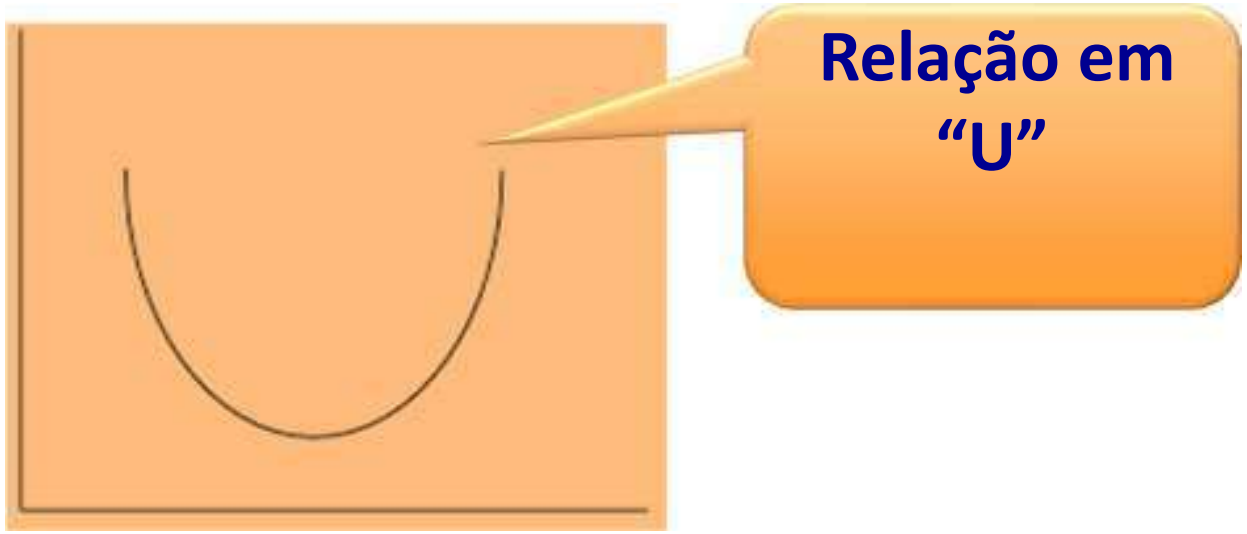
Qto se movimenta





Qto pode se movimentar







Chan, BK *et al*. 2007; Faulkner, KA *et al*. 2009; Ribom, EL *et al*. 2009; Ferreira, MT *et al*. 2010; Mazo, G *et al*. 2007; Mertz, KJ *et al*. 2010; Peeters, GM *et al*. 2010; Delbaere, K *et al.* 2010; Gregg, EW *et al* 2000.

Nível de Atividade Física x Equilíbrio x Quedas

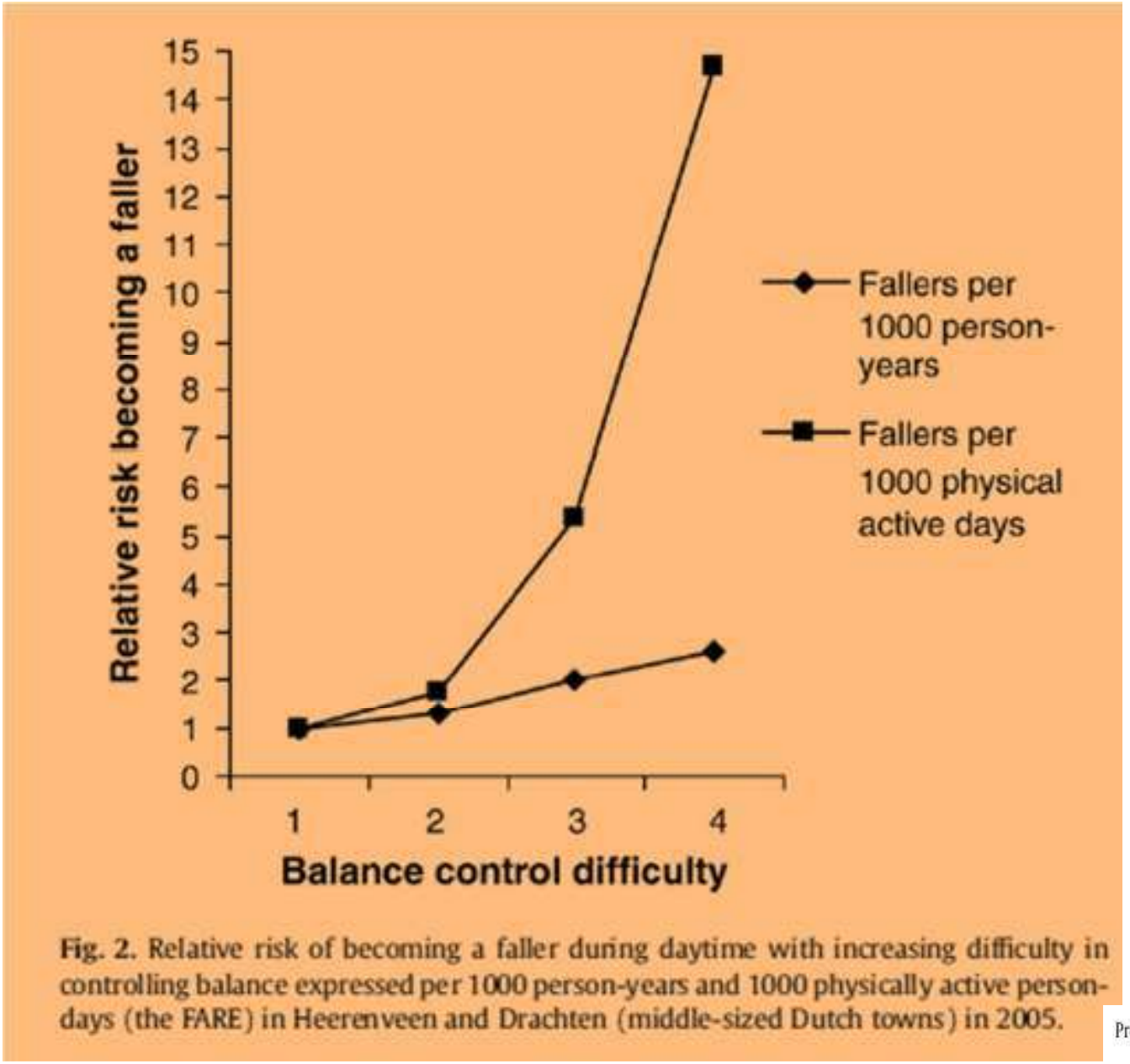
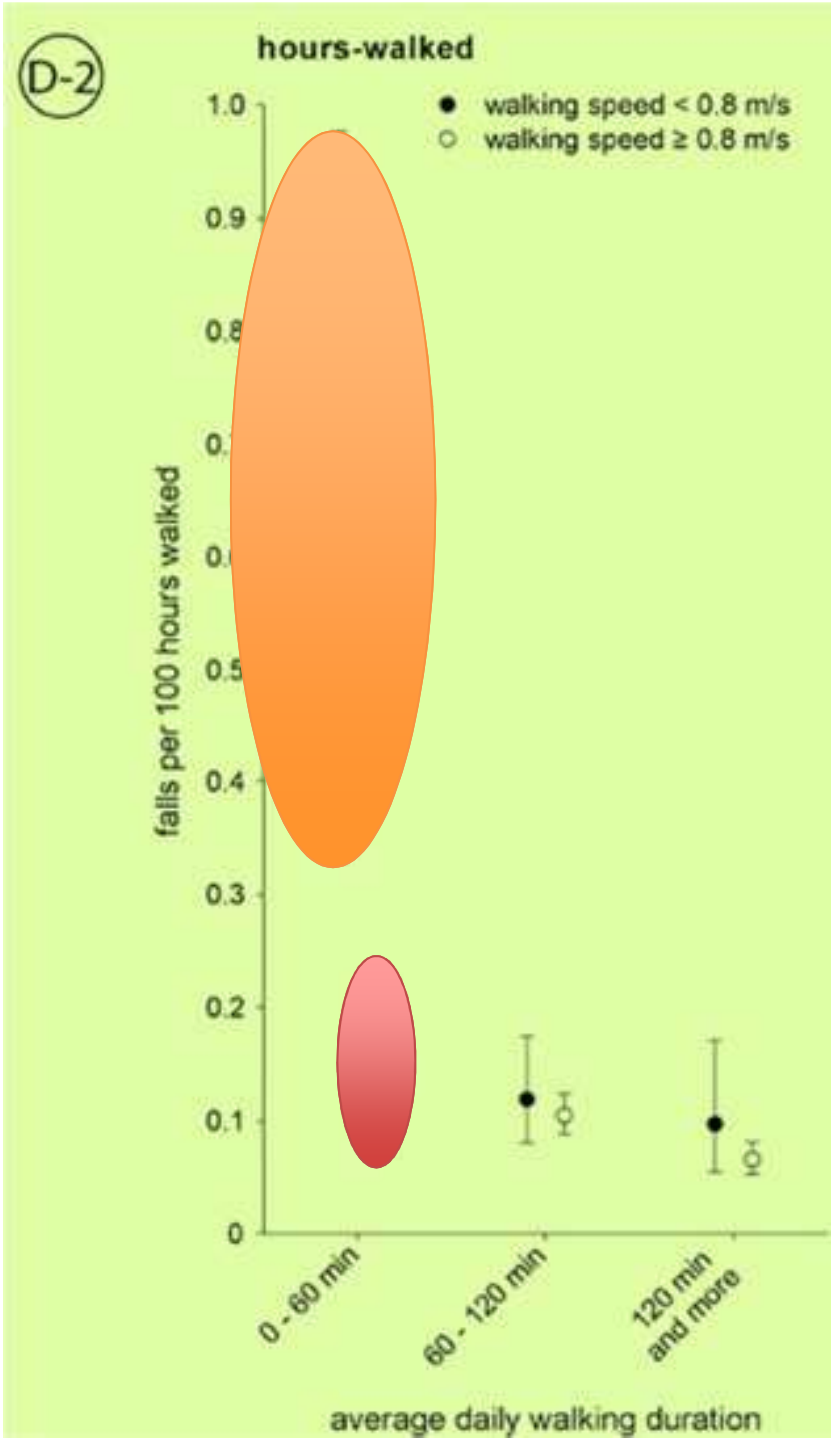


Fig. 2. Relative risk of becoming a faller during daytime with increasing difficulty in controlling balance expressed per 1000 person-years and 1000 physically active person-days (the FARE) in Heerenveen and Drachten (middle-sized Dutch towns) in 2005.

Preventive Medicine 50 (2010) 143–147





Andam lentamente <0,8 m/s

E se movimentam pouco…
🡻 AF andam só até 1 hora dia

Sofrem mais quedas por hora caminhada

Klenk et al 2015

Alto nível de AF ↓ risco de cair (2x ou +) em 12 meses em 39%

Study or Subgroup	Lowest PA Events	Total	Highest PA Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Peeters et al. 2010	163	409	47	151	40.7%	1.28 [0.98, 1.67]
Cauley et al. 2013	95	452	201	1408	59.3%	1.47 [1.18, 1.83]
Total (95% CI)		**861**		**1559**	**100.0%**	**1.39 [1.17, 1.65]**
Total events	258		248			

Heterogeneity: Tau² = 0.00; Chi² = 0.63, df = 1 (P = 0.43); I² = 0%
Test for overall effect: Z = 3.82 (P = 0.0001)

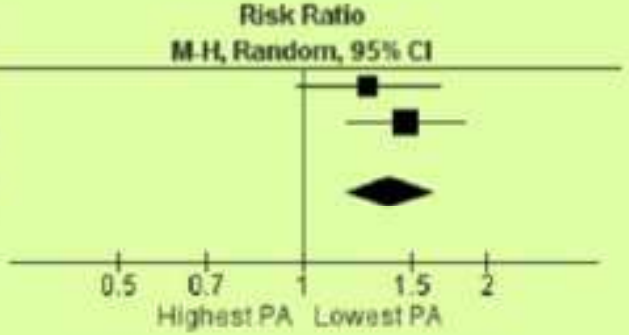


Figure 3 - Random effects analysis of fully adjusted studies for highest versus lowest physical activity level and risk of recurrent falls (two or more falls).



Physical Activity level and risk of falling in community-dwelling older adults: systematic review and meta-analysis

Running head: Physical activity level and falls

Mas não para quedas no geral!



Study or Subgroup	Lowest PA Events	Total	Highest PA Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Klenk et al. 2015	53	159	129	325	13.6%	0.85 [0.65, 1.10]
Cauley et al. 2013	174	531	421	1629	24.3%	1.27 [1.09, 1.47]
Peeters et al. 2010	312	558	129	232	25.6%	1.01 [0.86, 1.16]
Chan et al. 2007	907	1496	1770	2993	36.5%	1.03 [0.98, 1.08]
Total (95% CI)		**2744**		**5183**	**100.0%**	**1.05 [0.93, 1.18]**
Total events	1446		2447			

Heterogeneity: Tau² = 0.01; Chi² = 9.85, df = 3 (P = 0.02); I² = 70%
Test for overall effect: Z = 0.80 (P = 0.43)

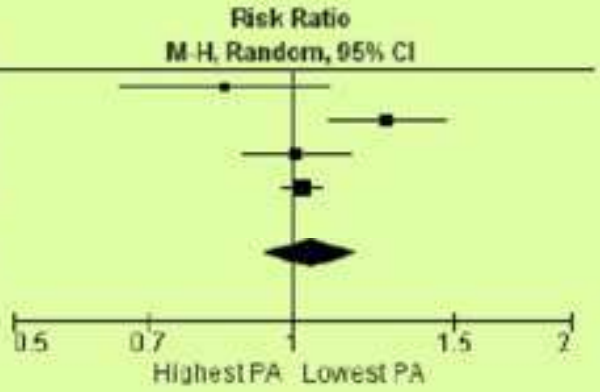


Figure 2 - Random effects analysis of fully adjusted studies for highest versus lowest physical activity level and risk of falls (one or more falls).



Declínio cognitivo

Fraqueza muscular

Osteosarcopenia

Doenças neurológicas e musculoesqueléticas: Parkinson, AVE, neuropatias, demências, osteoartrite

Depressão

Problemas na deglutição e nutricionais: disfagia, obesidade, desnutrição

Distúrbios de Equilíbrio e Marcha

Problemas nos pés

Polifarmácia

Riscos ambientais

Alguns fatores de risco biológicos:

- **Polifarmácia e disturbio de marcha** (independente de comorbidades)
  - **Cada medicamento a mais, ↑ 12% o risco de declinio da marcha e em ↑ 5% a incidência de quedas** (Montero-Odasso et al. JAGS, 2019)

- **Obesidade**
  - **Maior risco (25%) entre os obesos comparado aos outros grupos de IMC** (Mitchell, Lord, Harvey, Close. Archives of Gerontology and Geriatrics, 2015)
  - **Associação entre quedas e obesidade central, dinapenia e combinação entre dinapenia + obesidade** (**Máximo, Santos, Perracinici, Oliveira, Duarte, Alexandre.** Braz J Phys Ther. 2018)

- **Incontinência Urinária**
  - **Maior risco para homens (69%) e mulheres (39%) com perdas mais frequentes; homens (53%) e mulheres (33%) com perdas ocasionais** (Schluter, Arnold, Jamieson. Neurourol Urodyn, 2018)

Diabetes

- **Maior risco (67%) explicado por: > no. medicamentos, dor, déficit cognitivo, pior funcionalidade de MMII** (Pijpers et al. Age and Ageing 2012)

Dor

- **Prevalência annual de dor em caidores recorrentes (13%) vs. sem dor (7%)** $p < 0.001$ (Stubbs et al. Pain Medicine, 2014)

Problemas nos pés

- **Meta-análise: caidores tem mais dor, hallux valgus e deformidade nos dedos do pé** (Menz, Auhl, Spink. Maturitas, 2018)

Comportamento arriscado e riscos ambientais

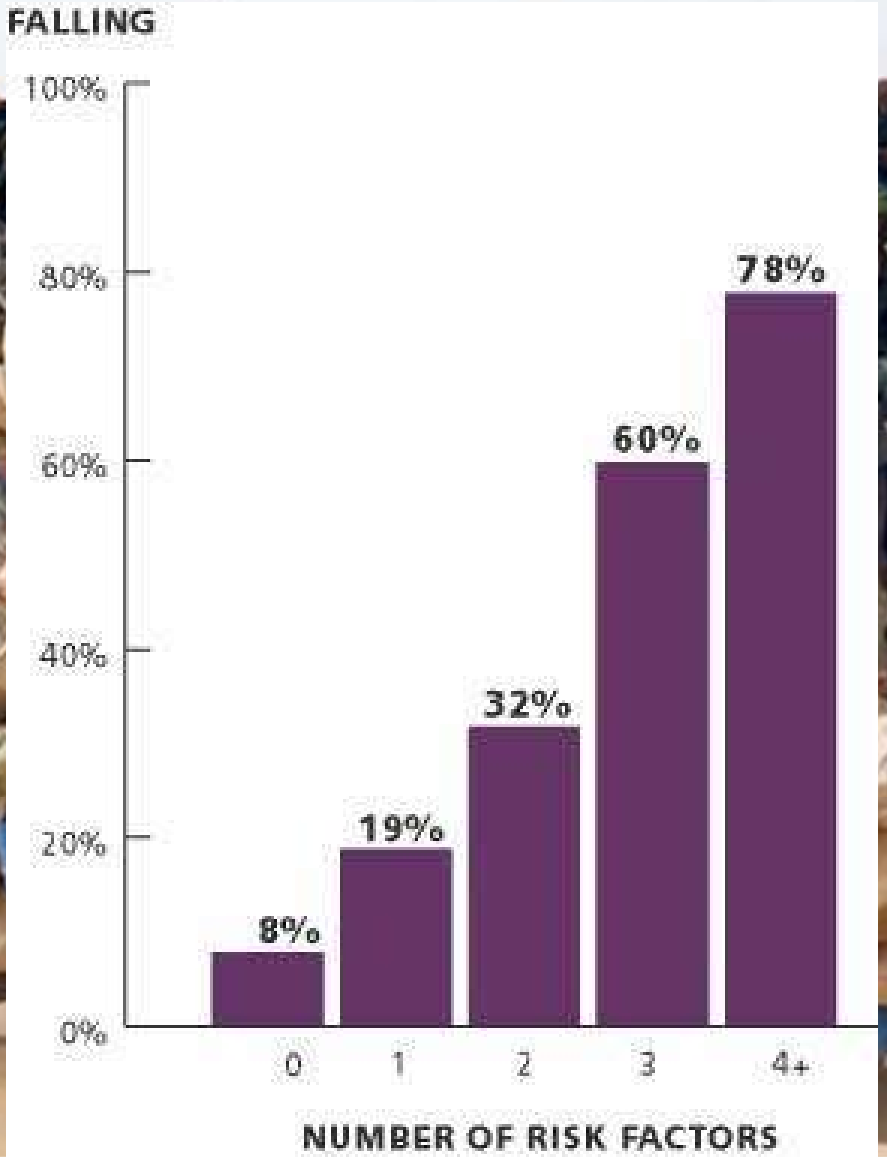




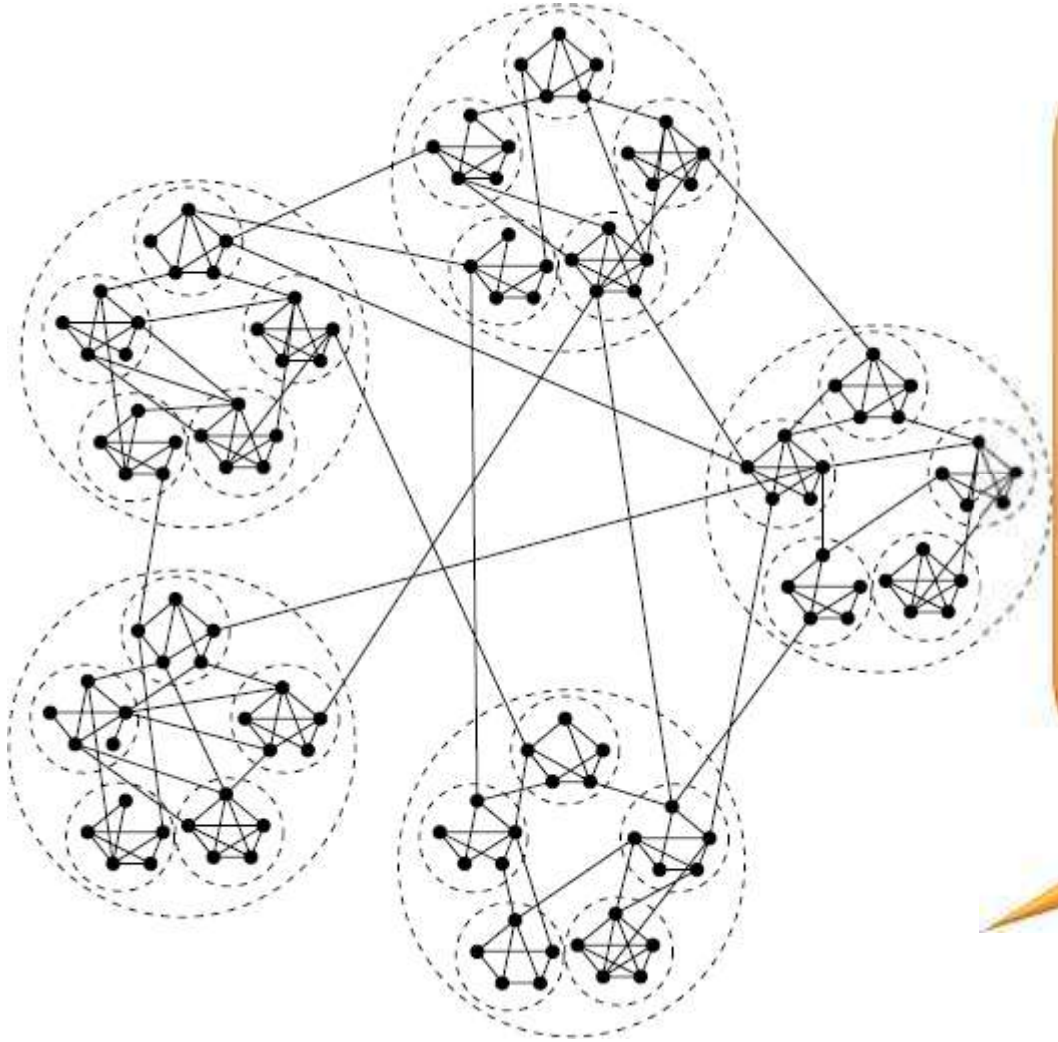



Avaliação e Estratificação

Efeito cumulativo dos fatores de risco



Complexidade da avaliação



Pequenos riscos que atuam conjuntamente que darão efeitos diferentes em diferentes pessoas

Efeito cumulativo aumenta o risco e as consequências

New J. Phys. **9** (2007) 110

Ponderação de cada fator colaborador

Na tecnologia da avaliação Geriátrico-Gerontológica o ponto principal é a Hierarquização de problemas a partir da identificação:

1. De cada problema isoladamente

2. Das relações dos problemas entre si

3. Dos efeitos de um sobre o outro

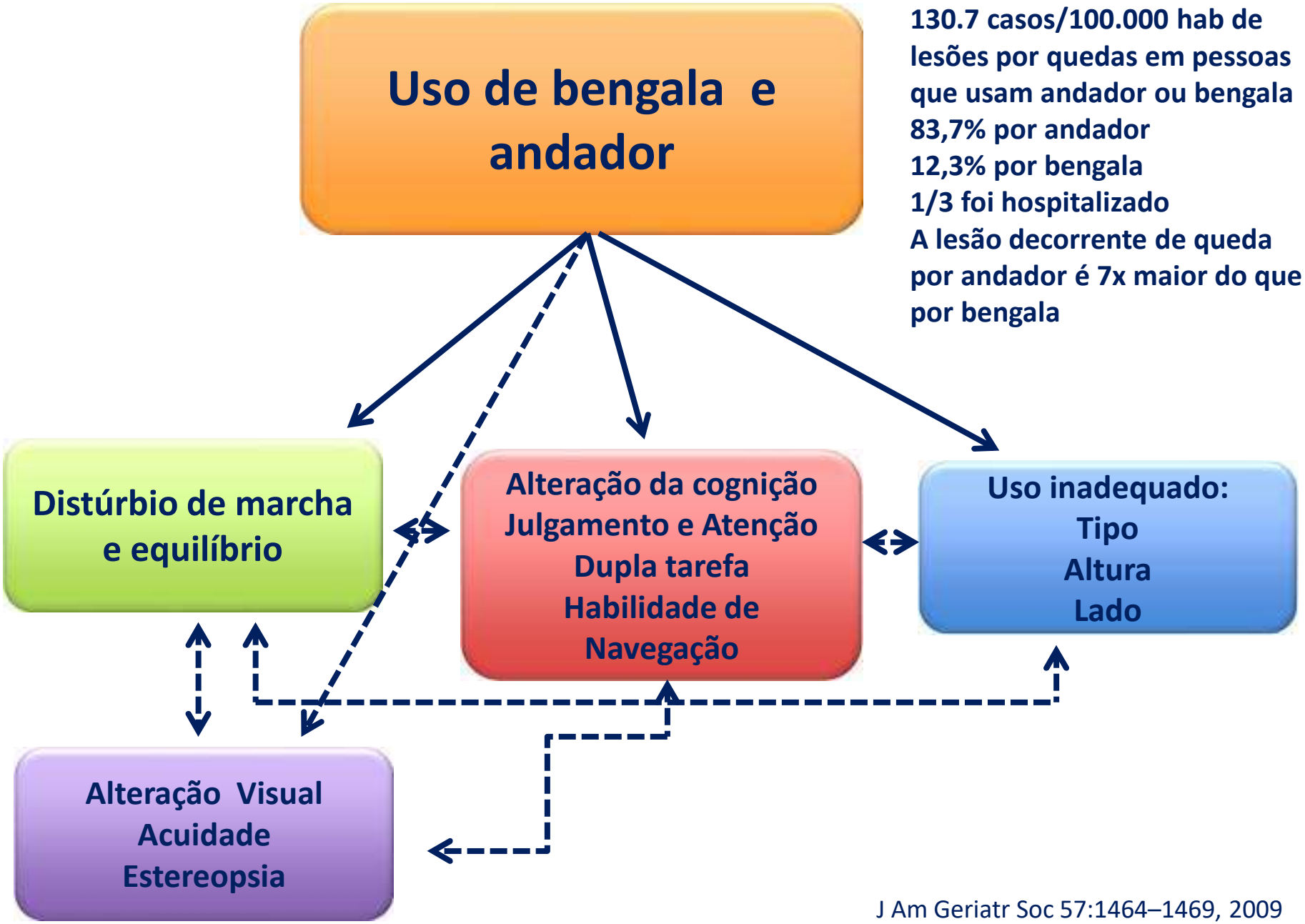
Bengala/andador ou o comprometimento da marcha que é o fator de risco?

ou …

a combinação de características envolvendo os dois fatores?

Há riscos compartilhados?

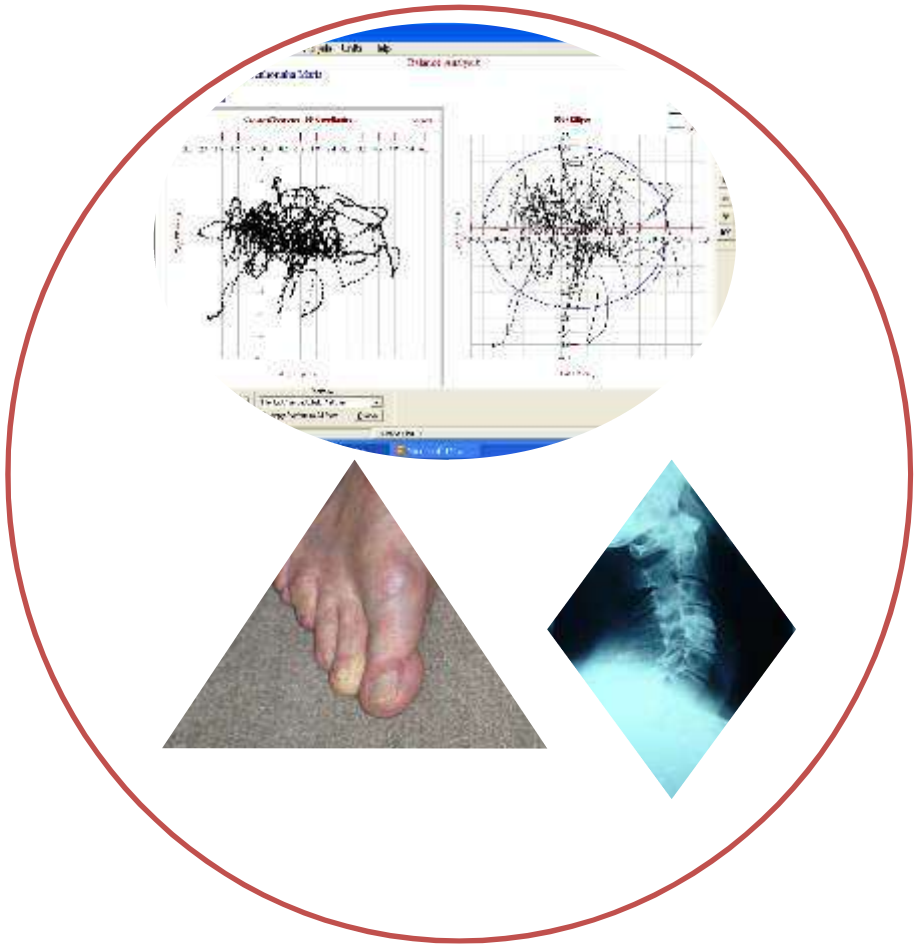
- **visão**
- **cognição?**



J Am Geriatr Soc 57:1464–1469, 2009

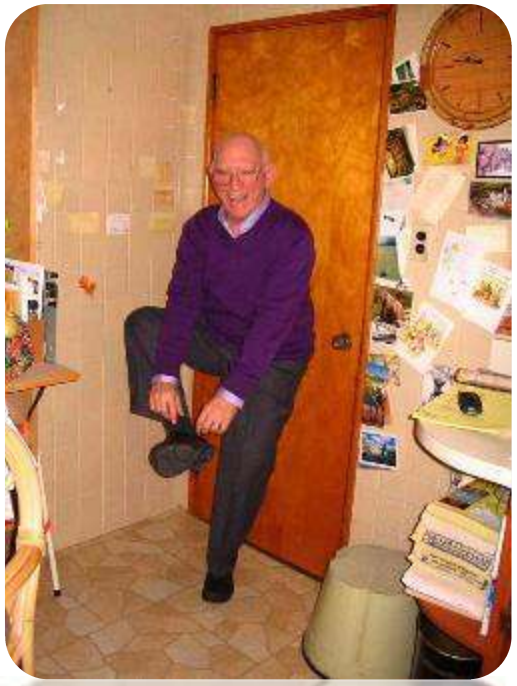


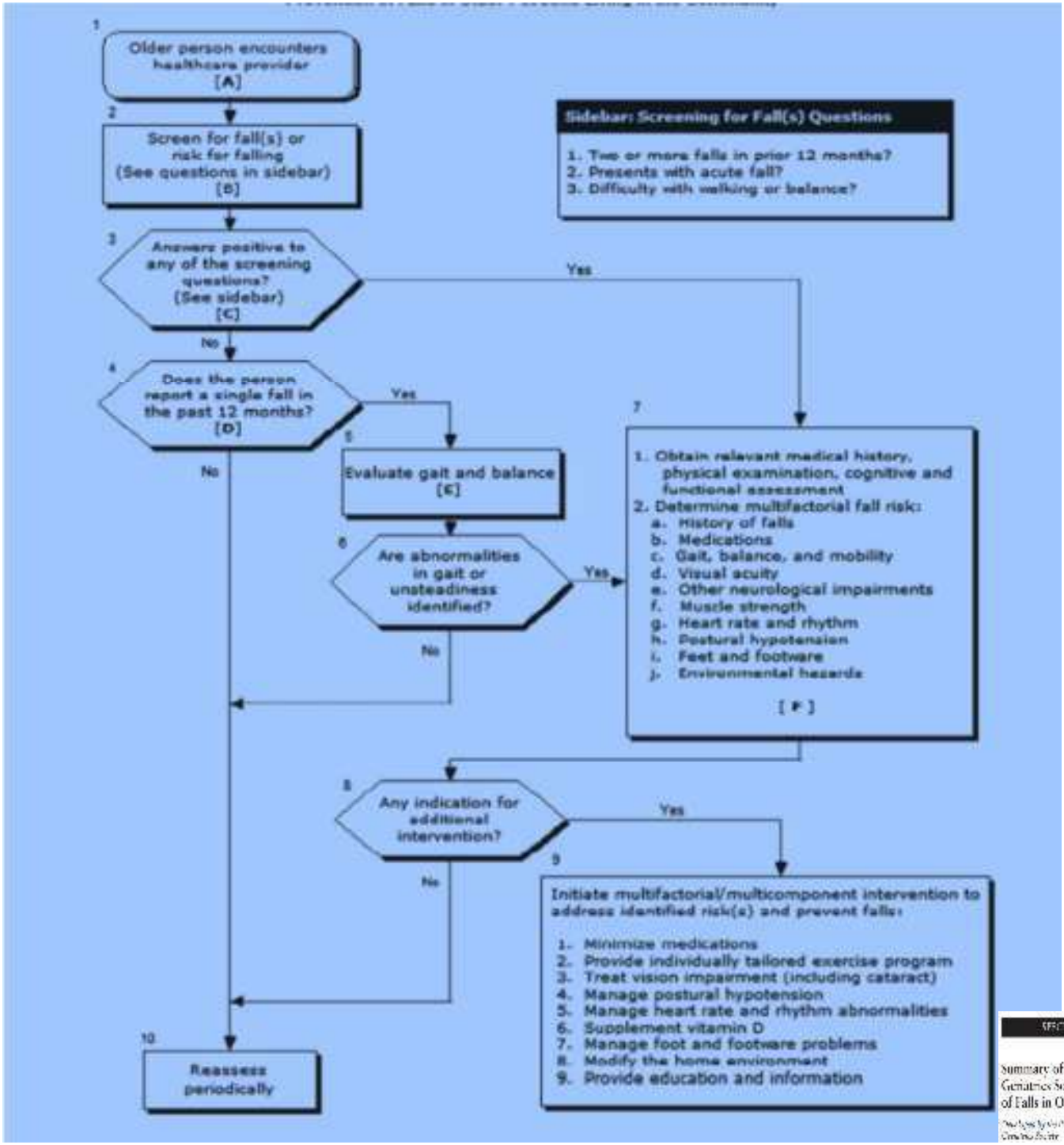
Condições de Saúde e disfunções



?

Atividades e contexto ambiental





SPECIAL ARTICLES

Summary of the Updated American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons

STEADI Stopping Elderly Accidents, Deaths & Injuries

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

Screen for fall risk

Patient scores ≥ 4 on the ***Stay Independent*** brochure

— OR —

Clinician asks key questions:

- Fell in past year?
  - If **YES** ask, How many times? Were you injured?
- Feels unsteady when standing or walking?
- Worries about falling?

Score < 4 — OR — **NO** to all questions

Score ≥ 4 — OR — **YES** to any key question

Evaluate gait, strength, & balance

- Timed Up & Go (recommended)
- 30-Second Chair Stand (optional)
- 4-Stage Balance Test (optional)

No gait, strength or balance problems*

LOW RISK
Individualized fall interventions

- Educate patient
- Vitamin D +/- calcium
- Refer for strength & balance exercise (community exercise or fall prevention program)

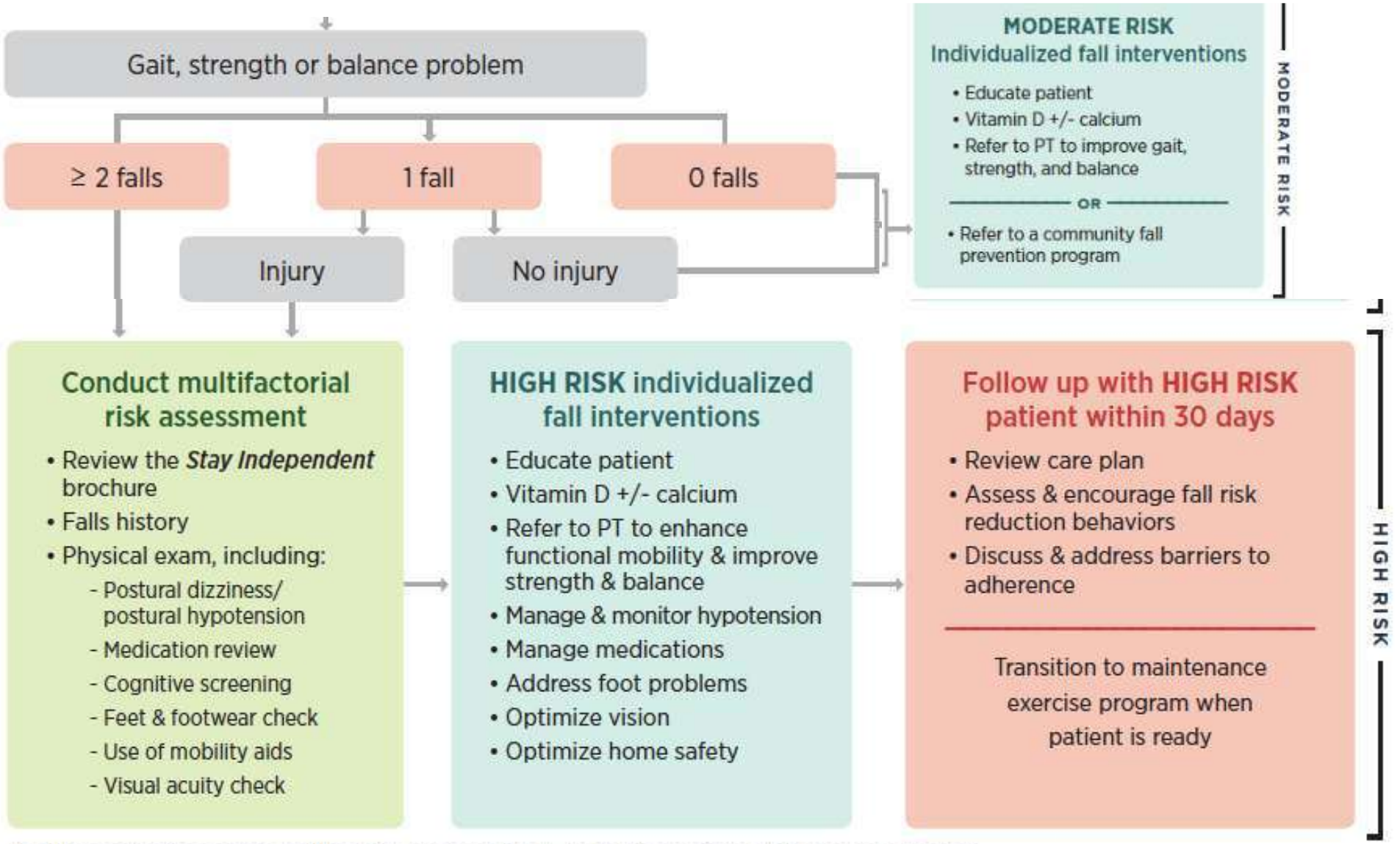
LOW RISK

Check Your Risk for Falling

Circle "Yes" or "No" for each statement below			Why it matters
Yes (2)	No (0)	I have fallen in the past year.	People who have fallen once are likely to fall again.
Yes (2)	No (0)	I use or have been advised to use a cane or walker to get around safely.	People who have been advised to use a cane or walker may already be more likely to fall.
Yes (1)	No (0)	Sometimes I feel unsteady when I am walking.	Unsteadiness or needing support while walking are signs of poor balance.
Yes (1)	No (0)	I steady myself by holding onto furniture when walking at home.	This is also a sign of poor balance.
Yes (1)	No (0)	I am worried about falling.	People who are worried about falling are more likely to fall.
Yes (1)	No (0)	I need to push with my hands to stand up from a chair.	This is a sign of weak leg muscles, a major reason for falling.
Yes (1)	No (0)	I have some trouble stepping up onto a curb.	This is also a sign of weak leg muscles.
Yes (1)	No (0)	I often have to rush to the toilet.	Rushing to the bathroom, especially at night, increases your chance of falling.
Yes (1)	No (0)	I have lost some feeling in my feet.	Numbness in your feet can cause stumbles and lead to falls.
Yes (1)	No (0)	I take medicine that sometimes makes me feel light-headed or more tired than usual.	Side effects from medicines can sometimes increase your chance of falling.
Yes (1)	No (0)	I take medicine to help me sleep or improve my mood.	These medicines can sometimes increase your chance of falling.
Yes (1)	No (0)	I often feel sad or depressed.	Symptoms of depression, such as not feeling well or feeling slowed down, are linked to falls.

Total _____ Add up the number of points for each "yes" answer. If you scored 4 points or more, you may be at risk for falling. Discuss this brochure with your doctor.

This checklist was developed by the Greater Los Angeles VA Geriatric Research Education Clinical Center and affiliates and is a validated fall risk self-assessment tool (Rubenstein et al. J Safety Res; 2011: 42(6)493-499). Adapted with permission of the authors.



*For these patients, consider additional risk assessment (e.g., medication review, cognitive screen, snycope).

HHS Public Access
Author manuscript
J Epidemiol Community Health. Author manuscript; available in PMC 2017 December 14.

Published in final edited form as:
J Epidemiol Community Health. 2017 December ; 71(12): 1191–1197. doi:10.1136/jech-2017-209709

Operationalization and Validation of the Stopping Elderly Accidents, Deaths, and Injuries (STEADI) Fall Risk Algorithm in a Nationally Representative Sample

Matthew C. Lohman, PhD[1,2], Rebecca S. Cross, DO[2,3,4], Peter R. DiMilia, MPH[2,4], Emily J. Nicklett, PhD[5], Martha L. Bruce, PhD[1,2], and John A. Batsis, MD[1,2,3,4]

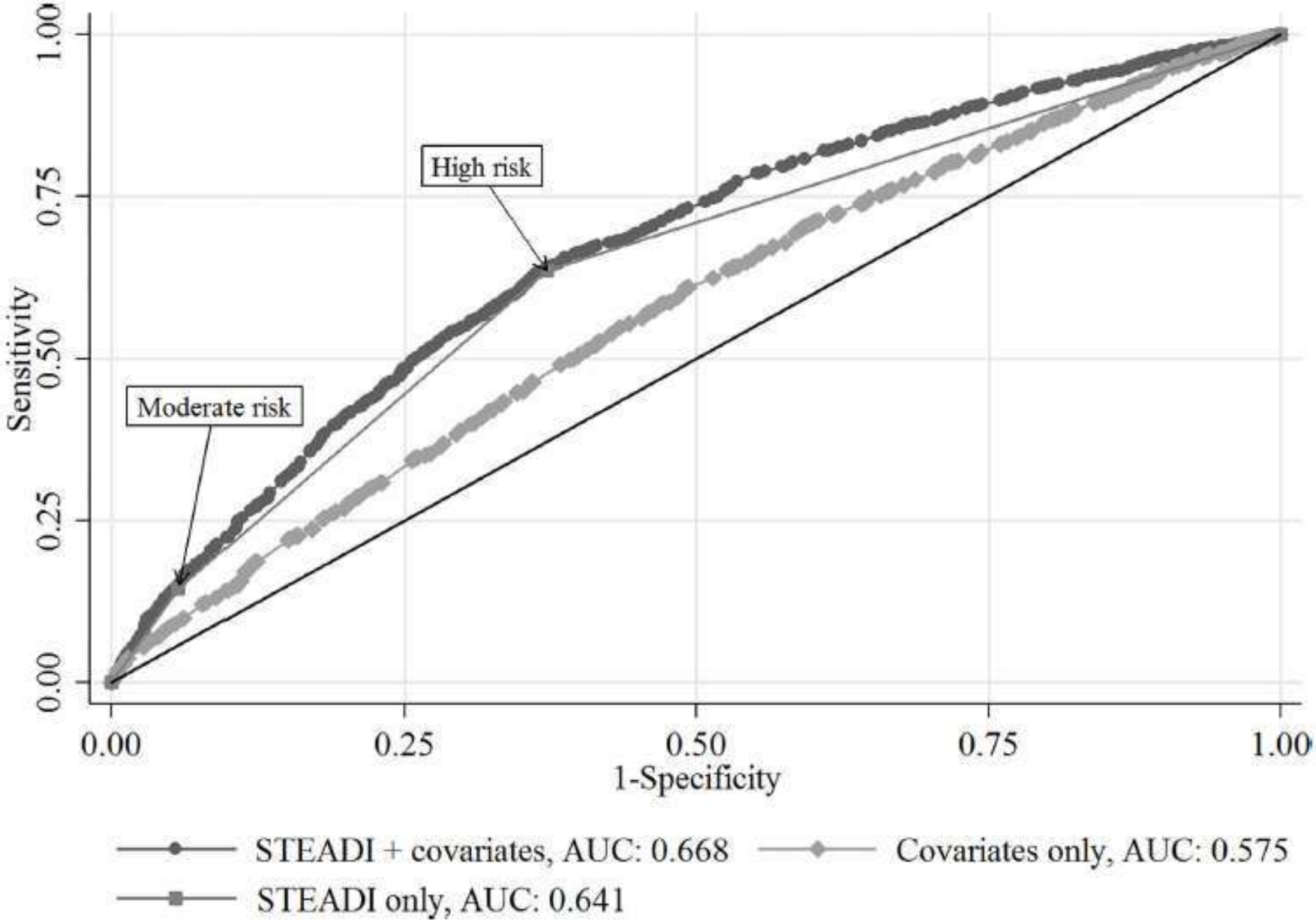


Figure 2.
Receiver operating characteristic (ROC) curves comparing model prediction of any fall over the follow-up period.

126.703 idosos seguidos por 6 meses
Para identificar algorítmo predizer 1ª. queda

30% da amostra foi usada para validação

6 níveis – Machine learning

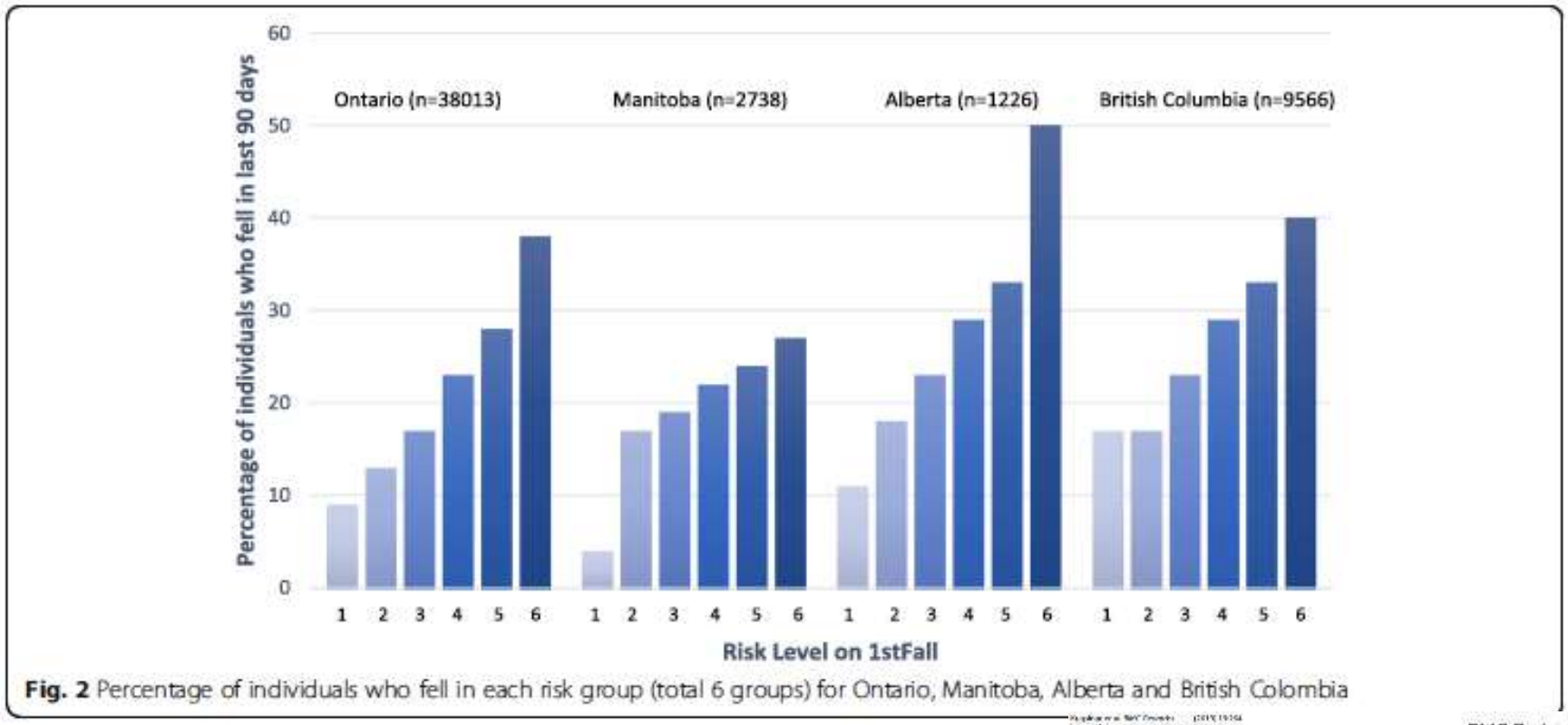
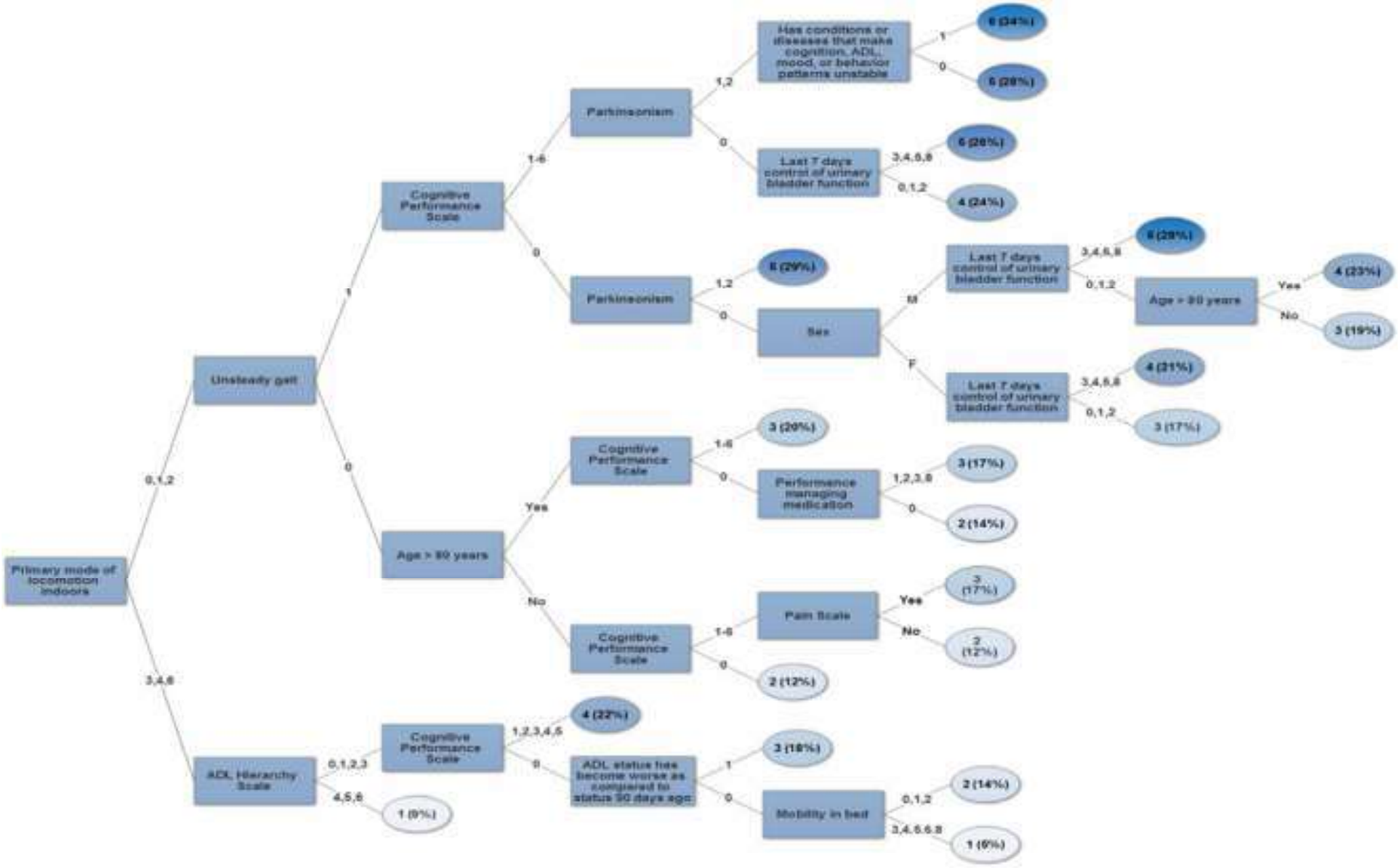


Fig. 2 Percentage of individuals who fell in each risk group (total 6 groups) for Ontario, Manitoba, Alberta and British Colombia

BMC Geriatrics

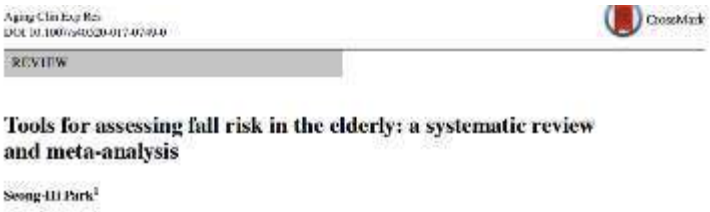
RESEARCH ARTICLE Open Access

Development and validation of an algorithm to assess risk of first-time falling among home care clients


Primary mode of locomotion indoors
0,1,2
3,4,5
Unsteady gait
1
0
Cognitive Performance Scale
1-6
0
Parkinsonism
1,2
0
Has conditions or diseases that make cognition, ADL, mood, or behavior patterns unstable
1
0
6 (34%)
5 (26%)
Last 7 days control of urinary bladder function
3,4,5,6
0,1,2
6 (26%)
4 (24%)
Parkinsonism
1,2
0
6 (29%)
Sex
M
F
Last 7 days control of urinary bladder function
3,4,5,6
0,1,2
6 (29%)
Age > 90 years
Yes
No
4 (23%)
3 (19%)
Last 7 days control of urinary bladder function
3,4,5,6
0,1,2
4 (21%)
3 (17%)
Age > 90 years
Yes
No
Cognitive Performance Scale
1-6
0
3 (20%)
Performance managing medication
1,2,3,6
0
3 (17%)
2 (14%)
Cognitive Performance Scale
1-6
0
Pain Scale
Yes
No
3 (17%)
2 (12%)
2 (12%)
ADL Hierarchy Scale
0,1,2,3
4,5,6
Cognitive Performance Scale
1,2,3,4,5
0
4 (22%)
1 (9%)
ADL status has become worse as compared to status 90 days ago
1
0
3 (18%)
Mobility in bed
0,1,2
3,4,5,6,8
2 (14%)
1 (6%)

Quais os problemas com a avaliação?

- **Vários instrumentos em vários domínios**
  (avaliação longa e demorada)
- **Baixa Capacidade preditiva**
- **Inexistência de estudos de acurácia diagnóstica em diferentes populações**



Aging Clin Exp Res
DOI 10.1007/s40520-017-0717-0

REVIEW

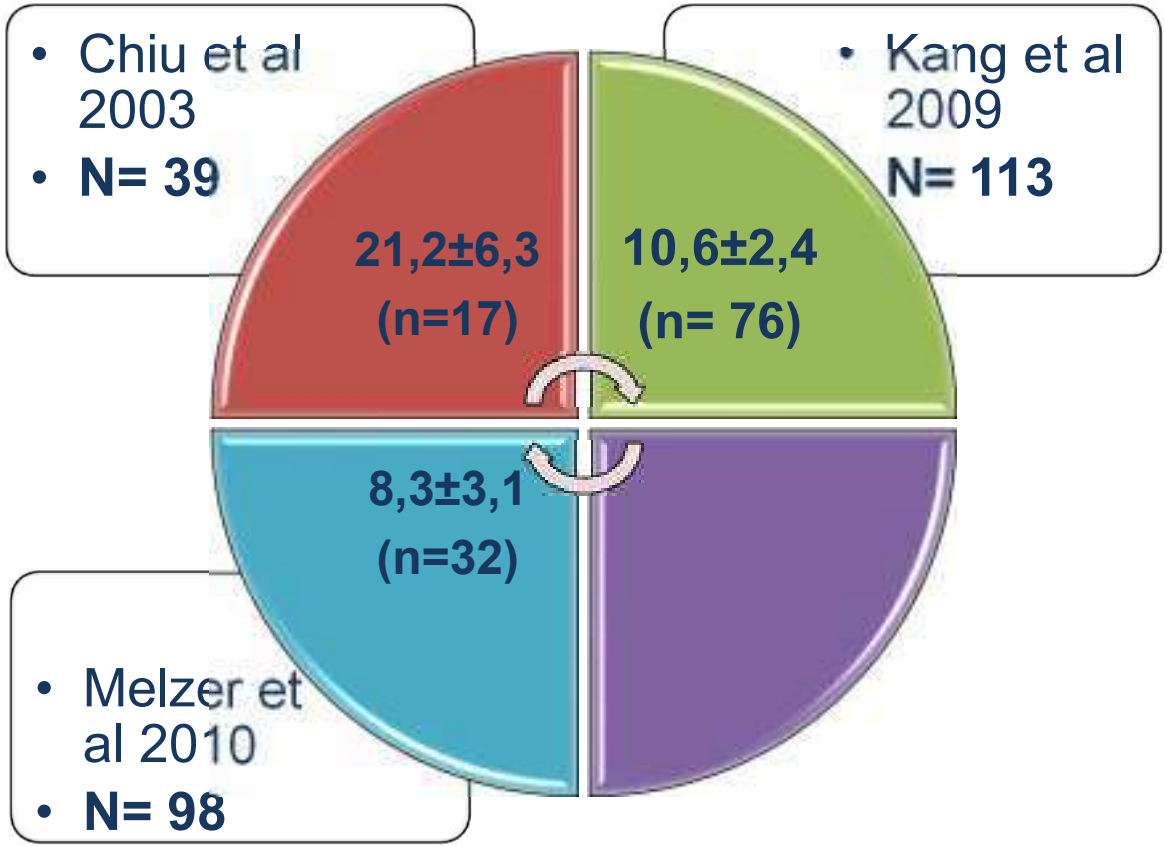
Tools for assessing fall risk in the elderly: a systematic review and meta-analysis

Seong-Il Park[1]

Timed Up and Go Test



Variabilidade do tempo médio do TUGT em estudos longitudinais – caidores únicos



Variabilidade do tempo médio do TUGT em estudos longitudinais – caidores recorrentes

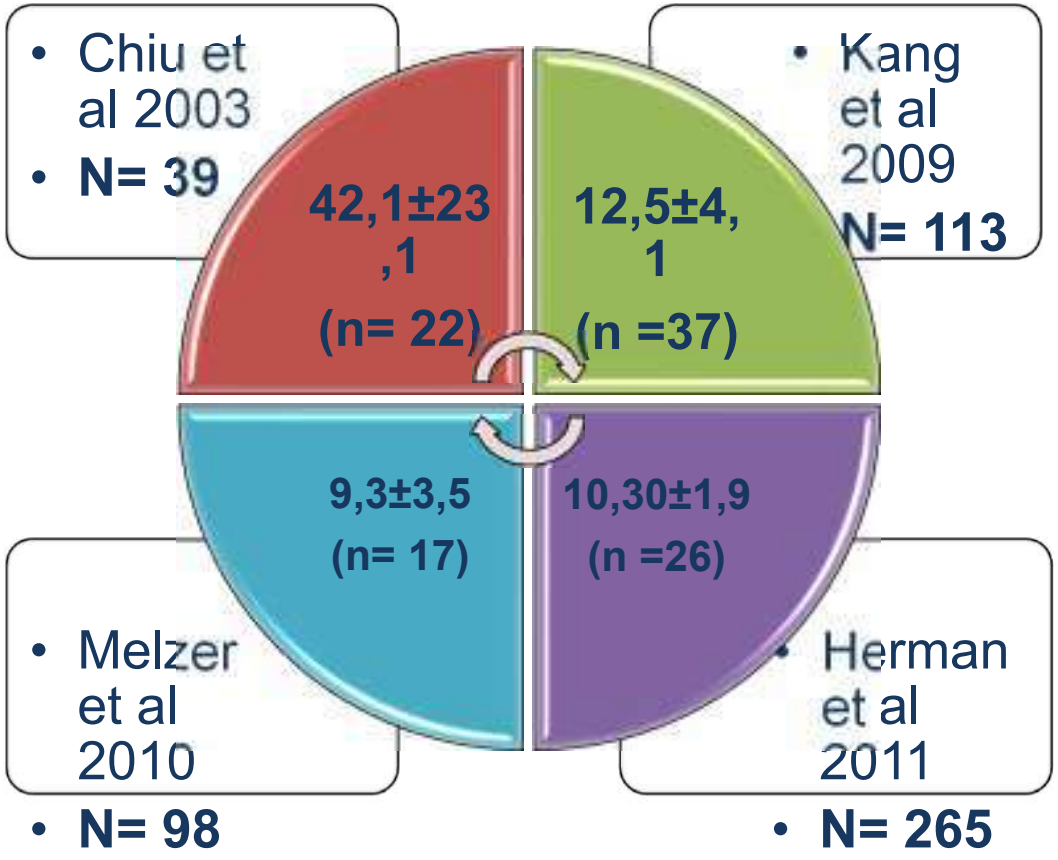
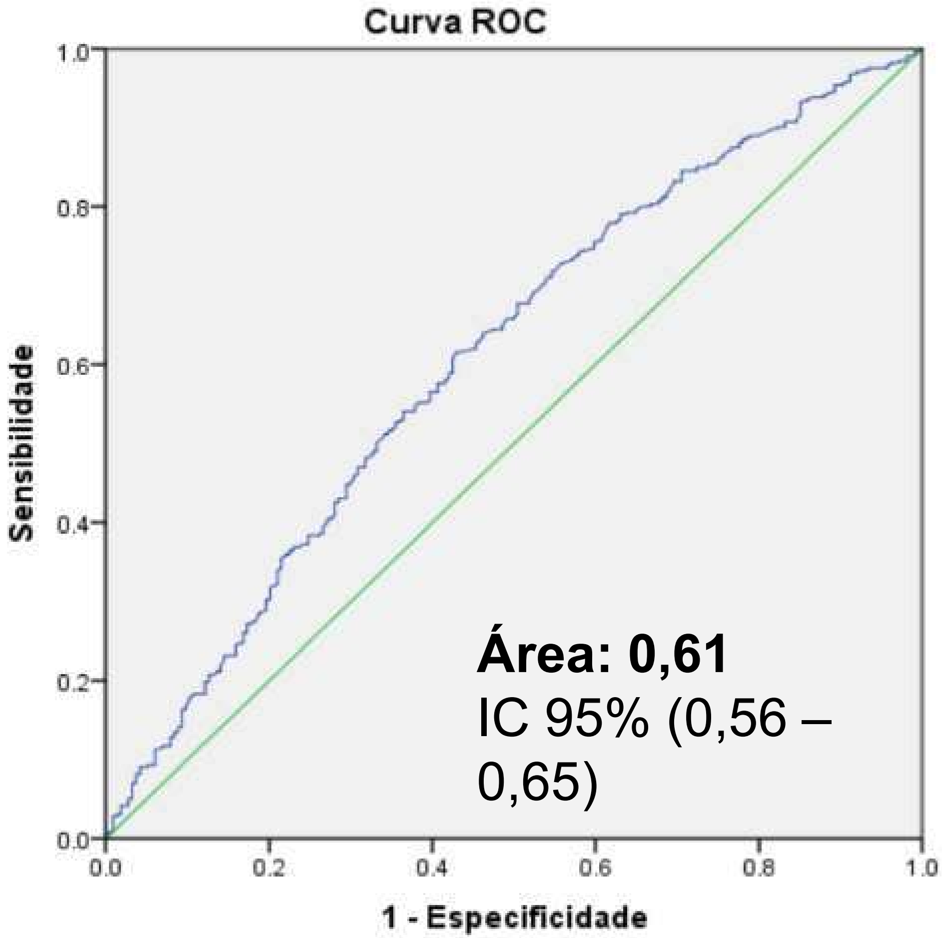


Table 3 - Coordinates of ROC … d Up and Go Test (TUG) to
discriminate recurrent fallers …

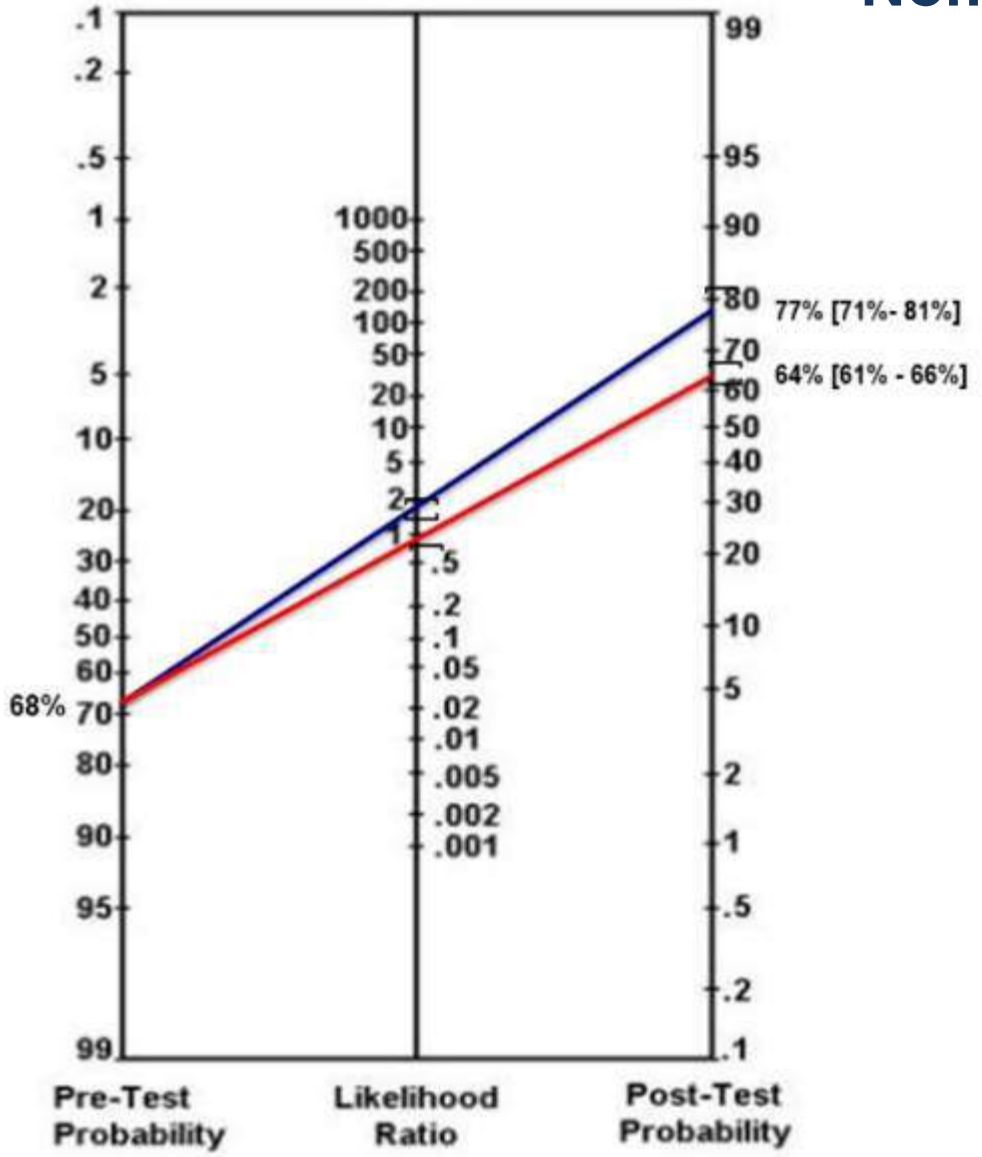
TUG cut points (in second … (N)	… LR- … 5% CI)	Odds ratio (95% CI)
≥ 10 / (281)	).58 – 0.82)	1.97 (1.41 – 2.73)
≥10.5/ (250)	).62 - 0.84)	1.98 (1.42 - 2.76)
≥11/ (224)	).66 - 0.86)	1.97 (1.40 - 2.76)
≥11.5/ (195)	).70 - 0.89)	1.89 (1.33 - 2.69)
≥12/ (169)	**).74 - 0.91)**	**1.85 (1.28 - 2.67)**
≥12.5/ (145)	).78 - 0.93)	1.81 (1.23 - 2.67)
≥13/ (128)	).80 -0.96)	1.71 (1.14 - 2.55)
≥13.5/ (113)	).83 - 0.97)	1.64 (1.08 - 2.49)

LR = likelihood ratio. **AUC** = Are… n 0.50 and 1.00; **small (but sometimes**
important): between 2.00 and 5.0… eater than 10.00 or less than 0.10 **Positive**
LR: not useful: less than 2.00; **mi**… er than 10.00



Soraes et al., in press

Nomograma da Fagan



AVDse IAVDs (OARS- BOMFAQ) caracterizado em percentis

(n=306) – seguimento de 12 meses

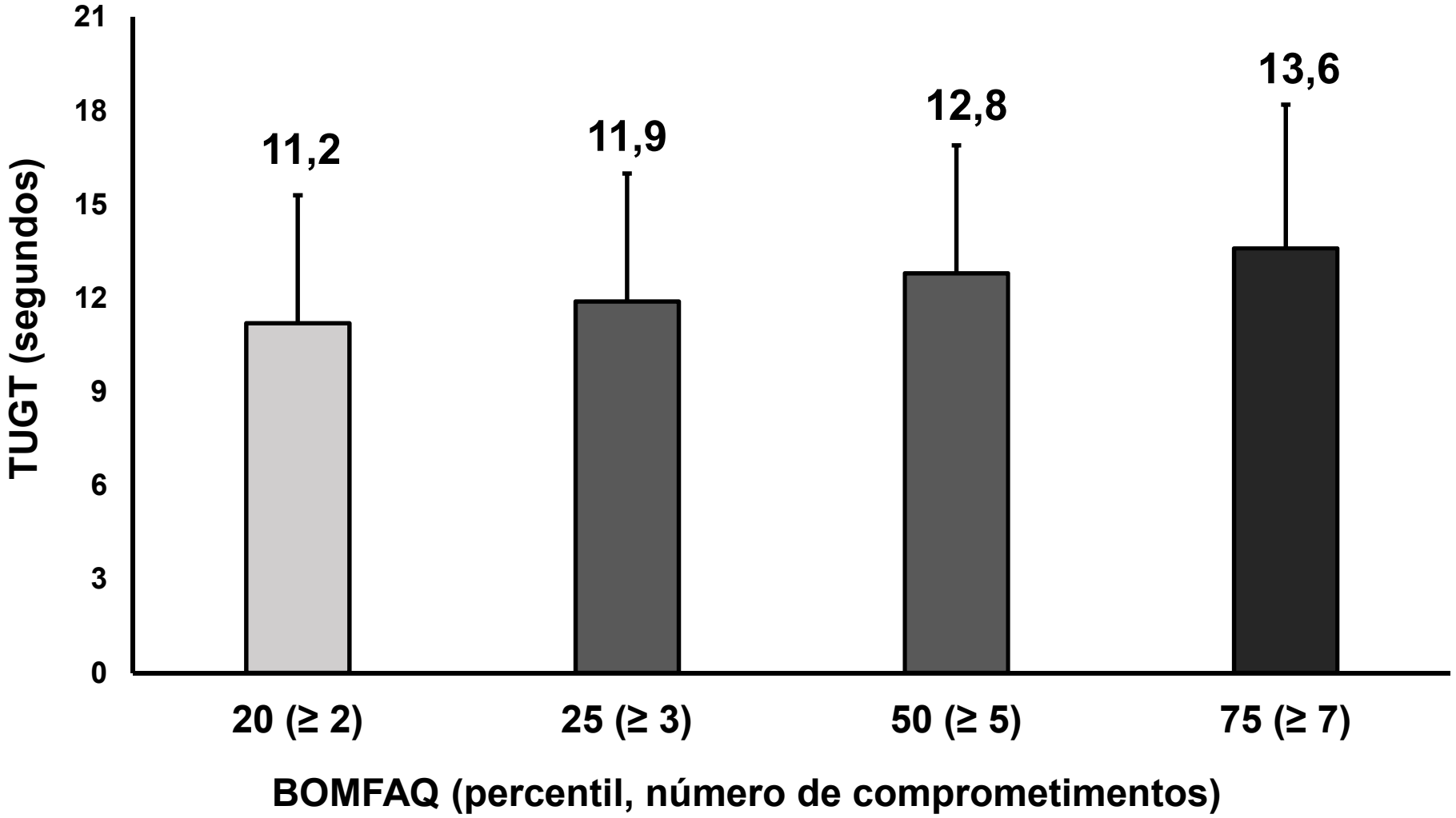


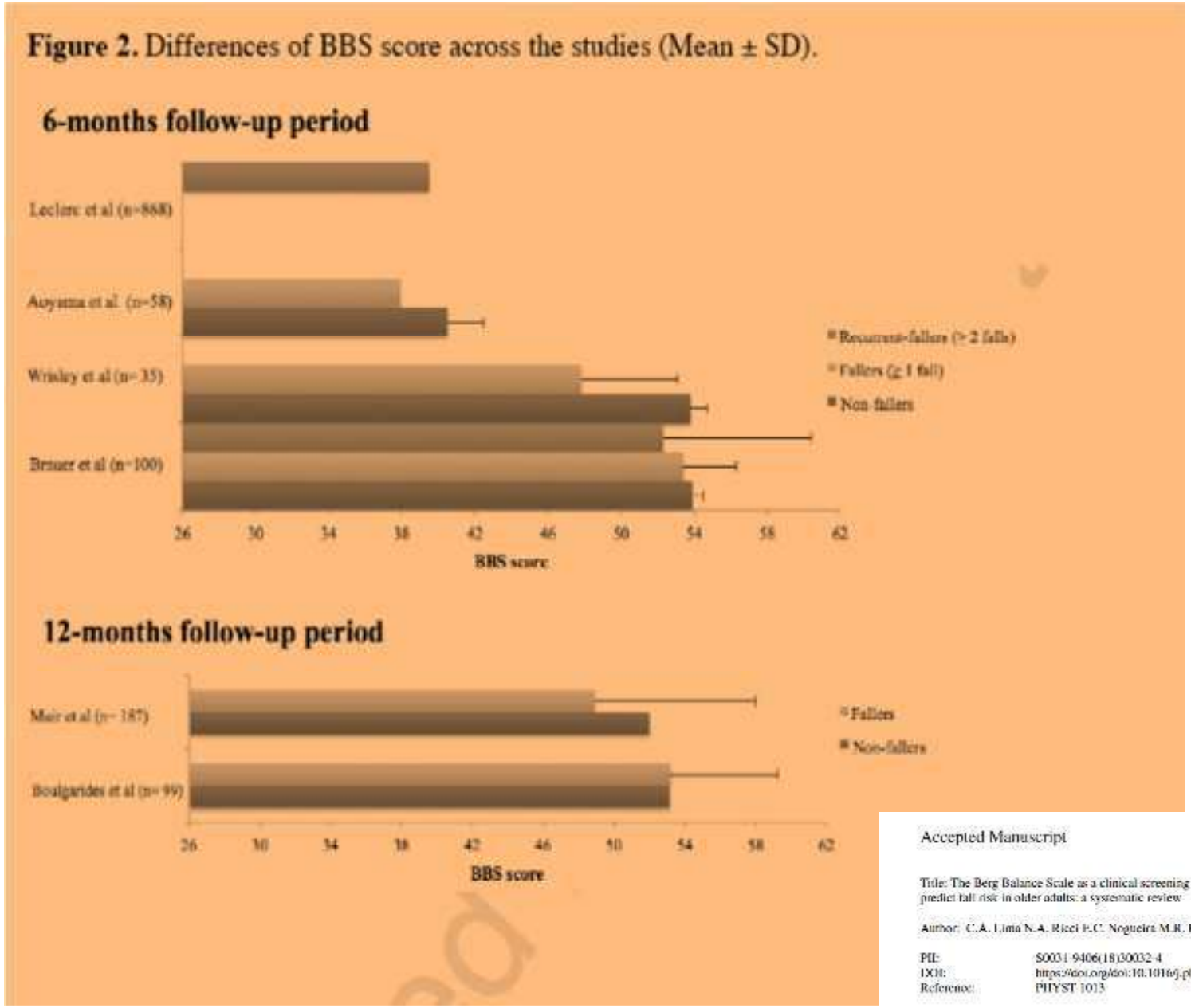
Tabela 4. Medidas de precisão diagnóstica do Teste Timed Up and Go (TUG) para discriminar quedas entre idosos caidores elegíveis para programa d prevenção de quedas com cinco ou mais atividades comprometidas BOMFAQ – mediana no seguimento de 12 meses (n=115).

TUG s (n)	Sensibi-lidade	Especifi-cidade	Valor preditivo (+)	Valor preditivo (-)	Odds ratio	Likelihood (+) IC (95%)	Likelihood (-) IC (95%)	AUC IC (95%)
≥10,0 (85)	0,73	0,60	0,58	0,75	4,25 (2,50 – 7,21)	1,84 (1,47 – 2,31)	0,43 (0,31 – 0,60)	0,67 (0,60 – 0,73)
≥10,5 (77)	0,66	0,68	0,61	0,72	4,30 (2,56 – 7,23)	2,09 (1,60 – 2,73)	0,48 (0,36 – 0,64)	0,67 (0,60 – 0,74)
≥11,0 (72)	**0,62**	**0,72**	**0,63**	**0,71**	**4,45 (2,64 – 7,49)**	**2,29 (1,70 – 3,08)**	**0,51 (0,39 – 0,66)**	**0,67 (0,61 – 0,74)**
≥11,5 (64)	0,55	0,77	0,65	0,69	4,28 (2,5 – 7,27)	2,45 (1,75 – 3,44)	0,57 (0,45 – 0,71)	0,66 (0,59 – 0,73)
≥12,0 (60)	0,52	0,80	0,67	0,68	4,55 (2,63 – 7,85)	2,69 (1,86 – 3,91)	0,59 (0,48 – 0,72)	0,66 (0,59 – 0,73)
≥12,5 (50)	0,43	0,84	0,68	0,66	4,24 (2,38 – 7,56)	2,83 (1,84 – 4,35)	0,66 (0,56 – 0,79)	0,64 (0,57 – 0,70)
≥13,0 (43)	0,37	0,69	0,69	0,64	1,35 (0,69 – 2,61)	1,22 (0,78 – 1,90)	0,90 (0,72 – 1,12)	0,62 (0,55 – 0,69)
≥13,5 (39)	0,33	0,88	0,69	0,63	4,01 (2,12 – 7,58)	2,99 (1,78 – 5,00)	0,74 (0,64 – 0,86)	0,61 (0,54 – 0,68)

Tabela 5. Medidas de precisão diagnóstica do Teste Timed Up and Go (TUG) para discriminar quedas entre idosos caidores elegíveis para programa de prevenção de quedas com sete ou mais atividades comprometidas BOMFAQ – percentil 75 no seguimento de 12 meses (n=70).

TUG s (n)	Sensibilidade	Especificidade	Valor preditivo (+)	Valor preditivo (-)	Odds ratio	Likelihood (+) IC (95%)	Likelihood (-) IC (95%)	AUC (95%)
≥ 10,0 (55)	0,78	0,53	0,37	0,87	4,27 (2,26 – 8,80)	1,70 (1,40 – 2,06)	0,39 (0,24 – 0,63)	0,66 (0,59 – 0,73)
≥ 10,5 (50)	0,71	0,61	0,40	0,85	4,00 (2,21 – 7,24)	1,85 (1,47 – 2,34)	0,46 (0,31 – 0,68)	0,66 (0,59 – 0,73)
≥ 11,0 (48)	**0,68**	**0,66**	**0,42**	**0,85**	**4,36 (2,42 – 7,84)**	**2,05 (1,59 – 2,65)**	**0,47 (0,32 – 0,67)**	**0,67 (0,60 – 0,75)**
≥ 11,5 (43)	0,61	0,71	0,43	0,83	4,05 (2,28 – 7,19)	2,17 (1,62 – 2,91)	0,53 (0,39 – 0,73)	0,66 (0,59 – 0,74)
≥ 12,0 (42)	0,60	0,75	0,47	0,84	4,72 (2,64 – 8,43)	2,48 (1,81 – 3,40)	0,52 (0,39 – 0,71)	0,67 (0,60 – 0,75)
≥ 12,5 (35)	0,50	0,80	0,47	0,81	4,13 (2,29 – 7,43)	2,56 (1,77 – 3,71)	0,62 (0,48 – 0,79)	0,65 (0,57 – 0,73)
≥ 13,0 (31)	0,44	0,84	0,50	0,80	4,20 (2,28 – 7,72)	2,78 (1,83 – 4,22)	0,66 (0,53 – 0,82)	0,64 (0,56 – 0,72)
≥ 13,5 (29)	0,41	0,86	0,51	0,80	4,40 (2,35 – 8,22)	2,99 (1,91 – 4,68)	0,68 (0,55 – 0,83)	0,63 (0,55 – 0,71)

Escala de Berg



Accepted Manuscript

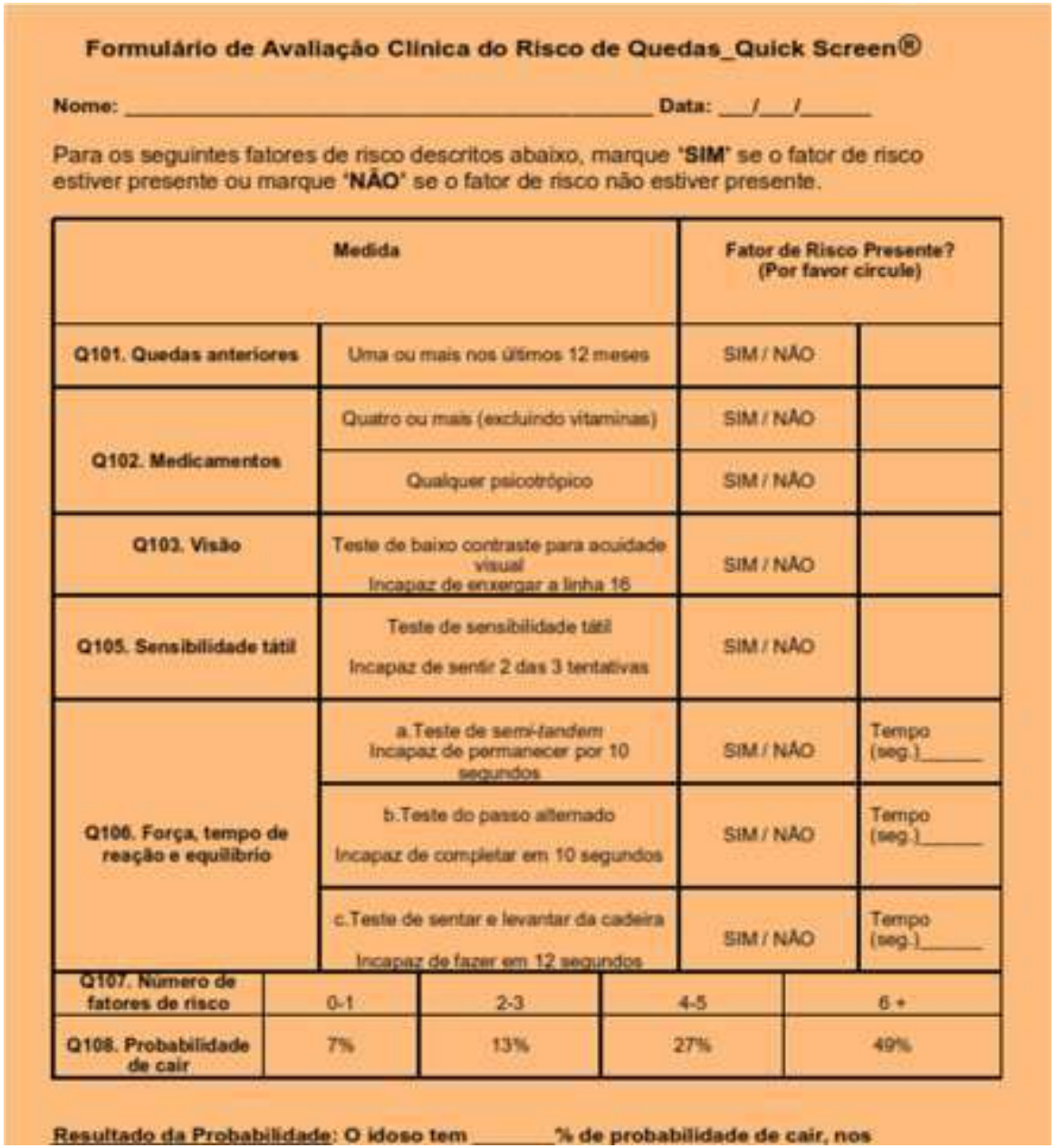
Title: The Berg Balance Scale as a clinical screening tool to predict fall risk in older adults: a systematic review

Author: C.A. Lima N.A. Ricci E.C. Nogueira M.R. Perracini

PII: S0031-9406(18)30032-4
DOI: https://doi.org/doi:10.1016/j.physio.2018.02.002
Reference: PHYST 1033



Quickscreen Fall Risk assessment



Formulário de Avaliação Clínica do Risco de Quedas_Quick Screen®

Nome: _____ **Data:** ___/___/_____

Para os seguintes fatores de risco descritos abaixo, marque '**SIM**' se o fator de risco estiver presente ou marque '**NÃO**' se o fator de risco não estiver presente.

Medida		**Fator de Risco Presente? (Por favor circule)**	
Q101. Quedas anteriores	Uma ou mais nos últimos 12 meses	SIM / NÃO	
Q102. Medicamentos	Quatro ou mais (excluindo vitaminas)	SIM / NÃO	
	Qualquer psicotrópico	SIM / NÃO	
Q103. Visão	Teste de baixo contraste para acuidade visual Incapaz de enxergar a linha 16	SIM / NÃO	
Q105. Sensibilidade tátil	Teste de sensibilidade tátil Incapaz de sentir 2 das 3 tentativas	SIM / NÃO	
Q106. Força, tempo de reação e equilíbrio	a.Teste de *semi-tandem* Incapaz de permanecer por 10 segundos	SIM / NÃO	Tempo (seg.)_____
	b.Teste do passo alternado Incapaz de completar em 10 segundos	SIM / NÃO	Tempo (seg.)_____
	c.Teste de sentar e levantar da cadeira Incapaz de fazer em 12 segundos	SIM / NÃO	Tempo (seg.)_____

Q107. Número de fatores de risco	0-1	2-3	4-5	6 +
Q108. Probabilidade de cair	7%	13%	27%	49%

Resultado da Probabilidade: O idoso tem _____% de probabilidade de cair, nos

Injury Prevention, 2012

Teste de Baixo Contraste para acuidade visual







Teste de sensibilidade Táctil





Semi-tandem OF 10s





Teste do passo alternado 8 toques = 10s





Teste de sentar e levantar 12s





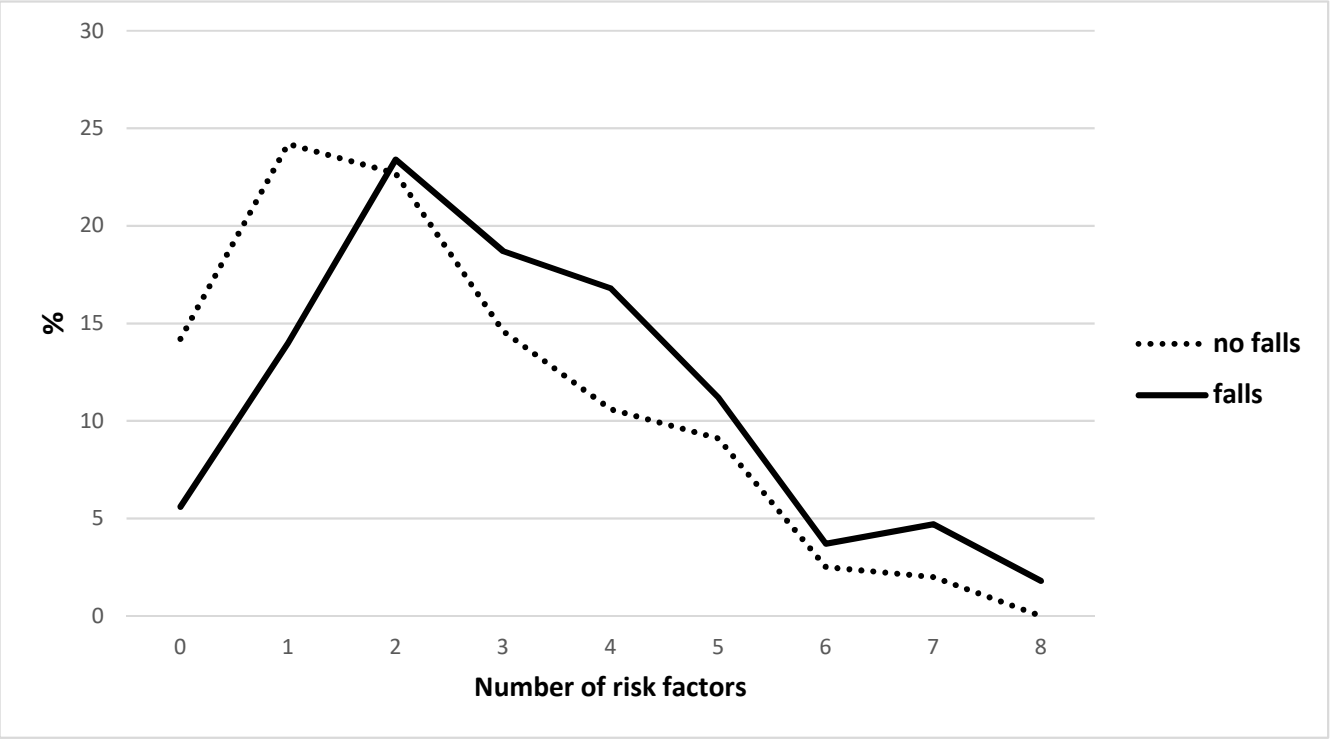


Figure 1 - Proportion of participants that sustained falls (fallers) over the 12 months compared with those who did not fall (non-fallers) stratified by the number of risk factors identified (n=305).

Cross-cultural adaptation to Brazilian Portuguese, reliability and predictive validityof the QuickScreen Clinical Falls Risk Assessment: a brief instrument to be used in community care

Roberta Bolzani de Miranda Dias, Flavia da Silva Arbex, Ilana Pinheiro, Anne Tiedemann, Stephen Lord, Monica Rodrigues Perracini

Table 4. Poisson regression models for any fall (one or more falls) and for recurrent falls (two or more falls), during 12 months of follow-up, in relation to the score of *QuickScreen Falls* – Brazil (n=305).

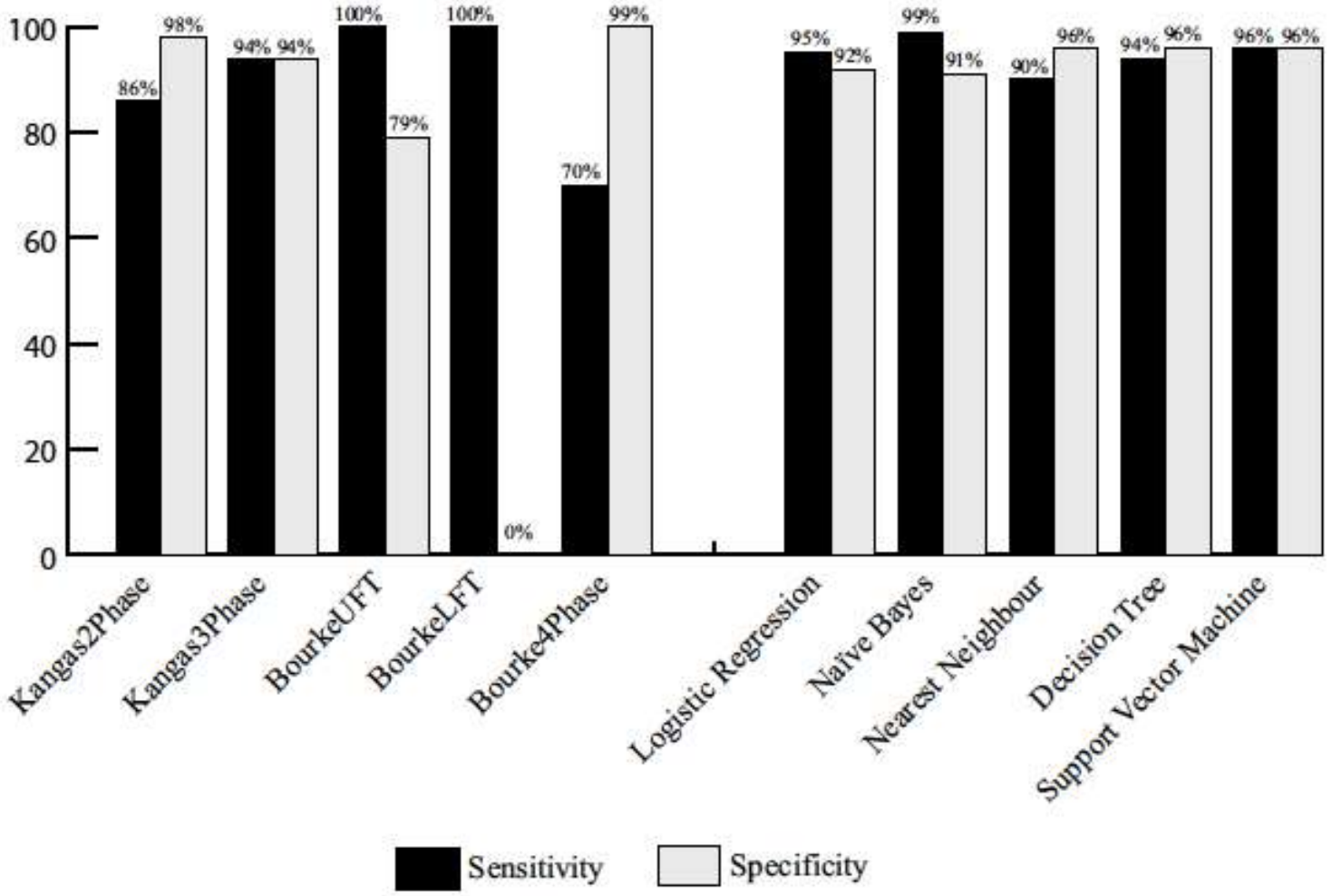
Risk factors	Any Fall			Recurrent falls		
	n (%)	Model 1 (unadjusted) IRR (CI 95%)	Model 2 (adjusted)* IRR (CI 95%)	*n* (%)	Model 1 (unadjusted) IRR (CI 95%)	Model 2 (adjusted)* IRR (CI 95%)
	p<0.001			*p*= 0.019		
0-1	21 (21)	1	1	10 (10)	1	1
2-3	45 (38)	1.76 (1.13-2.75)	1.73 (1.09-2.75)	22 (18)	1.81 (0.90-3.64)	1.61 (0.76-3.43)
4-5	30 (43)	1.97 (1.23-3.14)	1.92 (1.11-3.30)	12 (17)	1.65 (0.75-3.62)	1.30 (0.49-3.40)
6 or more	11 (55)	3.02 (1.80-5.06)	2.86 (1.44-5.67)	7 (41)	4.03 (1.78-9.14)	2.95 (0.92-9.45)

* Adjusted for age, sex, FESI score, number of comorbidities and number of depressive symptoms on the GDS scale

Sensores são/serão capazes de melhorar a capacidade preditiva de quedas e quedas recorrentes?

Algumas reflexões

- wearables (com acelerômetros e não só giroscópios)
- captar dados de sinais biológicos (acelerometria) ao longo do tempo (3m, 6m,12m?)
- > estudos ainda com jovens simulando quedas
- vários acelerômetros para captar diferentes AVDs
- diferentes subgrupos
- em diferentes ambientes (acoplar com outras plataformas?)
- indivíduo comparado com ele mesmo (dias bons e dias ruins)



Med Biol Eng Comput
DOI 10.1007/s11517-016-1501-y

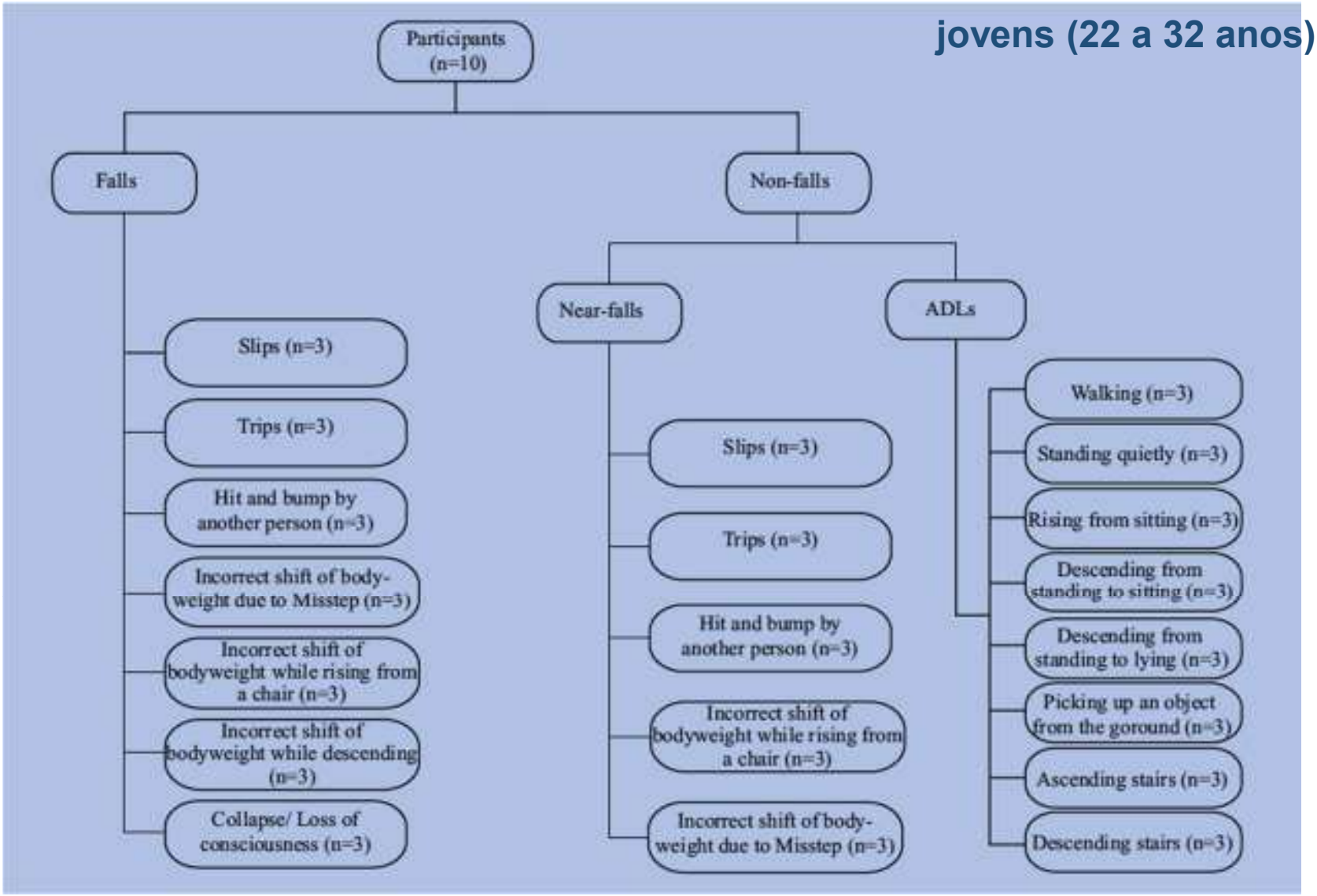
ORIGINAL ARTICLE

A comparison of accuracy of fall detection algorithms (threshold-based vs. machine learning) using waist-mounted tri-axial accelerometer signals from a comprehensive set of falls and non-fall trials

Omar Aziz[1,2,5] · Magnus Musngi[5] · Edward J. Park[5] · Greg Mori[4] · Stephen N. Robinovitch[1,2,5]

Received: 11 June 2015 / Accepted: 28 March 2016
© International Federation for Medical and Biological Engineering 2016

jovens (22 a 32 anos)



210 quedas, 150 quase-quedas e 240 AVDs

7 acelerômetros (bilat: tornozelo, coxa, cintura, esterno e cabeça)

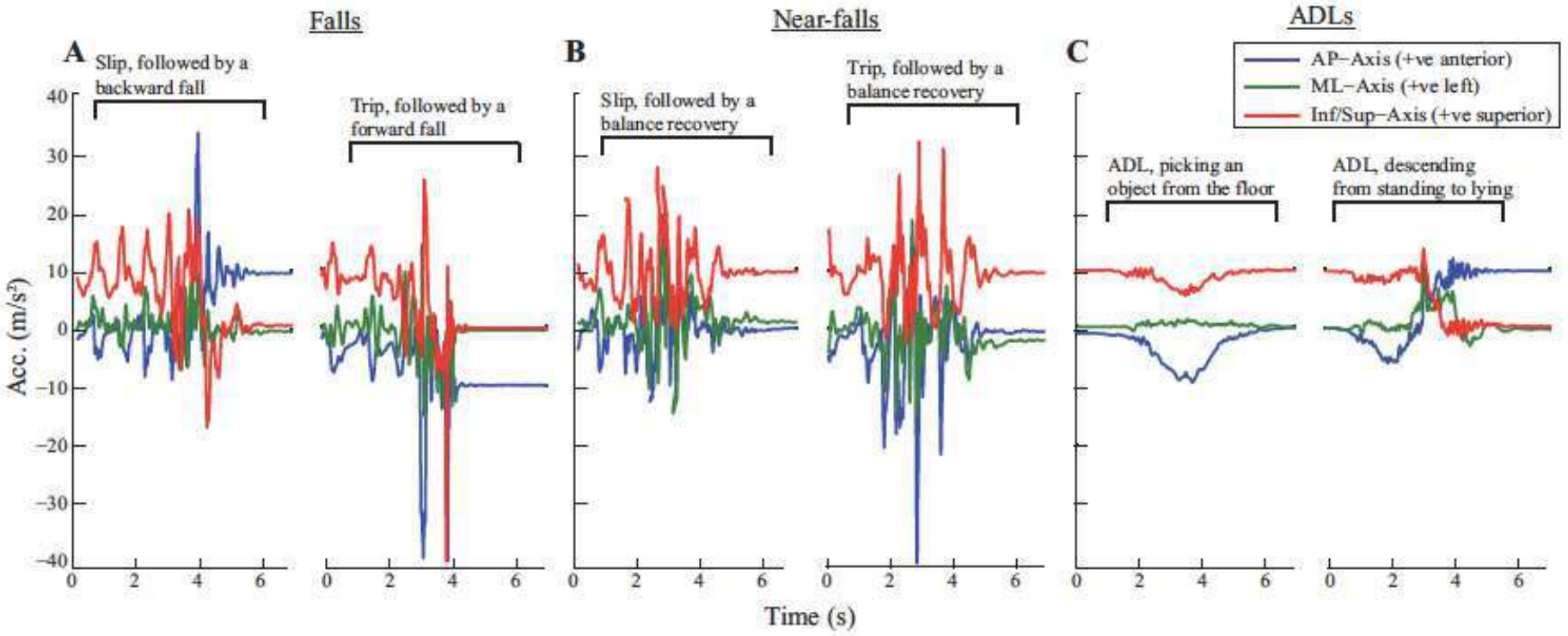


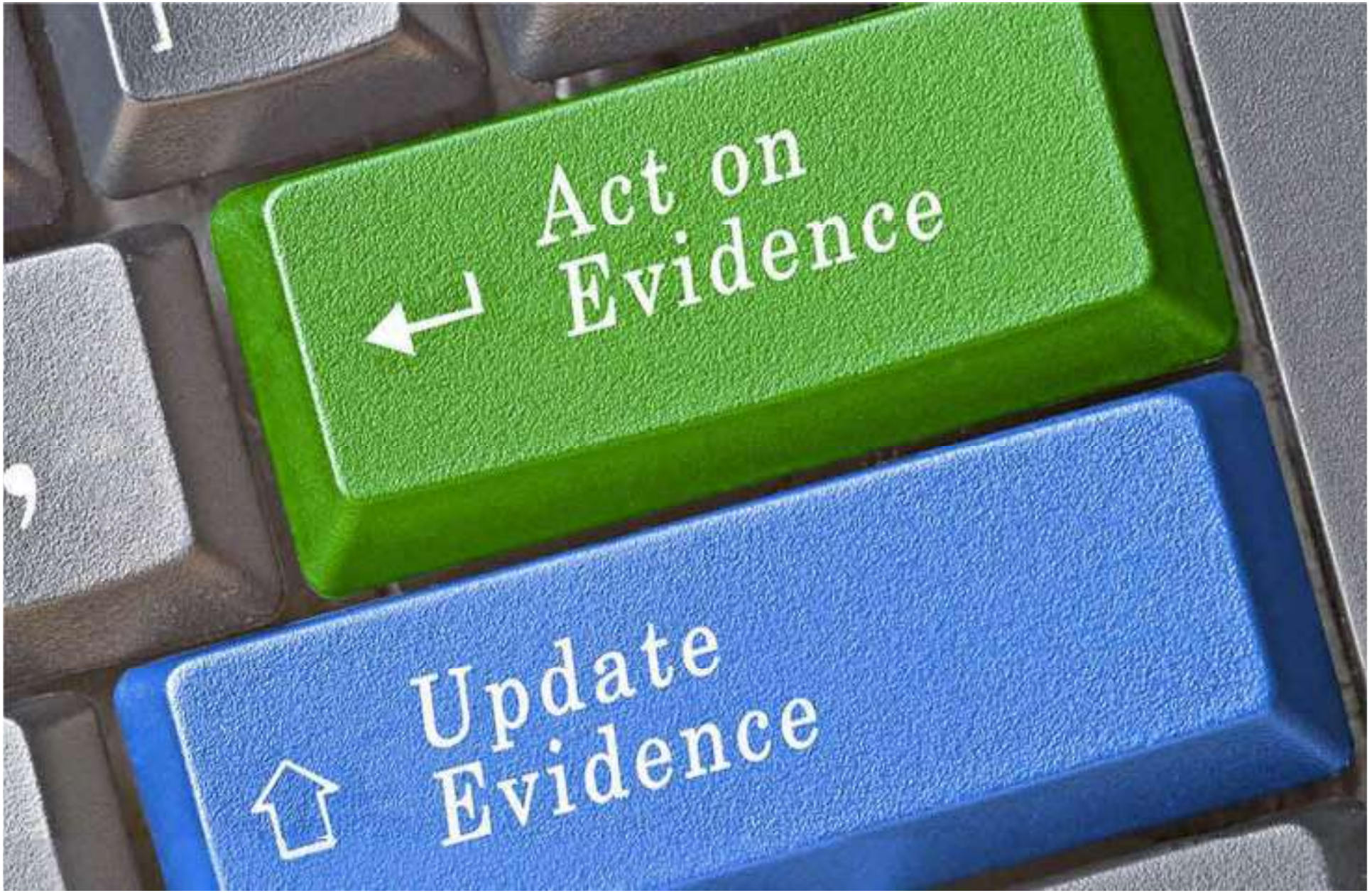
Fig. 2 Signals acquired from waist-mounted tri-axial accelerometers from a typical participant during **a** falls, **b** near-falls, and **c** activities of daily living (ADLs). *AP* acceleration in anterior/posterior direction, *ML* acceleration in medial/lateral direction, *Inf/Sup* acceleration in inferior/superior direction

Quedas que não foram capturadas com maior frequência:

- Tropeços, levantando da cadeira, subindo ou descendo escadas

Dentre todos os algorítmos usando sensores o menos sensível foi o que tentou identificar as 4 fases da queda:

- pré-queda
- crítica (descida)
- impacto
- pós-queda


Act on
Evidence
Update
Evidence


KNOWLEDGE
TRANSFER
ORGANIZATIONAL
PRACTICES
PRACTICE
INFORMATION
PROCESS
SOCIAL
BEST
INNOVATION
ECONOMIC
FACILITATE
ENSURE
LACK
ROUTINES
CONTEXT
UTILIZATION
MUCH
BECOME
ONE
DOMAINS
DEVELOPED
TECHNOLOGY
INCREASINGLY
SUBJECT
USED
JUST
EMBRAINED
USAGE
RESEARCH
APPLICATION
POTENTIAL
FACTORS
LANDSCAPE
UK
SKILLS
PRIVATE
PROBLEM
CULTURE
TYPES
DIFFICULT
TRANSFERRED
EMBEDDED
TYPE
HEALTH
MAY
PUBLIC
ENCULTURED
ECOLOGY
MANAGEMENT
NEW
STICKINESS
CAPACITY
THEORY
TACIT
EXPERIENCE
IP
COMPLEX
ARTICULATE
USERS
LANGUAGE
PART
DEVELOPING
MANY
IDEAS
UNDERSTANDING
COMMUNICATION
USE
INTERNAL
PRACTICAL
ORGANIZATION
APPLY
CREATION
BACKGROUND
DIFFUSION
ORGANISATIONS
E.G
GROUP
INDIVIDUALS
EMBODIED
PSRDS
INCLUDING
PRODUCED
POWER
SHARING
UNIVERSITIES
ANOTHER

Quais as evidências de intervenção que temos hoje para incorporar na sua prática clinica?

Andar como exercício ajuda na prevenção de quedas?

A home-based walking programme on falls in older people

Table 1. Fall outcomes by group at 48 weeks

	Control	Intervention	CI)	P-value	Attributable risk reduction (95% CI)
Rate of falls, mean	0.802	0.713		0.52	
1+ falls, number	68/180 (0.378)	54/159 (0.34		0.47	0.038 (−0.064–0.140)
2+ falls, number	28/180 (0.156)	25/159 (0.157)		0.96	−0.002 (−0.079–0.076)

[a]Incident rate ratios calculated using a negative binomial regression with tim exposure variable.
[b]Relative risk, excludes 47 participants who did not provide at least 24 weeks of falls data.

- Walking should not be recommended as a falls prevention strategy.





Age and Ageing 2015; 44: 377–383

The impact of a home-based walking programme on falls in older people: the Easy Steps randomised controlled trial

Alexander Voukelatos[1], Debra Merom, Catherine Sherrington, Chris Rissel, Robert G. Cumming, Stephen R. Lord

Andar rápido/acelerado aumenta o risco de cair

Table 4. The occurrence of falls and fractures among brisk-walking and placebo groups at 1 and 2 years

	n (rate per 100 person-years)	
	Brisk walking	Placebo
Falls		
Year 1		
Total falls	42 (80.1)	26 (52.0)**
Percent falling	42%	36%
Year 2		
Total falls	29 (59.2)	28 (58.3)
Percent falling	35%	38%
Cumulative falls risk	71 (70.3)	54 (55.1)*
Fractures		
Year 1	2 (3.8)	3 (6.0)
Year 2	4 (8.2)	1 (2.1)
Cumulative risk	6 (5.9)	4 (4.1)

Differences between brisk-walking and placebo groups: $^{**}P < 0.01$, $^{*}P < 0.05$.

Age and Ageing 1997; 26: 253–260

Randomized placebo-controlled trial of brisk walking in the prevention of postmenopausal osteoporosis

SHAH EBRAHIM, PAUL W. THOMPSON[1], VERMALA BASKARAN[2], KATHY EVANS[3]

Estudo de base populacional (n=412)

Confirmou que a marcha rápida é perigosa para:

- idosos com limitações neuromotoras
- idosos mais jovens e ativos
  - ↑ cadência
  - tamanho do passo
  - transição habitual/rápida



Gait & Posture

Contents lists available at SciVerse ScienceDirect

Gait & Posture

journal homepage: www.elsevier.com/locate/gaitpost

Risk of falls in older people during fast-walking – The TASCOG study

M.L. Callisaya, L. Blizzard, J.L. McGinley, V.K. Srikanth

Dança de salão previne quedas?



80 h, 2 horas por semana de dança de salão

idosos em comunidades de aposentados
43% com 80 anos e mais

Table 3. Number of falls and incidence of falling among study groups and by baseline falls history.

	Dance (*N* = 275)	Control (*N* = 247)	Unadjusted	Adjusted
	Falls (rate [a])	Falls (rate)	IRR [b] (95% CI)	IRR [c] (95% CI)
All study participants (*n* = 522)	257 (1.03)	187 (0.80)	1.34 (0.98–1.83)	1.19 (0.83–1.71)
Falls in the past 12 mo				
No fall (*n* = 377)	142 (0.78)	103 (0.61)	1.35 (0.83–2.21)	1.19 (0.67–2.10)
1 fall (*n* = 92)	34 (0.81)	44 (1.06)	0.77 (0.42–1.38)	0.78 (0.45–1.35)
≥2 falls (*n* = 51)	74 (3.12)	40 (1.78)	1.69 (1.17–2.44)	2.02 (1.15–3.54)

[a] = fall rates per person-year

[b] = IRR for dance group compared to control group, allowing for cluster

[c] = Adjusted for age, sex, educational attainment, baseline MMSE, dancing status at baseline, fall risk at baseline.

The adjusted model included 521 participants due to one person with missing data on dancing status, and the adjusted model comparing previous fallers included 141 participants due to two participants with no data on history of falls.

PLOS | MEDICINE

RESEARCH ARTICLE

Social Dancing and Incidence of Falls in Older Adults: A Cluster Randomised Controlled Trial

Dafna Merom[1]*, Erin Mathieu[2], Ester Cerin[3], Rachael L. Morton[4], Judy M. Simpson[5], Chris Rissel[6], Kaarin J. Anstey[4], Catherine Sherrington[4], Stephen R. Lord[7], Robert G. Cumming[8]

Evidência até o momento:



- Qto > nível de atividade física ↓ o risco de cair de <u>forma recorrente</u>
- Não sabemos a dose-resposta

- Caminhar não reduz quedas e caminhar rápido pode ↑ risco
- Dança de salão não reduz quedas

Exercício estruturado: qual o mais indicado?













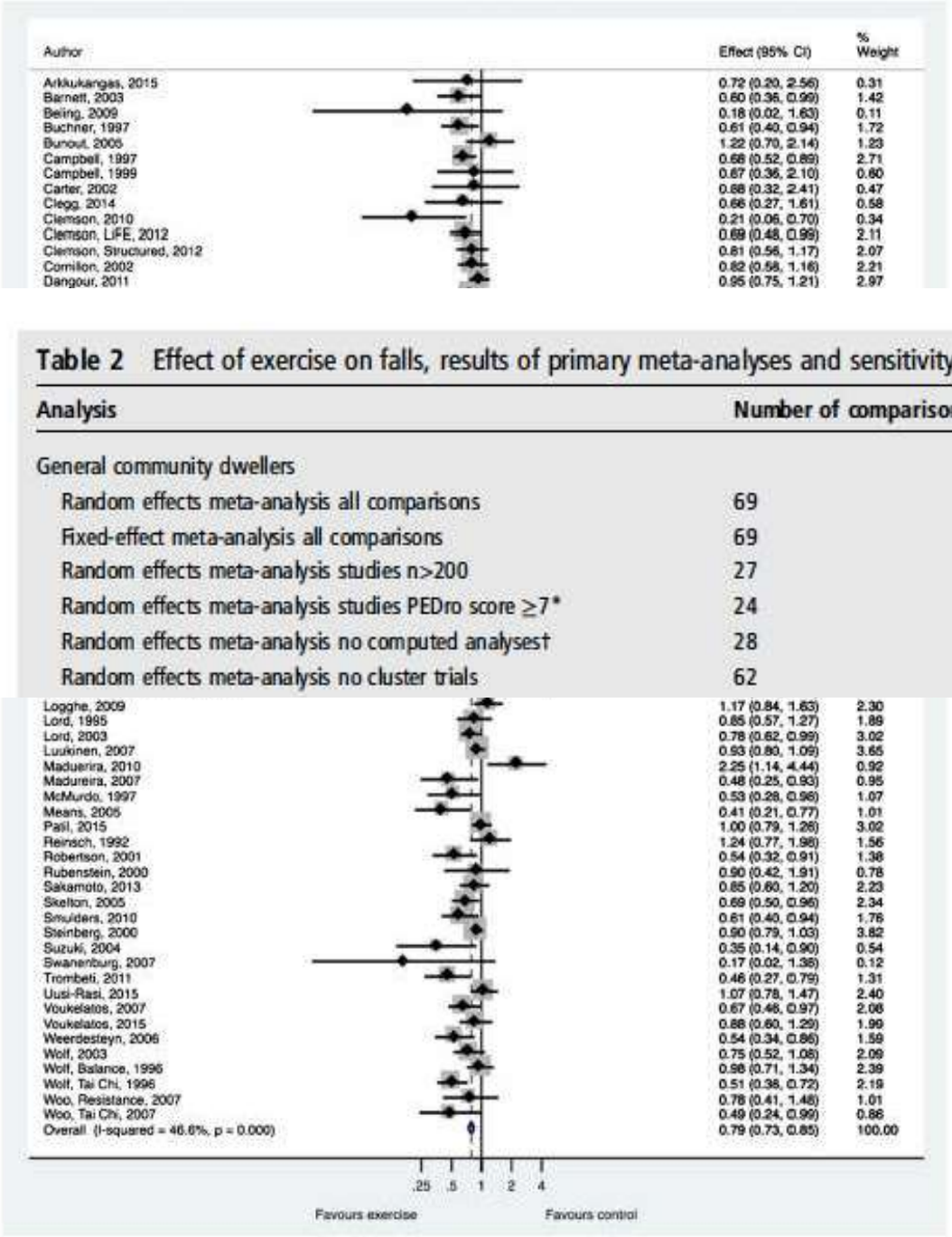


Figure 2 Forest plot of trials of exercise to prevent falls undertaken in general community dwellers.

Table 2 Effect of exercise on falls, results of primary meta-analyses and sensitivity analyses

Analysis	Number of comparisons	Pooled	I^2 (%)
General community dwellers			
Random effects meta-analysis all comparisons	69	0.79 (0.73 to 0.85)	47
Fixed-effect meta-analysis all comparisons	69	0.82 (0.79 to 0.86)	47
Random effects meta-analysis studies n>200	27	0.81 (0.75 to 0.89)	52
Random effects meta-analysis studies PEDro score ≥7*	24	0.81 (0.74 to 0.89)	30
Random effects meta-analysis no computed analyses†	28	0.76 (0.69 to 0.83)	46
Random effects meta-analysis no cluster trials	62	0.78 (0.72 to 0.85)	49

24% a 18% de redução

chegando a 31%

88 ensaios clínicos
69 comparações

- **75 anos – 33 comparações**
- **47 treino de equilibrio**
- **31 treino de exercicios de equilíbrio progressivos**
- **37 não incluíram idosos de alto risco**
- **31 ajustaram o nível do esxercicio**

Programme characteristic	
Inclusion of moderate or high-intensity strength training† (28)	0.97 (0.82 to 1.15), 0.73, –4%
Inclusion of high-intensity strength training (10)	1.23 (0.96 to 1.57), 0.11, 9%
Inclusion of moderate or high challenge balance training‡ (47)	0.85 (0.71 to 1.00), 0.06, 19%
Inclusion of high challenge balance training (31)	*0.85 (0.73 to 1.00), 0.04, 28%*
Inclusion of walking training or practice (29)	1.01 (0.86 to 1.20), 0.87, –6%
2+ hours per week of exercise (40)	0.98 (0.83 to 1.16), 0.83, –6%
3+ hours per week of exercise (20)	*0.77 (0.65 to 0.91), 0.003, 61%*
Better adherence to exercise§ (52)	0.95 (0.79 to 1.13), 0.54, –1%

- **intensidade de Exercicios de equilíbrio progressivos e desafiadores**
- **> dose (3 horas ou mais por semana!)**

Sherrington et al 2017. Exercise to prevent falls in older adults: an updated systematic review and meta-analysis.
Sherrington et al 2019. (Cochrane Review). Exercise for preventing falls in older people living in the community

Exercícios multimodais X controle
(em grupo)

Incidência de Quedas

Subtotal (95% CI) ◆ **100.0 %** **0.71 [0.63, 0.82]**

Heterogeneity: Tau?? = 0.03; Chi?? = 29.11, df = 15 (P = 0.02); I?? =48%

Test for overall effect: Z = 4.91 (P < 0.00001)

Supervisão Segurança

Exercícios domiciliares X controle
(individuais: multimodais)

Subtotal (95% CI) ◆ **100.0 %** **0.68 [0.58, 0.80]**

Heterogeneity: Tau?? = 0.0; Chi?? = 1.30, df = 6 (P = 0.97); I?? =0.0%

Test for overall effect: Z = 4.55 (P < 0.00001)







Tai Chi x controle
(em grupo)



Ex. de marcha, equilíbrio ou treino funcional X controle
(em grupo)



Exercícios resistidos (força e resistência) X controle
(em grupo)



Exercícios resistidos domiciliares X controle
(individuais)



Maiores desafios:

- ↑ Intensidade
- ↑ Dose
- ↑ Aderência


BMJ

RESEARCH

Integration of balance and strength training into daily life activity to reduce rate of falls in older people (the LiFE study): randomised parallel trial

OPEN ACCESS

- LIFE
- Programa estruturado 3x por semana
- intervenção mínima

Redução de 31% na taxa de quedas no LIFE comparado com o controle (incidence rate ratio 0.69 (0.48 a 0.99), n=212

Não foi observado o mesmo no programa estrutrado comparado ao controle 0.81 (0.56 a 1.17), n=210.







Adesão foi maior no LIFE do que no exercício em grupo

Table 6| **Analysis of variance for adherence to exercise programmes over first six months**

Programme	No of participants	Proportion (%) of adherence (mean (standard deviation))	F ratio	P
LiFE	107	47 (33)	4.69	0.01
Structured exercise	105	35 (29)		
Control	105	47 (34)		
Total	317	43 (36)	—	—

Em alguns grupos a intervenção isolada de exercicio pode ↑ quedas

Idosos frágeis recentemente hospitalizados

	Control (n = 169)	Intervention (n = 171)	Difference between groups
Falls per participant, n (%)			
0	99 (59)	73 (43)	1.38 (1.11 to 1.73), p = 0.004[a]
1	45 (27)	58 (34)	
2	12 (7)	16 (9)	
3	4 (2)	13 (8)	
≥4	9 (5)	11 (6)	
All falls (primary outcome)	123	177	1.43 (1.07 to 1.93), p = 0.017[b]
Fall location			
Indoors	79	128	1.62 (1.13 to 2.33), p = 0.009[b]
Outdoors	44	49	1.10 (0.71 to 1.69), p = 0.670[b]
Falls with injuries			
Received health care	53	61	1.14 (0.76 to 1.73), p = 0.524[b]
Fractures	15	14	n/a[c]

A Post-Hospital Home Exercise Program Improved Mobility but Increased Falls in Older People: A Randomised Controlled Trial

Catherine Sherrington[1*], Stephen R. Lord[2], Constance M. Vogler[3,4], Jacqueline C. T. Close[2,5], Kirsten Howard[6], Catherine M. Dean[7], Gillian Z. Heller[8], Lindy Clemson[9], Sandra D. O'Rourke[2], Elisabeth Ramsay[2], Elizabeth Barraclough[2], Robert D. Herbert[2], Robert G. Cumming[6]

Intervenções Multifatoriais



Intervenções mais complexas (profissionais treinados)

- **Reabilitação do Equilíbrio Corporal**: envolvendo treino funcional especializado, Reabilitação Vestibular se necessário

- **Ações educativas**: mudança de comportamento frente a limitações

- **Psicológica**: Medo de cair, ansiedade, depressão

- **Médica**: análise da possibilidade de manejo de medicações, suplementação de vitamina D, tratamento de doenças cardiovasculares, manejo da dor, encaminhamentos

- **Ambiental:** visita e análise de riscos ambientais e de dispositivos de auxílio a marcha

Intervenções Multifatoriais

Table 1 Effect of multifactorial intervention compared with usual care or usual care plus advice

	Overall			
Outcome	Trials, n	Participants, n	Effect estimate (random effects) 95% CI	I^2 (%)
Rate of falls	20	10116	RaR 0.79 (0.70 to 0.88)	90
Risk of sustaining one or more falls	30	13817	RR 0.95 (0.90 to 1.00)	56
Risk of recurrent falls	15	7277	RR 0.88 (0.78 to 1.00)	46
Risk of fall-related fractures	10	3160	RR 0.73 (0.53 to 1.01)	0
Risk of a fall that required hospital admission	14	5077	RR 1.00 (0.92 to 1.08)	0
Risk of a fall that required medical attention	9	3669	RR 0.98 (0.84 to 1.14)	1
Health-related quality of life	7	2000	SMD 0.13 (–0.01 to 0.26)	52

RR, risk ratio;RaR, rate ratio; SMD, standardised mean difference.



Multifactorial interventions for preventing falls in older people living in the community: a systematic review and meta-analysis of 41 trials and almost 20 000 participants

Sally Hopewell, Bethan Copsey, Philippa Nicolson, Busola Adedire, Graham Boniface, Sarah Lamb

Hopewell S, *et al*. *Br J Sports Med* 2019;**0**:1–13.

PERCEPÇÃO DOS IDOSOS SOBRE BARREIRAS PARA PARTICIPAÇÃO EM UM PROGRAMA MULTIFATORIAL DE PREVENÇÃO DE QUEDAS: PREVQUEDAS BRASIL

Renato Barbosa dos Santos, Lima, CA, Paschoal, SM, Leme, LEG, Hill, KD, **Perracini, MR**

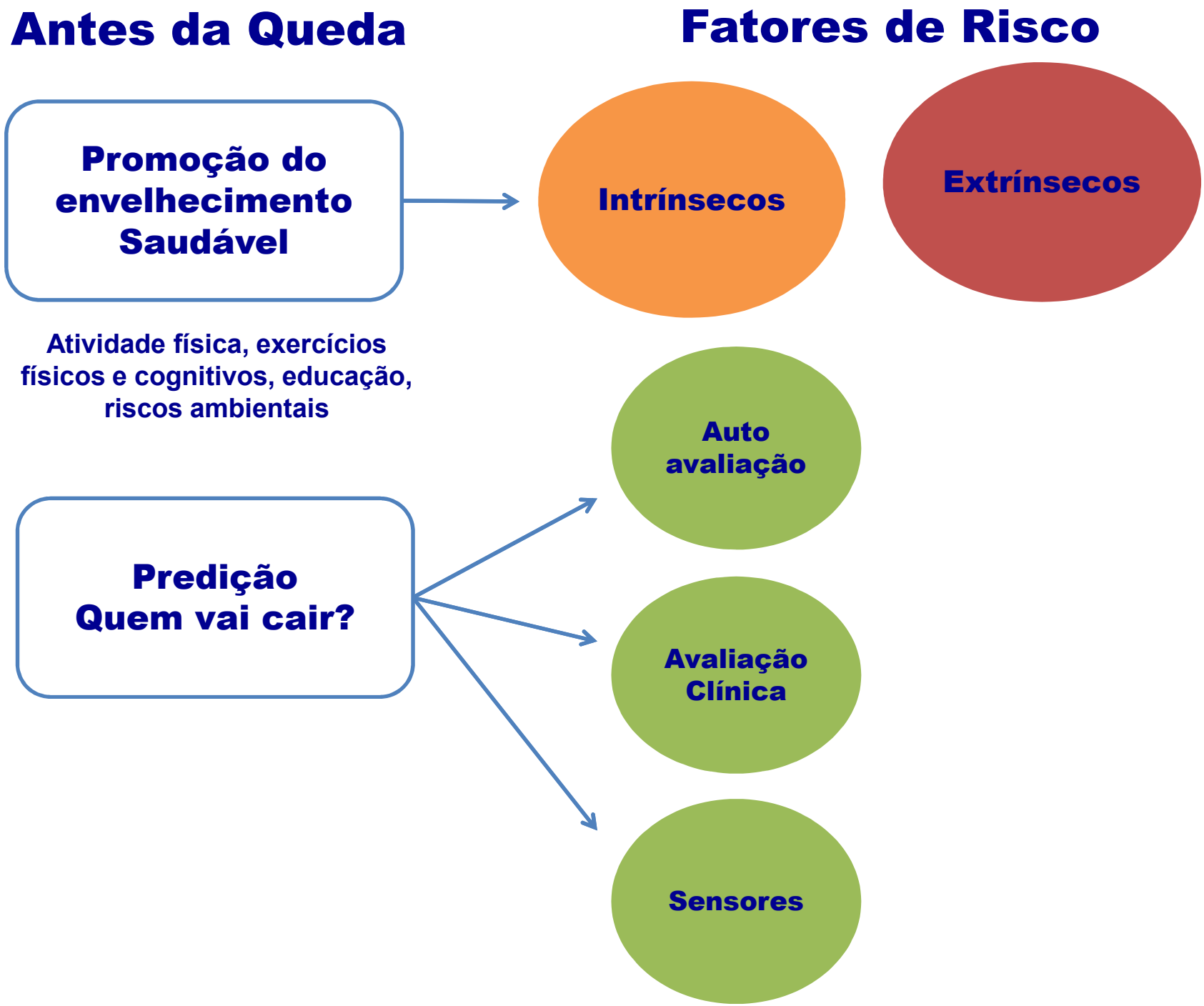
BAIXA ADESÃO aos Programas

46% a 86%

(SR, 2012; Osho et al., 2018)

BARREIRAS	% (n)
Saúde física e mental	55.0 (120)
Demandas competitivas	45.2 (98)
Praticalidades	37.5 (81)
Características do programa	27.6 (60)
Falta de suporte	13.3 (29)

Como a tecnologia pode ajudar?


Antes da Queda
Fatores de Risco
Promoção do envelhecimento Saudável
Intrínsecos
Extrínsecos
Atividade física, exercícios físicos e cognitivos, educação, riscos ambientais
Predição Quem vai cair?
Auto avaliação
Avaliação Clínica
Sensores


PREDICTION
© CanStockPhoto.com - csp49471890



realtime

Predizer se algo no comportamento (biológico) mudou

Se o risco aumentou

Se antecipar ameaça imediata
ou estimular mudanças



SENSE4CARE

ABOUT PRODUCTS SUPPORT CONTACT SHOP EN



ANGEL4
Product Details

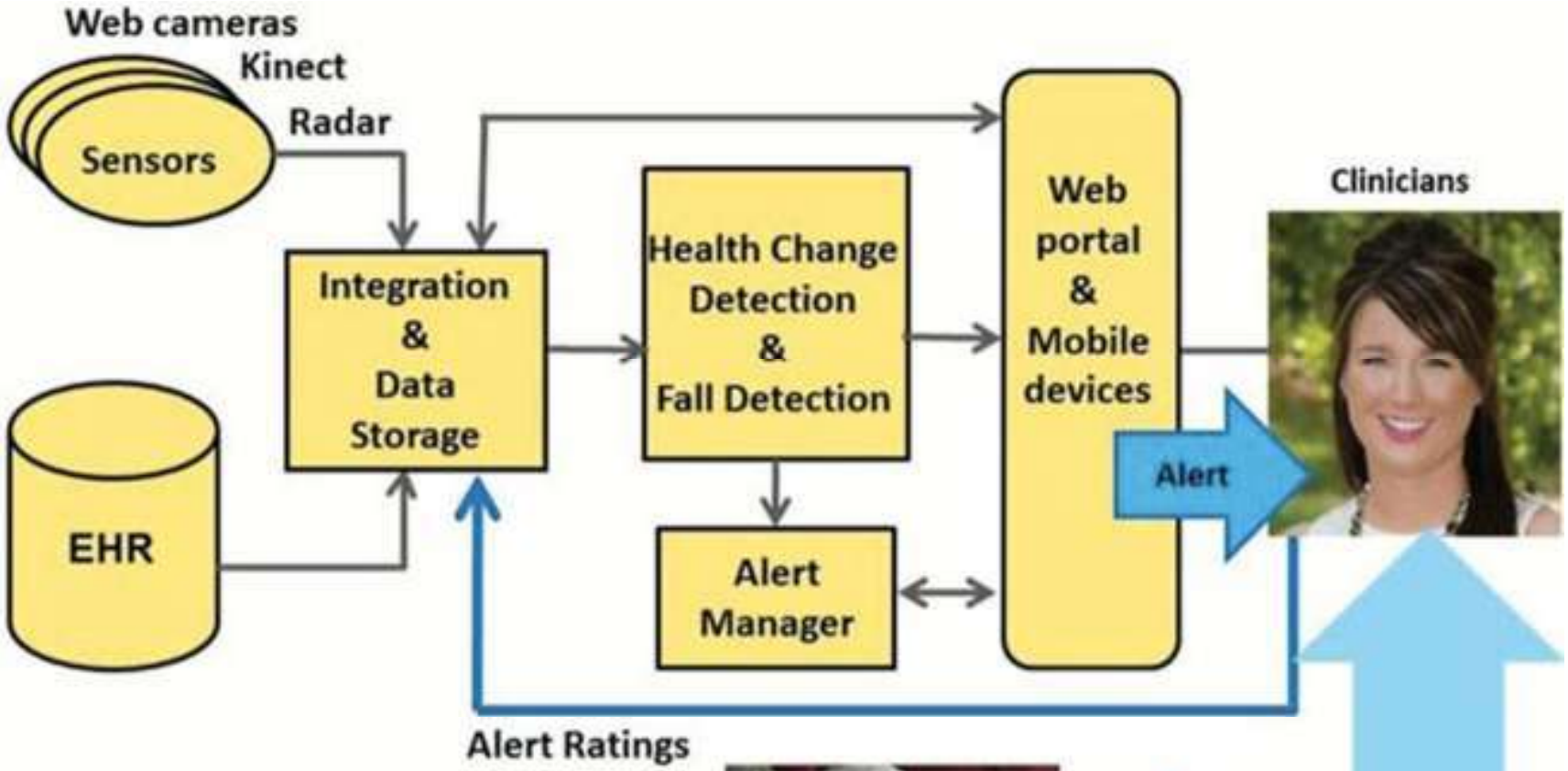
BUY YOUR FALL DETECTOR ONLINE

The tranquility of yours to continue enjoying the small things of every day

The **Angel4 fall detector** is a unique personal device that provides very sensitive automatic fall detection by means of a triaxial accelerometer and a new specific algorithm developed and tested by the Center for Technological Studies for Dependency and Autonomous Life (CETpD) of **The Universidad Politécnica de Catalunya** in various research projects.

BUY

Predição





Clinical Care Coordination

THE GERONTOLOGICAL SOCIETY OF AMERICA

Automated In-Home Fall Risk Assessment and Detection Sensor System for Elders

Marilyn Rantz, PhD, RN, FAAN,[4,1] Marjorie Skubic, PhD,[1] Carmen Abbott, PhD,[1] Colleen Galambos, PhD, MSW, ACSW, LCSW-C,[1] Mihail Popescu, PhD,[1] James Keller, PhD,[1] Erik Stone, PhD,[1] Jessie Back, MSW, LCSW,[1] Steven J. Miller, MA,[1] and Gregory F. Petroski, PhD[2]

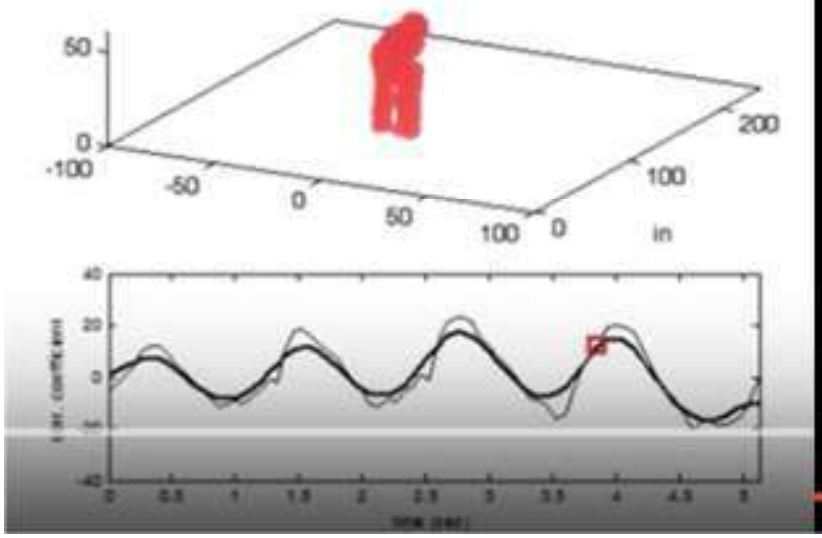
A person's risk of falling goes up more than four times if their walking speed slows.

Researchers found pensioners had an 86 per cent chance of falling within three weeks if it decreased by 5.1cm per second

By comparison it was 20 per cent in those with no changes.







Depois da Queda



Profissionais

Diagnóstico Clínico e Funcional

Testes
Escalas
Algorítmos

Sensores

Acelerômetros
Camêras
Infravermelhos
Pisos

Estado Basal de cada indivíduo:

- **comparação com ele mesmo**
- **com pares da mesma idade, sexo e condição de saúde**
- **dias bons e dias ruins**
- **comportamento (atividades)**

Avaliação

Kinesis QTUG™ - A proven tool for falls risk assessment

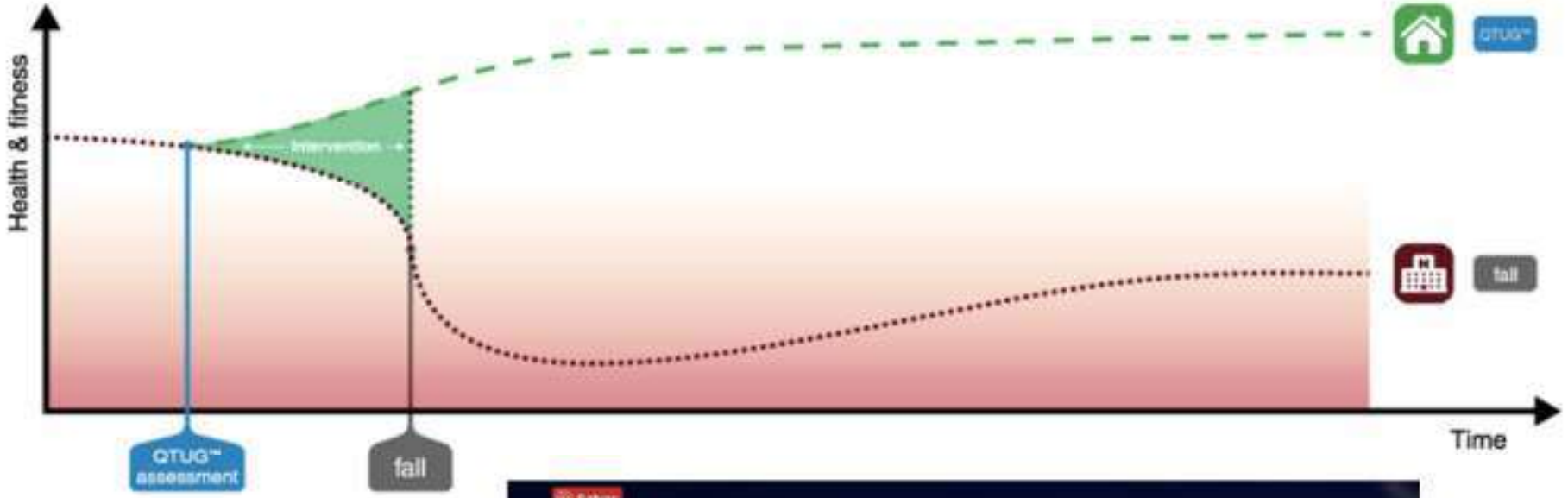


Kinesis QTUG is an objective tool for identifying older adults at risk of falling. QTUG™ (Quantitative Timed Up and Go) is based on the Timed Up and Go test and is instrumented with wireless sensors placed on each leg. This technology provides a method for objective assessment of mobility, frailty and falls risk. It provides automatic analysis of patient data against average values for patients' age and gender with colour coding to indicate deviations from normality.

QTUG™ is intended to assist those assessing falls risk, by providing a falls risk score (known as the **Falls Risk Estimate (FRE)**) and a frailty score (known as the **Frailty Estimate**) along with fast, accurate and objective data. QTUG™ also incorporates a questionnaire based on the American Geriatric Society (AGS) and British Geriatric Society (BGS) guidelines recording standard falls risk-factors.

Discover how QTUG™ can help you prevent falls now!

Click here to read the briefing note.





Depois da Queda

↓ Fatores de Risco
Intervenção



Atividade física, exercícios
físicos e cognitivos, educação,
riscos ambientais

Depois da Queda

Detecção Rápida e acionamento de socorro

→

Que tipo de queda?

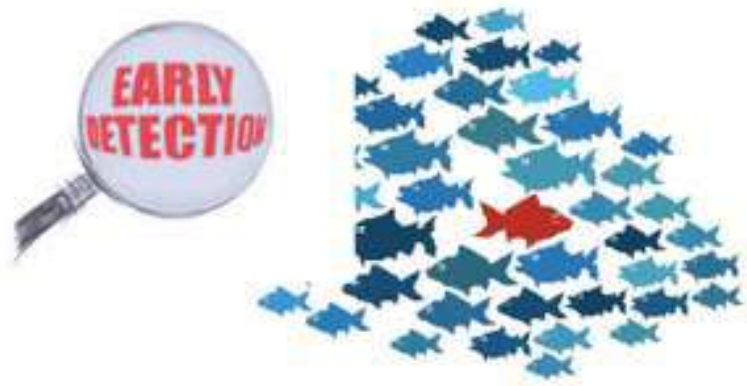
Falso positivos?

Processo de desencadeamento de Emergência – Roteiro

Cuidadores

Detectar precocemente:

- ↓ Custos (emergência, hospitalização, cuidados de longa duração)
- Cuidados mais efetivos e abrangentes em < tempo
- Tranquilidade para os cuidadores familiares
- Sensação de segurança e proteção para os idosos



Receber ajuda o mais breve possível



Evitar ficar por muito tempo no chão – idosos que mora sozinhos



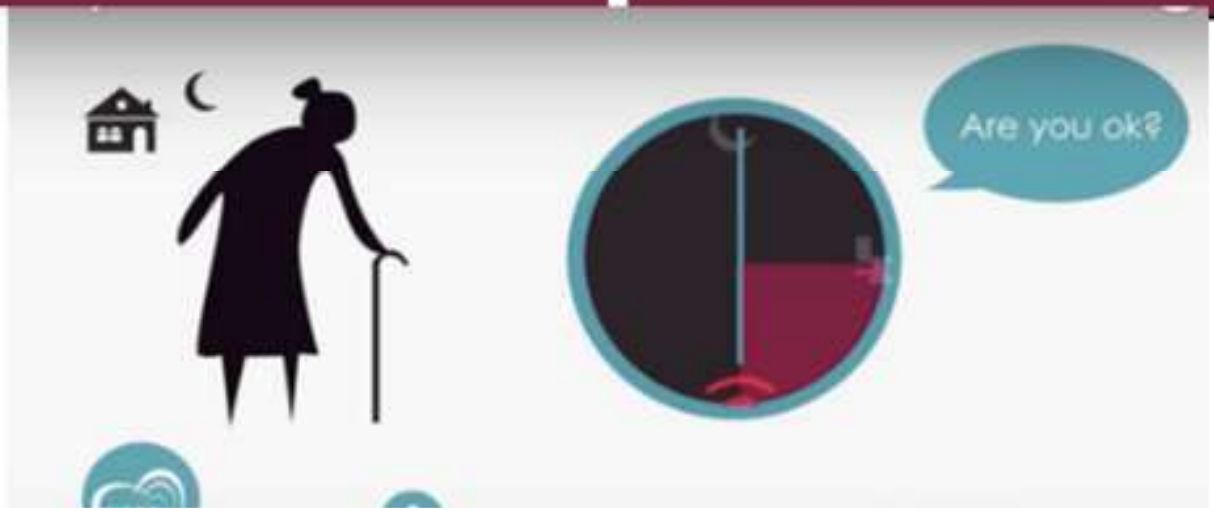

EMERGENCIA



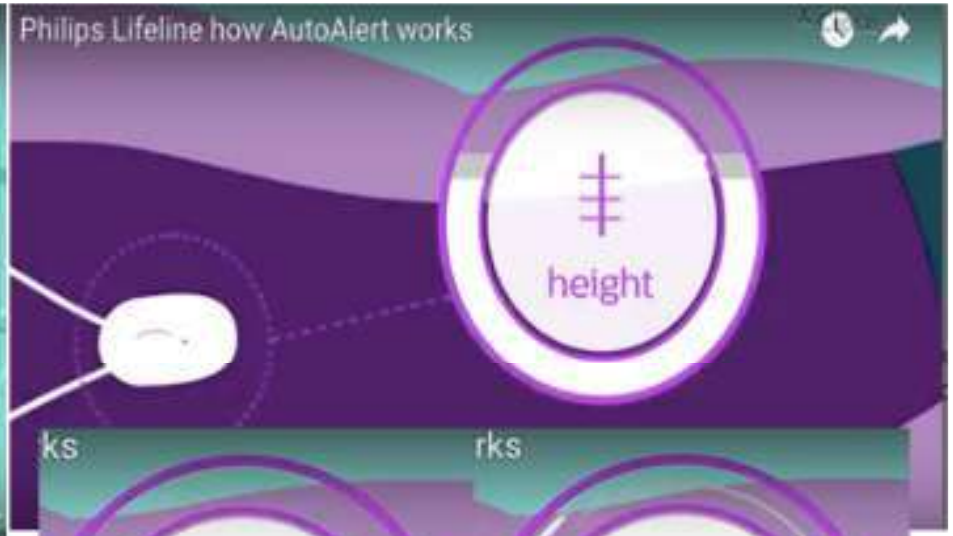
FATE - FAll DeTector for the Elderly















Accelerometers

These sensors will measure a high acceleration force when a fall occurs.

Barometric sensors

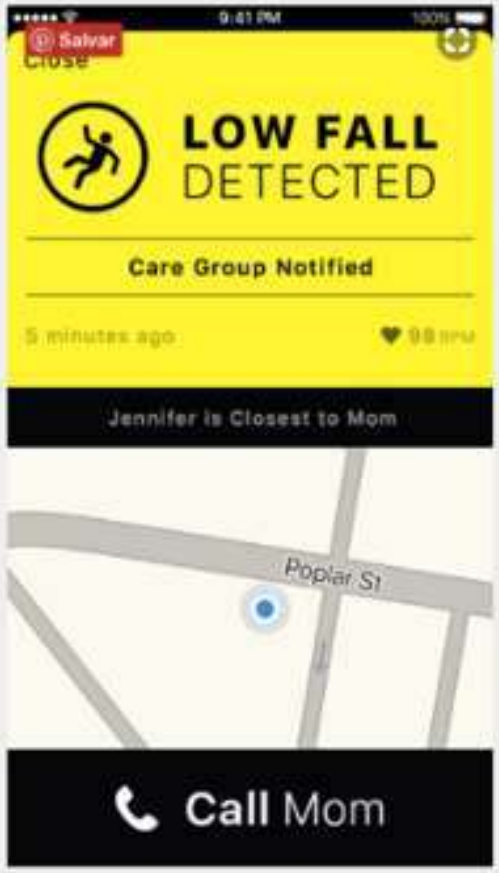
These highly sensitive sensors can detect a very small change in barometric pressure such as one from a standing position to laying on the floor.

A finely tuned algorithm

Our finely tuned algorithm differentiates between true falls and false alarms. It is the most important part of our AutoAlert technology.

FallCallNow

Home About Us News Corporat



An application that can distinguish between low altitude falls (i.e. sitting) vs. higher altitude falls(i.e. standing) and call for different levels of assistance (Caregivers and/or a central monitoring agency*)

Exercícios

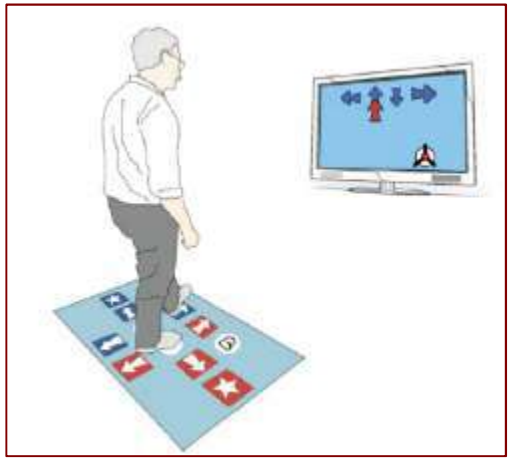
(diferentes plataformas: wiifit, xbox, sob-medida – 'bespoke')

Para melhora da funcionalidade – altamente heterogêneo


REVIEW Open Access

Virtual reality using games for improving physical functioning in older adults: a systematic review

- **Estudos com baixa evidência para prevenção de quedas usando RV (tamanho de amostra) Lord, Close Age and Ageing 2018**



Há evidência que exercícios com treino de stepping reduz quedas em até 48% (Okubo, Schoene, Lord. Step. Br J Sports Med 2017; 51: 586–93)

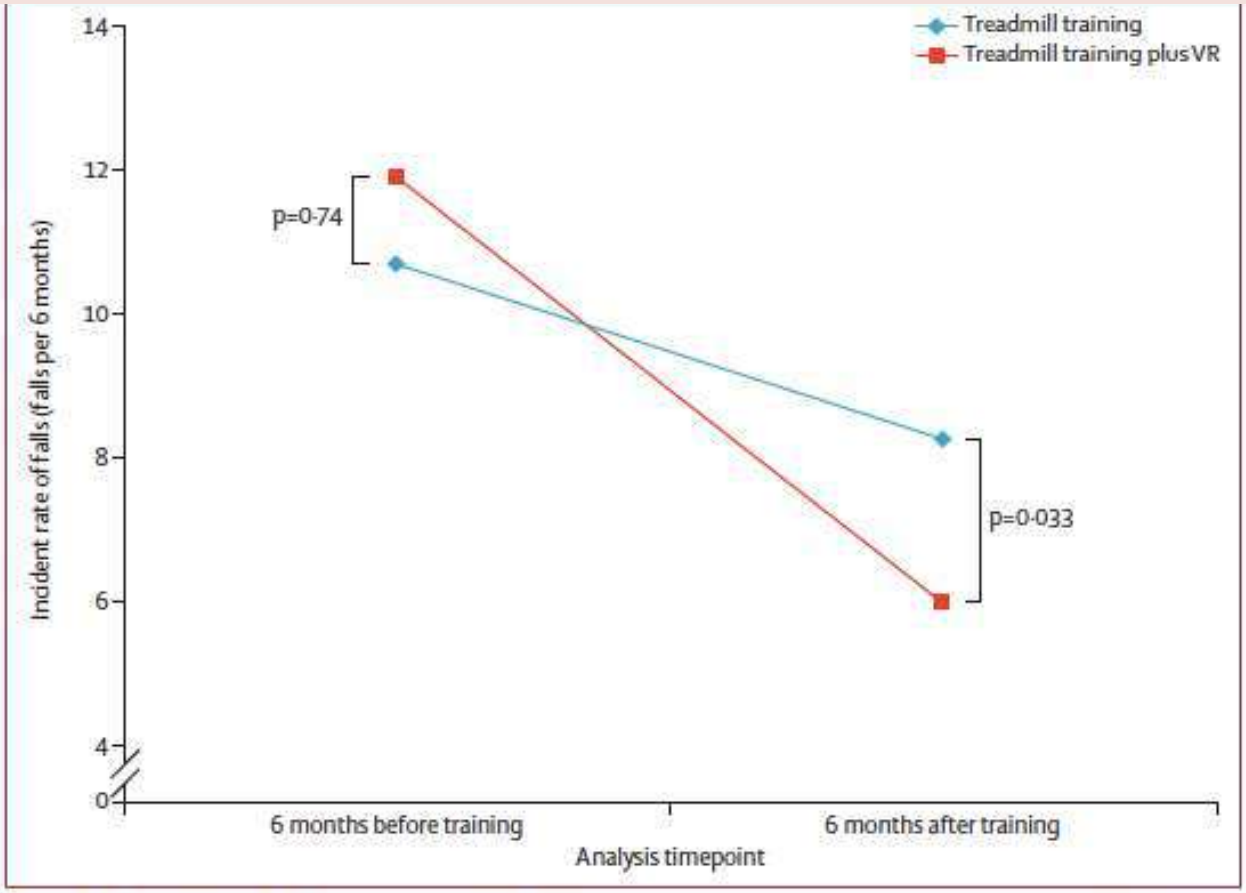
Schoene, Valenzuela, Lord , de Bruin. BMC Geriatr 2014

45’ (3x sem)
6 semanas



Figure 1: **Treadmill training with VR system**
The system includes a camera based motion capture (modified Microsoft Kinect) and a computer-generated simulation. The camera (red rectangle) records the movement of the participant's feet (the red rectangle) while they walk on the treadmill. These images are transferred into the computer simulation and projected to the patient in real time on a large screen during training (red rectangle). Progression of the intervention is modulated by the speed of the treadmill, the duration of the walking bouts within a given training session, and the size and frequency of the virtual obstacles and the distractors. Participants walked while wearing a safety harness to prevent falls during training. VR=non-immersive virtual reality.

	6 months before training				6 months after training			
	All participants	People with idiopathic falls	Mild cognitive impairment	Parkinson's disease	All participants	People with idiopathic falls	Mild cognitive impairment	Parkinson's disease
Incident rate of falls (95% CI)								
Treadmill training	10·71 (8·51–13·47)	3·23 (2·70–3·86)	2·85 (2·20–3·69)	19·23 (13·39–27·64)	8·27 (5·55–12·31)	0·89 (0·55–1·44)	1·28 (0·58–2·79)	16·48 (9·96–27·29)
Treadmill training plus VR	11·92 (9·47–15·01)	8·07 (5·67–11·49)	3·30 (2·64–4·14)	18·26 (12·79–26·07)	6·00 (4·36–8·25)	5·10 (2·65–9·80)	2·35 (1·11–4·96)	8·06 (5·55–11·71)
p value	0·29	0·0001	0·29	0·34	0·03	0·10	0·99	0·01



Treadmill training (n=136)	Treadmill training plus VR (n=146)

Addition of a non-immersive virtual reality component to treadmill training to reduce fall risk in older adults (V-TIME): a randomised controlled trial

Lancet, 2016

Figure 3: **Differences in fall incident rates within and between training groups before and after training**
95% CIs and incidence rates for the subgroups are shown in table 2. VR=non-immersive virtual reality.

Desafios:

- Melhorar o engajamento
- Melhorar a adesão a curto, medio e longo prazo
- Entregar programas em áreas remotas ou para idosos que não podem ir ao Centro de Reabilitação
- Aumentar a dose dos exercícios
- Idoso passa a ser agente do seu tratamento: percepção do seu risco
- Combinação de ações educativas
- Envolver outras pessoas: cuidadores familiares, amigos
- Interferir no ambiente

Desafios para criação de Plataformas Pré-Quedas

1: **Falta de pesquisa que desenvolva tecnologia para prevenir fatores de risco extrínsecos para idosos independentes**

2: **Falta de tecnologia que promova a educação para redução de fatores de risco**

Recommendação :Identificar aplicações baseadas em tecnologia para ajudar idosos e profissionais de saúde a lidar com fatores extrínsecos para quedas e intervenções educativas



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