

Examination of the Increased Risk for Falls Among Individuals with Knee Osteoarthritis: A CLSA Population-Based Study

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Objective

Present findings from our published work on the risk of falls among individuals with knee osteoarthritis using data from the CLSA

Examination of the Increased Risk for Falls Among Individuals With Knee Osteoarthritis: A Canadian Longitudinal Study on Aging Population-Based Study

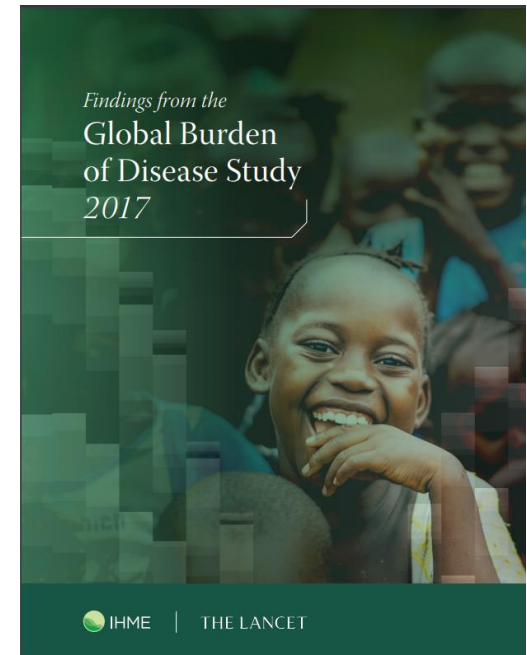
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Background

Burden of falls

- Global Burden of Diseases Study, 2017
 - 18th leading cause of disability-adjusted life years
 - 2nd leading cause of death due to unintentional injuries



Burden of falls in Canada

- Leading cause of hospitalizations and emergency department (ED) visits for injury and trauma¹
- 72% of ED visits for falls made by patients < 65 years
- 71% of hospitalizations for falls made by patients ≥ 65 years
- In 2018, falls accounted for \$10.3 billion, or 35%, of the total cost of injury²

How common are falls?

- 20-30% of Canadian seniors experience one or more falls per year¹
- 6% of Canadian seniors experience a serious injury resulting from a fall²

Risk factors for falls

Intrinsic Factors

Extrinsic Factors

Fall(s)

Behavioural Factors



Behavioural Factors

- Lack of physical activity
- Risk-taking behaviour
- Poor nutrition/hydration
- Alcohol intake
- Improper medication usage



Adobe Stock | #137718898

Extrinsic Factors

- Stairs and steps
- Tripping hazards
- Lack of adaptations
- Inappropriate walking aids
- Inappropriate footwear and clothing
- Poor lighting
- Unstable furniture



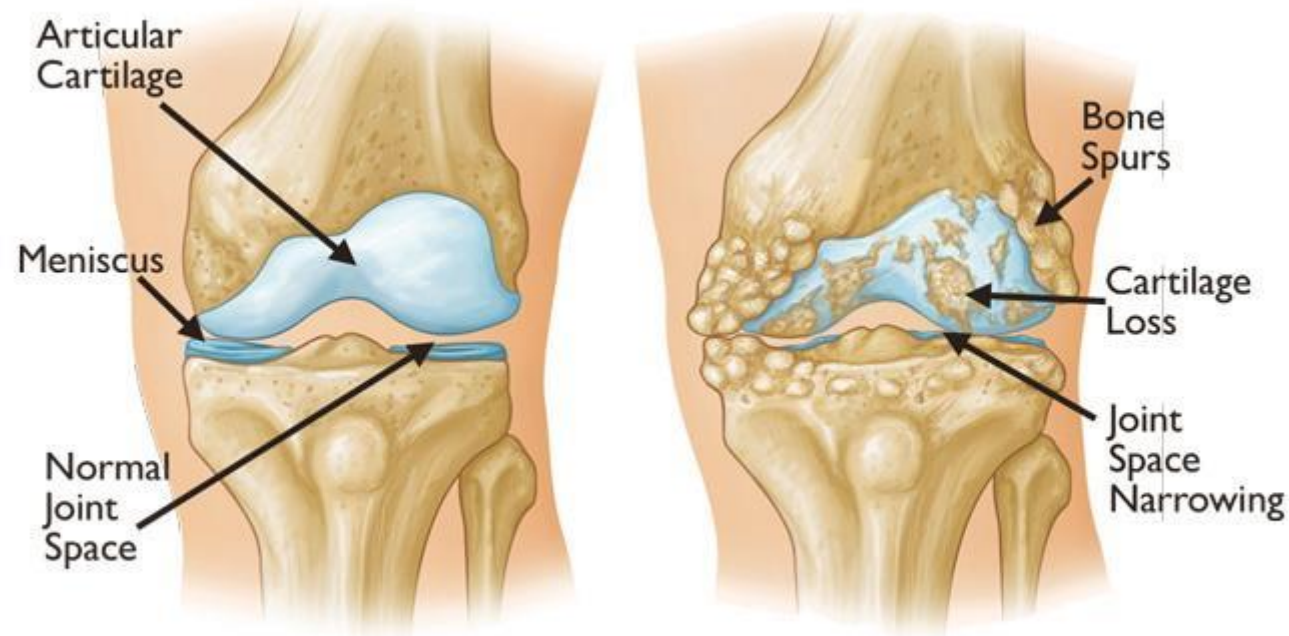
Intrinsic Factors

- Advanced age
- History of falls
- Previous fractures
- Impaired balance/gait
- Poor vision
- Pain
- Certain medications
- Certain comorbidities
 - e.g., Knee osteoarthritis (OA)



Knee OA

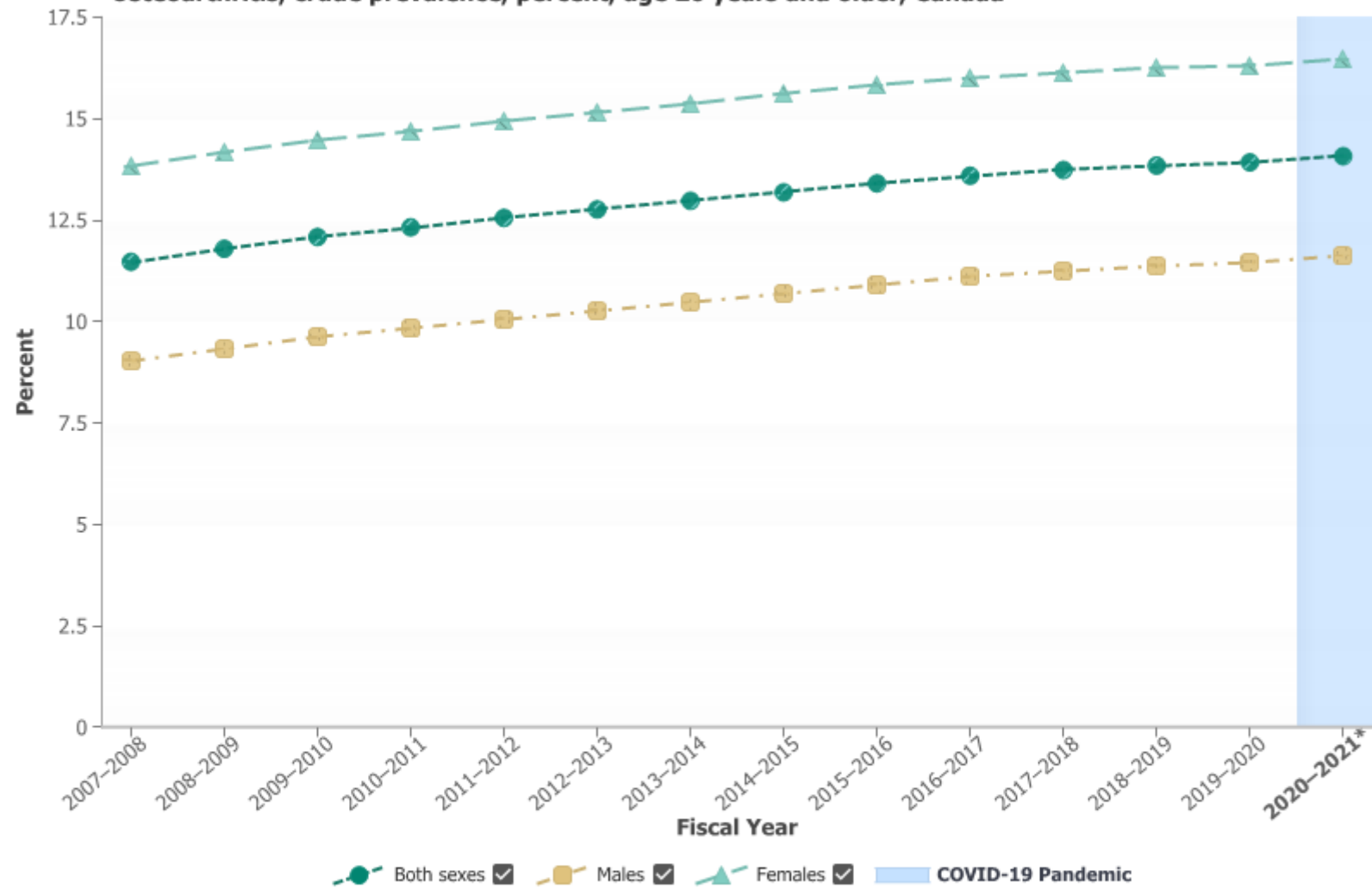
- Degenerative joint disease of the knee
- Results from the breakdown of cartilage in the knee



How common is knee OA?

- An estimated 15% of Canadian adults aged 20+ are diagnosed with OA¹
- Knee OA is the most common form of OA²
- Study in Alberta estimated the prevalence of knee OA to be about 11% for adults aged 18+³

Osteoarthritis, crude prevalence, percent, age 20 years and older, Canada



Source: Canadian Chronic Disease Surveillance System data files provided by provinces and territories, as of April 2023.
Public Health Agency of Canada, Health Infobase <https://health-infobase.canada.ca>

Important: For more information on the interpretation of the data please see the notes.

Knee OA and falls

- Knee OA is a known risk factor for falls
- Individuals with arthritis are more than 2x as likely to fall 2 or more times in a year¹
- Older adults with knee OA are at an increased risk of recurrent falls regardless of OA severity²
- The mechanisms and risk factors contributing to falls in individuals with knee OA is not yet fully understood

Knee OA and falls

- A recent review of risk factors for falls in individuals with knee OA yielded only a few articles that met inclusion criteria¹

Strong Evidence

Moderate Evidence

- Impaired balance
- ↓ knee muscle strength
- ↑ number of symptomatic joints
- Comorbidities

Limited Evidence

- Knee instability
- Use of walking aids
- Impaired proprioception

Conflicting Evidence

- Pain

Purpose of the current study

- Understand more about the nature of falls among individuals with knee OA using a Canadian population-based longitudinal study
 - Objective 1: To confirm knee OA as a risk factor for falling
 - Objective 2: To characterize the profile of risk factors for falling among those with and without knee OA
 - Objective 3: To examine the context surrounding a fall, including where and how the fall occurred
 - Objective 4: To identify risk factors that contribute to an individual with knee OA experiencing 2 or more falls

Methods

Data

- Baseline and 3-year follow-up (FUP1) of the Canadian Longitudinal Study on Aging (CLSA)
 - Comprehensive Cohort includes 30,097 individuals aged 45-85 years at baseline
- Analytic sample: 21,710 individuals with and without knee OA



Primary outcome

Injurious fall within the past 12 months at FUP1

- Answering **yes** to “In the last 12 months, have you had any injuries that were serious enough to limit some of your normal activities?”

AND

- Answering **yes** to “Was this injury (Were any of these injuries) caused by a fall?”

“Where did this fall happen?”

Inside of your
home

Outside of your
home, but
inside a building

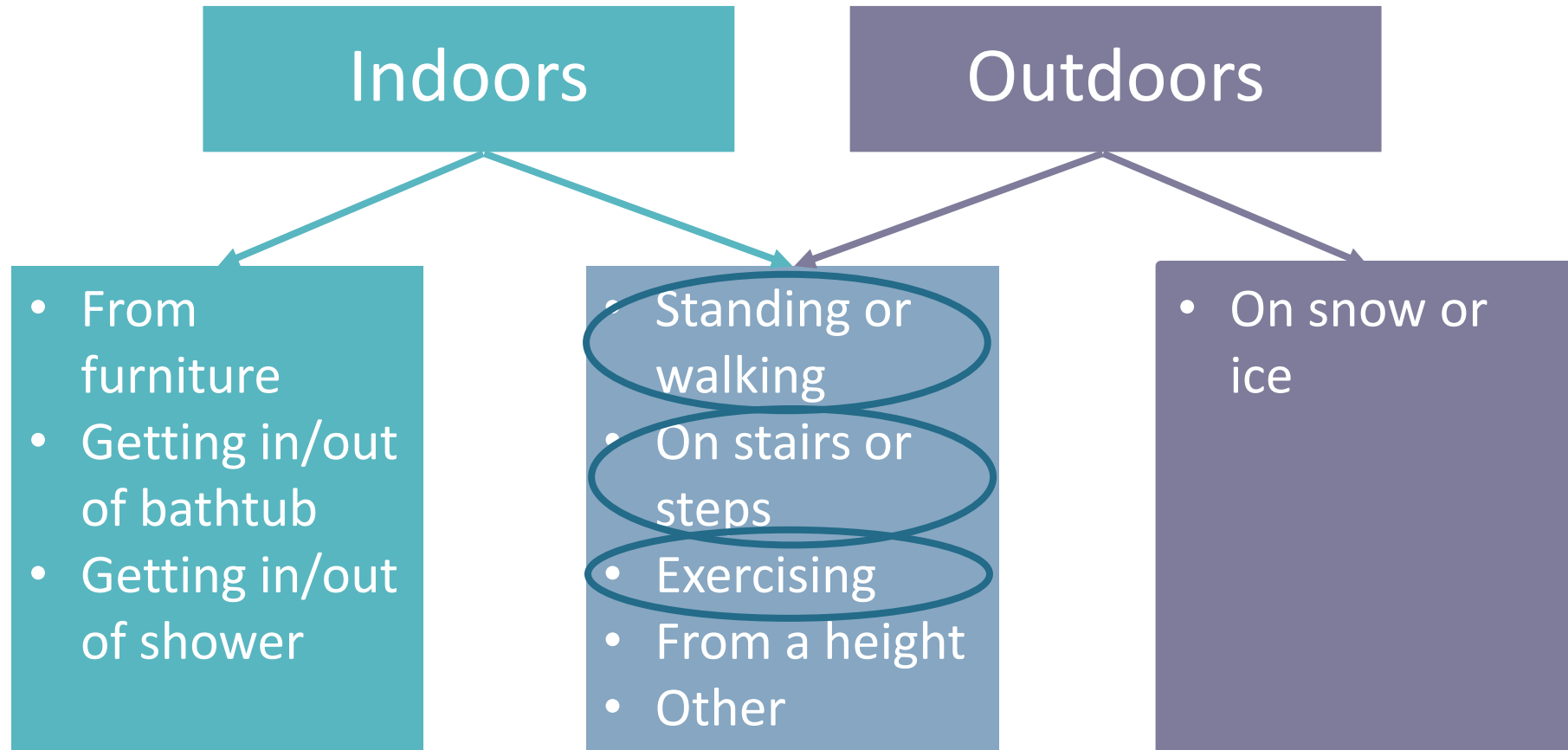
Outdoors

“Where did this fall happen?”

Indoors

Outdoors

“How did your fall happen?”



Predictors of interest

- Knee OA
- Injurious fall
- Age (45-54, 55-64, 65-74, 75-85 years)
- BMI (under/normal; overweight; obese)
- Alcohol use (≤ 1 /week, 2–5/week, and 6+/week)
- Knee symptoms
- Lower body fracture
- Self-rated vision (fair/poor, excellent/very good/good)
- Chronic conditions
- Physical performance

Chronic conditions

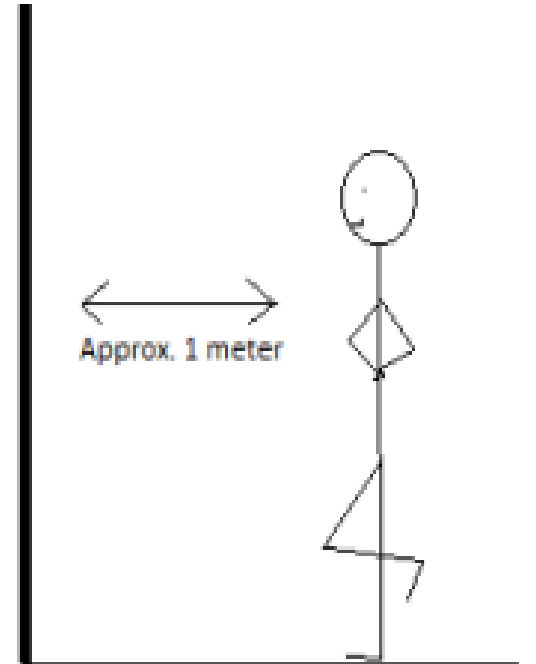
- Respiratory conditions
 - Chronic obstructive pulmonary disease, asthma
- Cardiovascular disease
 - CVD, heart disease, stroke, transient ischemic attack
- Urinary incontinence
- Neurologic conditions
 - Parkinson's disease, multiple sclerosis, epilepsy
- Diabetes mellitus
- High blood pressure
- Depression



Physical performance

Standing Balance Test

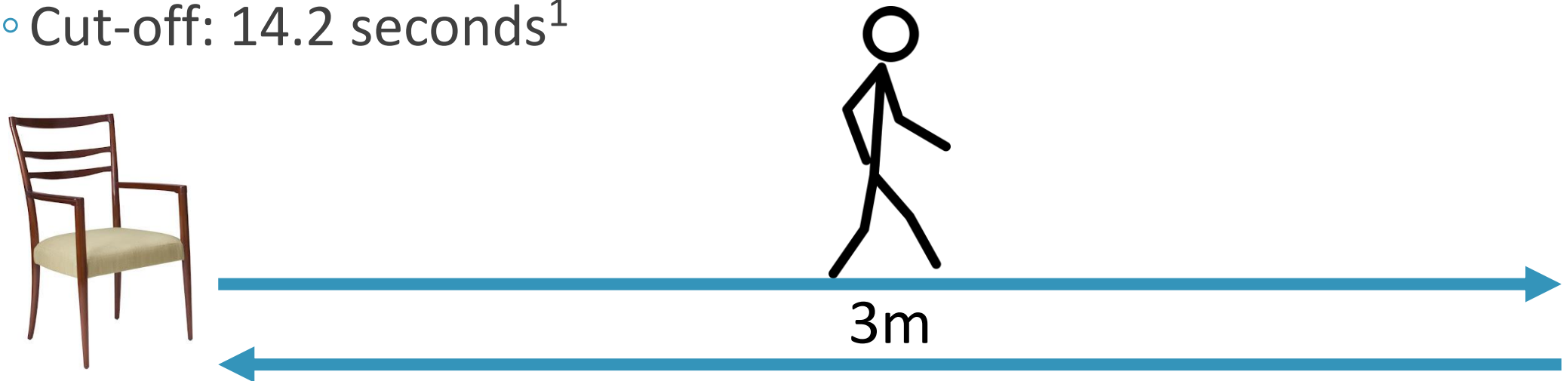
- The time (in seconds) is recorded for how long they are able to balance on one leg before their foot touches the ground or they lose their balance and touch the wall
- Cut-off: 4.5 seconds¹



Physical performance

Timed-Up-And-Go Test

- The time (in seconds) is recorded for how long it takes to stand up from an armchair, walk 3 meters, turn around, walk back to the chair and sit down again at their normal pace
- Cut-off: 14.2 seconds¹



Physical performance

Chair Rise Test

- The time (in seconds) is recorded for how long it takes to stand up from a chair and sit back down 5 times as quickly as possible with no rests in between
- Cut-off: 15.9 seconds¹



Findings

Characteristics of the sample

- 19% of the sample reported knee OA
 - Of those 4,112 individuals, 10% reported having at least one injurious fall
 - 6% reported 1 fall; 4% reported 2+ falls

Objective 1

TO CONFIRM KNEE OA AS A RISK FACTOR FOR FALLING

■ 1 fall ■ 2+ falls

14%
12%
10%
8%
6%
4%
2%
0%

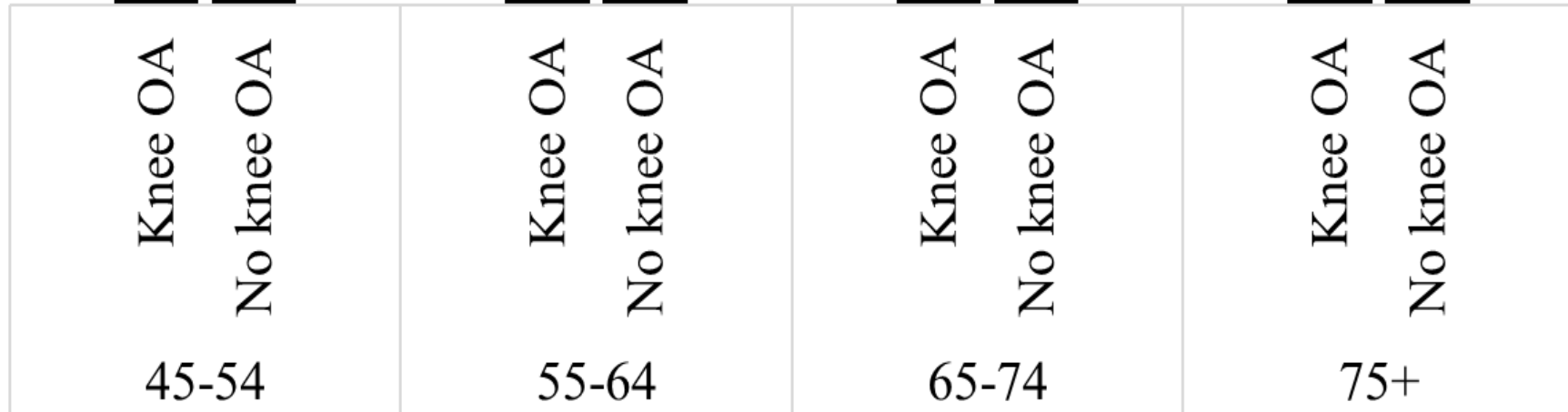


Table 1. Characteristics of individuals in the full analytic sample stratified by knee OA status, with comparisons between those who did and did not fall*

Baseline characteristics	Knee OA		No knee OA	
	Fallers (n = 394)	Nonfallers (n = 3,718)	Fallers (n = 1,005)	Nonfallers (n = 16,593)
Age group, years				
45-54	11.9	12.8	31.5	31.9
55-64				33.9
65-74				21.3
75-85				12.8
Female				45.2
Body mass index				
Underweight				33.0
Overweight				41.8
Obese				25.2
Alcohol use				
6+ times/week				16.7
2-5 times/week				33.2
0-1 times/week				50.1
Injurious fall				4.1†
Knee symptoms				18.7†
Lower limb pain				24.2†
Vision problem				6.4
Chronic conditions				
Respiratory				13.8†
Cardiovascular				12.0†
Urinary incontinence				5.7†
Neurological				2.0†
Diabetes				13.9
High blood pressure, yes	48.8	47.9	32.9	32.1
Depression, yes	24.6	20.1†	21.1	13.8†
Impaired performance				
One-leg balance <4.5 seconds	27.4	21.1†	14.2	9.2†
TUG time ≥14.2 seconds	10.8	7.0†	3.9	1.8†
Chair rise test ≥15.9 seconds	36.3	29.5†	21.4	18.2†

* Values are the percentage. OA = osteoarthritis; TUG = timed-up-and-go.

† Significant chi-square test comparing individuals who did and did not fall ($P < 0.05$).

Fallers are more likely to report at baseline an injurious fall, knee symptoms, lower body fracture, chronic conditions, and impaired physical performance

Table 2. Examination of the predictors of reporting an injurious fall, overall and among those with knee OA and without knee OA from the full analytic sample (outcome: fallers versus nonfallers)*

	Model 1 Full sample	Model 2 Knee OA	Model 3 No knee OA
Knee OA, yes (ref. no)	1.33 (1.14–1.56) [†]	–	–
Age, years (ref. 15–44)			
45–54	0.93 (0.76–1.13)	0.96 (0.62–1.48)	0.90 (0.71–1.14)
55–64			0.83 (0.66–1.05)
65–74			0.81 (0.64–1.03)
Female (ref. male)			1.55 (1.34–1.78) [†]
Body mass index (ref. underweight)			
Overweight			0.95 (0.81–1.11)
Obese			0.90 (0.75–1.09)
Alcohol use (ref. 0–1 times/week)			
6+ times/week			1.19 (0.98–1.44)
2–5 times/week			1.08 (0.93–1.26)
Baseline fall, yes (ref. no)			1.89 (1.47–2.42) [†]
Knee symptoms, yes (ref. no)			1.14 (0.97–1.35)
Lower fracture, yes (ref. no)			1.38 (1.20–1.60) [†]
Vision problems, yes (ref. no)			1.18 (0.92–1.52)
Respiratory, yes (ref. no)			1.16 (0.97–1.39)
Cardiovascular disease, yes (ref. no)			1.19 (0.97–1.47)
Urinary incontinence, yes (ref. no)			1.26 (0.98–1.62)
Neurologic, yes (ref. no)			1.38 (0.92–2.06)
Diabetes mellitus, yes (ref. no)	1.05 (0.89–1.24)	1.26 (0.96–1.67)	0.94 (0.76–1.16)
High blood pressure, yes (ref. no)	0.97 (0.85–1.11)	0.97 (0.76–1.24)	0.96 (0.82–1.13)
Depression, yes (ref. no)	1.40 (1.21–1.62) [†]	1.10 (0.83–1.46)	1.55 (1.31–1.83) [†]
One leg balance ≤4.5 seconds (ref. >4.5 seconds)	1.34 (1.12–1.60) [†]	1.18 (0.87–1.59)	1.47 (1.18–1.83) [†]
TUG time ≥14.2 seconds (ref. <14.2 seconds)	1.34 (0.96–1.86)	1.25 (0.78–2.01)	1.54 (0.97–2.44)
Chair rise test ≥15.9 seconds (ref. <15.9 seconds)	1.09 (0.94–1.26)	1.11 (0.85–1.44)	1.09 (0.92–1.30)

* Values are the odds ratio (95% confidence interval). OA = osteoarthritis; ref. = reference; TUG = timed-up-and-go.

[†] P < 0.05.

The risk of falling is significantly higher for individuals with knee OA compared to those without
OR = 1.33 (1.14-1.56)

Objective 2

TO CHARACTERIZE THE PROFILE OF RISK FACTORS FOR FALLING AMONG THOSE WITH AND WITHOUT KNEE OA

Table 2. Examination of the predictors of reporting an injurious fall, overall and among those with knee OA and without knee OA from the full analytic sample (outcome: fallers versus nonfallers)*

	Model 3 No knee OA
Knee OA, yes (ref. no)	-
Age, years (ref. 75-85)	
45-54	0.90 (0.71-1.14)
55-64	0.83 (0.66-1.05)
65-74	0.81 (0.64-1.03)
Female (ref. male)	1.55 (1.34-1.78)†
Body mass index (ref. underweight)	
Overweight	0.95 (0.81-1.11)
Obese	0.90 (0.75-1.09)
Alcohol use (ref. 0-1 times/week)	
6+ times/week	1.19 (0.98-1.44)
2-5 times/week	1.88 (0.99-3.20)
Baseline fall, yes (ref. no)	1.89 (1.47-2.42)†
Knee symptoms, yes (ref. no)	1.14 (0.97-1.35)
Lower fracture, yes (ref. no)	1.38 (1.20-1.60)†
Vision problems, yes (ref. no)	1.16 (0.92-1.52)
Respiratory, yes (ref. no)	1.16 (0.97-1.39)
Cardiovascular disease, yes (ref. no)	1.19 (0.97-1.47)
Urinary incontinence, yes (ref. no)	1.26 (0.98-1.62)
Neurologic, yes (ref. no)	1.38 (0.92-2.06)
Diabetes mellitus, yes (ref. no)	0.94 (0.76-1.16)
High blood pressure, yes (ref. no)	0.96 (0.82-1.13)
Depression, yes (ref. no)	1.55 (1.31-1.83)†
One leg balance ≤4.5 seconds	1.47 (1.18-1.83)†
TUG time ≥14.2 seconds	1.54 (0.97-2.44)
Chair rise test ≥15.9 seconds	1.09 (0.92-1.30)

Significant risk factors for both those with and without knee OA:

Baseline fall

OR_{KneeOA}: 1.75 (1.22-2.52)

OR_{NoKneeOA}: 1.89 (1.47-2.42)

Lower body fracture

OR_{KneeOA}: 1.42 (1.12-1.80)

OR_{NoKneeOA}: 1.38 (1.20-1.60)

* Values are the odds ratio (95% confidence interval). OA = osteoarthritis; ref. = reference; TUG = timed-up-and-go.

† P < 0.05.

Table 2. Examination of the predictors of reporting an injurious fall, overall and among those with knee OA and without knee OA from the full analytic sample (outcome: fallers versus nonfallers)*

	Model 1 Full sample	Model 2 Knee OA	Model 3 No knee OA
Knee OA, yes (ref. no)	1.99 (1.41-2.81)†	1.99 (1.41-2.81)†	-
Age, years (ref. 75-85)			
45-54			0.90 (0.71-1.14)
55-64			0.83 (0.66-1.05)
65-74			0.81 (0.64-1.03)
Female (ref. male)			1.55 (1.34-1.78)†
Body mass index (ref. un- derweight)			
Overweight			0.95 (0.81-1.11)
Obese			0.90 (0.75-1.09)
Alcohol use (ref. 0-1 time per week)			
6+ times/week			1.19 (0.98-1.44)
2-5 times/week			1.08 (0.93-1.26)
Baseline fall, yes (ref. no)			1.89 (1.47-2.42)†
Knee symptoms, yes (ref. no)			1.14 (0.97-1.35)
Lower fracture, yes (ref. no)			1.38 (1.20-1.60)†
Vision problems, yes (ref. no)			1.18 (0.92-1.52)
Respiratory, yes (ref. no)			1.16 (0.97-1.39)
Cardiovascular disease, yes (ref. no)			1.13 (0.97-1.31)
Urinary incontinence, yes (ref. no)			1.26 (0.98-1.62)
Neurologic, yes (ref. no)			1.38 (0.92-2.06)
Diabetes mellitus, yes (ref. no)			0.94 (0.75-1.16)
High blood pressure, yes (ref. no)			0.96 (0.82-1.13)
Depression, yes (ref. no)			1.55 (1.31-1.83)†
One leg balance ≤4.5 seconds (ref. >4.5 seconds)	1.34 (1.12-1.60)†	1.18 (0.87-1.59)	1.47 (1.18-1.83)†
TUG time ≥14.2 seconds (ref. <14.2 seconds)	1.34 (0.96-1.86)	1.25 (0.78-2.01)	1.54 (0.97-2.44)
Chair rise test ≥15.9 seconds (ref. <15.9 seconds)	1.09 (0.94-1.26)	1.11 (0.85-1.44)	1.09 (0.92-1.30)

* Values are the odds ratio (95% confidence interval). OA = osteoarthritis; ref. = reference; TUG = timed-up-and-go.

† P < 0.05.

Significant risk factors for those with knee OA:

Urinary incontinence
OR_{KneeOA}: 1.38 (1.01-1.88)

Neurologic condition
OR_{KneeOA}: 2.13 (1.18-3.87)

Table 2. Examination of the predictors of reporting an injurious fall, overall and among those with knee OA and without knee OA from the full analytic sample (outcome: fallers versus nonfallers)*

	Model 3 No knee OA
Knee OA, yes (ref. no)	-
Age, years (ref. 75-85)	
45-54	0.90 (0.71-1.14)
55-64	0.83 (0.66-1.05)
65-74	0.81 (0.64-1.02)
Female (ref. male)	1.55 (1.34-1.78)†
Body mass index (ref. normal)	
Overweight	0.95 (0.81-1.11)
Obese	0.90 (0.75-1.09)
Alcohol use (ref. 0-1 times/week)	
6+ times/week	1.19 (0.98-1.44)
2-5 times/week	1.08 (0.93-1.26)
Baseline fall, yes (ref. no)	1.89 (1.47-2.42)†
Knee symptoms, yes (ref. no)	1.14 (0.97-1.35)
Lower fracture, yes (ref. no)	1.38 (1.20-1.60)†
Vision problems, yes (ref. no)	1.18 (0.92-1.52)
Respiratory, yes (ref. no)	1.16 (0.97-1.39)
Cardiovascular disease, yes (ref. no)	1.19 (0.97-1.47)
Urinary incontinence, yes (ref. no)	1.26 (0.98-1.62)
Neurologic, yes (ref. no)	1.38 (0.92-2.06)
Diabetes mellitus, yes (ref. no)	0.94 (0.76-1.16)
High blood pressure, yes (ref. no)	0.98 (0.82-1.17)
Depression, yes (ref. no)	1.55 (1.31-1.83)†
One leg balance ≤4.5 sec (ref. >4.5 sec)	1.47 (1.18-1.83)†
TUG time ≥14.2 seconds (ref. <14.2 sec)	1.54 (0.97-2.44)
Chair rise test ≥15.9 seconds (ref. <15.9 sec)	1.09 (0.92-1.30)

Significant risk factors for those without knee OA:

Female
 $OR_{NoKneeOA}: 1.55 (1.34-1.78)$

Depression
 $OR_{NoKneeOA}: 1.55 (1.31-1.83)$

Impaired balance
 $OR_{NoKneeOA}: 1.47 (1.18-1.83)$

* Values are the odds ratio (95% confidence interval). OA = osteoarthritis; rel. = reference; TUG = timed-up-and-go.

† $P < 0.05$.

Objective 3

TO EXAMINE THE CONTEXT SURROUNDING A FALL,
INCLUDING WHERE AND HOW THE FALL OCCURRED

Table 3. Where and how falls occurred among those who experienced a fall, by OA status*

Where and how fall occurred	Knee OA	No knee OA
Indoors†	46.8	38.7
Standing or walking‡	48.4	35.7
On the stairs or steps	17.9	27.0
Exercising	6.0	9.0
Other	27.7	28.3
Outdoors	53.2	61.3
Standing or walking§	41.6	32.0
On the stairs or steps	12.9	9.3
Exercising	8.6	12.4
Other	36.8	46.3

* Values are the percentage. OA = osteoarthritis.

† Significant chi-square test comparing the location of a fall between those with and without knee OA ($P < 0.05$).

‡ Significant chi-square test comparing how an indoor fall occurred between those with and without knee OA ($P < 0.05$).

§ Significant chi-square test comparing how an outdoor fall occurred between those with and without knee OA ($P < 0.05$).

Table 3. Where and how falls occurred among those who experienced a fall, by OA status*

Where and how fall occurred	Knee OA	No knee OA
Indoors†	46.8	38.7
Standing or walking‡	48.4	35.7
On the stairs or steps	17.9	27.0
Exercising	6.0	9.0
Other	27.7	28.3
Outdoors	53.2	61.3
Standing or walking§	41.6	32.0
On the stairs or steps	12.9	9.3
Exercising	8.6	12.4
Other	36.8	46.3

* Values are the percentage. OA = osteoarthritis.

† Significant chi-square test comparing the location of a fall between those with and without knee OA ($P < 0.05$).

‡ Significant chi-square test comparing how an indoor fall occurred between those with and without knee OA ($P < 0.05$).

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Exercising	6.0	9.0
Other	27.7	28.3
Outdoors	53.2	61.3
Standing or walking§	41.6	32.0
On the stairs or steps	12.9	9.3
Exercising	8.6	12.4
Other	36.8	46.3

* Values are the percentage. OA = osteoarthritis.

† Significant chi-square test comparing the location of a fall between those with and without knee OA ($P < 0.05$).

‡ Significant chi-square test comparing how an indoor fall occurred between those with and without knee OA ($P < 0.05$).

§ Significant chi-square test comparing how an outdoor fall occurred between those with and without knee OA ($P < 0.05$).

Objective 4

TO IDENTIFY RISK FACTORS THAT CONTRIBUTE TO AN INDIVIDUAL WITH KNEE OA EXPERIENCING 2 OR MORE FALLS

■ 1 fall ■ 2+ falls

14%
12%
10%
8%
6%
4%
2%
0%

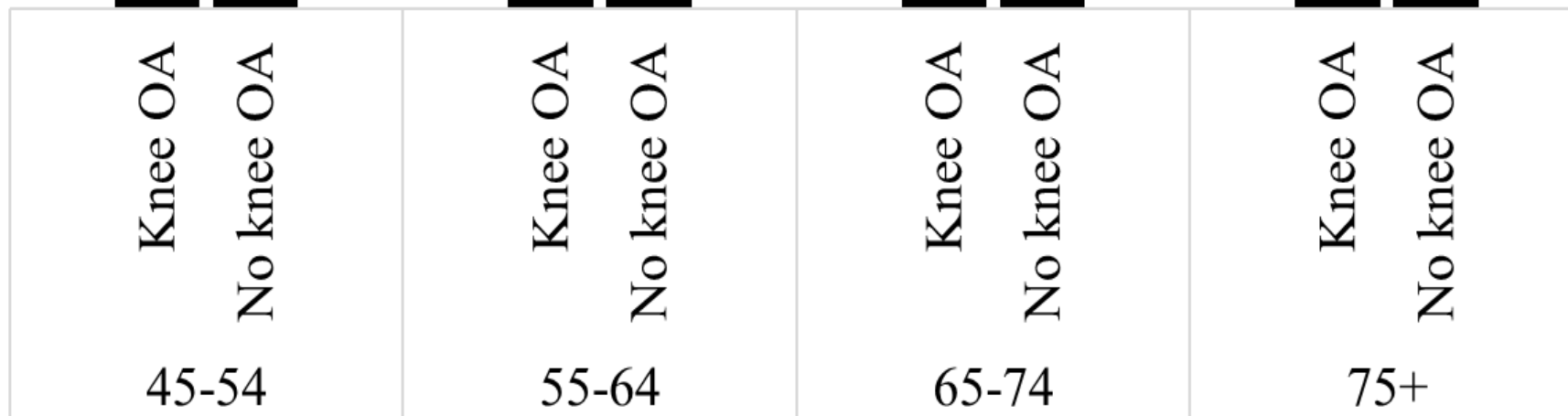


Table 4. Characteristics among individuals with knee osteoarthritis by number of falls reported*

Baseline characteristic	0 falls (n = 3,718)	1 fall (n = 247)	2+ falls (n = 147)
Sociodemographic, health, and lifestyle variables			
Age group			
45–54	12.8	10.9	13.6
55–64	32.6	32.0	32.0
65–74			26.5
75–85			27.9
Female			65.3
Body mass index			
Underweight			16.8
Overweight			32.9
Obese			50.4
Alcohol use			
6+ times/week			12.0
2–5 times/week			31.0
0–1 times/week			57.0
Injurious fall, yes			21.2
Knee symptoms, yes			83.0
Lower limb fracture, yes			49.7
Vision problem, yes			9.5
Chronic conditions, yes			
Respiratory, yes			34.5
Cardiovascular, yes			23.6
Urinary incontinence, yes			26.7
Neurologic, yes			9.0
Diabetes mellitus, yes			26.5
High blood pressure, yes	47.9	47.5	51.0
Depression, yes†	20.1	21.5	29.9
Impaired performance			
One leg balance ≤4.5 seconds†	21.1	20.1	40.6
TUG time ≥14.2 seconds†	7.0	5.7	19.4
Chair rise test ≥15.9 seconds†	29.5	32.4	43.2

Individuals with knee OA who reported 2+ falls were more likely to report a previous injurious fall, knee symptoms, a lower body fracture, and impaired physical performance

* Values are the percentage. TUG = timed-up-and-go.

† Significant chi-square test comparing groups ($P < 0.05$).

Table 5. Partial proportional odds model identifying contributors to the risk of falling among individuals with knee osteoarthritis*

Baseline characteristics	Proportional OR	Partial proportional OR	
		2+ or 1 vs. 0 falls	2+ vs. 1 or 0 falls
Age, years (ref. 75–85)			
45–54			–
55–64			–
65–74			–
Female (ref. male)			–
Body mass index (ref. underweight)			
Overweight			–
Obese			–
Alcohol use (ref. 0–1 times/week)			
2–5 times/week			–
6+ times/week			–
Baseline fall, yes (ref. no)			2.48 (1.53–4.04)†
Lower fracture, yes (ref. no)			–
Respiratory, yes (ref. no)			1.55 (1.03–2.32)†
Urinary incontinence, yes (ref. no)			–
Neurologic, yes (ref. no)			3.67 (1.77–7.59)†
Diabetes mellitus, yes (ref. no)			–
High blood pressure, yes (ref. no)			–
Depression, yes (ref. no)			–
One leg balance ≤4.5 seconds (ref. >4.5 seconds)		1.17 (0.67–1.97)	1.82 (1.20–2.77)†
TUG time ≤11.2 seconds (ref. >11.2 seconds)	1.28 (0.81–2.07)	–	–
Chair rise test ≥15.9 seconds (ref. <15.9 seconds)	1.10 (0.85–1.44)	–	–

* Values are the odds ratio (OR) (95% confidence interval). ref. = reference; TUG = timed-up-and-go.

† $P < 0.05$.

Significant risk factors for having one or more falls:

Lower body fracture
OR_C: 1.42 (1.12–1.80)

Urinary incontinence
OR_C: 1.38 (1.01–1.88)

Table 5. Partial proportional odds model identifying contributors to the risk of falling among individuals with knee osteoarthritis*

Baseline characteristic	Partial proportional OR	
	1+ vs. 0 falls	2+ vs. 1 or 0 falls
Age, years (ref. 75-85)		
45-54	-	-
55-64	-	-
65-74	-	-
Female (ref. male)	-	-
Body mass index (ref. underweight)		
Overweight	-	-
Obese	-	-
Alcohol use (ref. 0-1 times/week)		
2-5 times/week	-	-
6+ times/week	-	-
Baseline fall, yes (ref. no)	1.75 (1.21-2.51)	2.48 (1.53-4.04)†
Lower fracture, yes (ref. no)	-	-
Respiratory, yes (ref. no)	1.55 (1.03-2.32)†	-
Urinary incontinence, yes (ref. no)	-	-
Neurologic, yes (ref. no)	2.08 (1.14-3.78)	3.67 (1.77-7.59)†
Diabetes mellitus, yes (ref. no)	-	-
High blood pressure, yes (ref. no)	-	-
Depression, yes (ref. no)	-	-
One leg balance ≤4.5 seconds (ref. >4.5 seconds)	2.08 (1.14-3.78)	1.82 (1.20-2.77)†
TUG time ≥14.9 seconds (ref. <14.9 seconds)	-	-
Chair rise test ≥15.9 seconds (ref. <15.9 seconds)	-	-

Significant risk factors for having one or more falls:

Baseline Fall
 OR_{1+Falls v. 0}: 1.75 (1.21-2.51)
 OR_{2+Falls v. 0 or 1}: 2.48 (1.53-4.04)

Neurologic condition
 OR_{1+Falls v. 0}: 2.08 (1.14-3.78)
 OR_{2+Falls v. 0 or 1}: 3.67 (1.77-7.59)

* Values are the odds ratio (OR) (95% confidence interval). ref. = reference; TUG = timed-up-and-go.
 † P < 0.05.

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Age, years (ref. 75-85)		
45-54	-	-
55-64	-	-
65-74	-	-
Female (ref. male)	-	-
Body mass index (ref. underweight)		
Overweight	-	-
Obese	-	-
Alcohol use (ref. 0-1 times/week)		
2-5 times/week	-	-
6+ times/week	-	-
Baseline fall, yes (ref. no)	2.48 (1.53-4.04)†	2.48 (1.53-4.04)†
Lower fracture, yes (ref. no)	-	-
Respiratory, yes (ref. no)	1.55 (1.03-2.32)†	1.55 (1.03-2.32)†
Urinary incontinence, yes (ref. no)	-	-
Neurologic, yes (ref. no)	3.67 (1.77-7.59)†	3.67 (1.77-7.59)†
Diabetes mellitus, yes (ref. no)	-	-
High blood pressure, yes (ref. no)	-	-
Depression, yes (ref. no)	-	-
One leg balance ≤4.5 seconds (ref. >4.5 seconds)	1.82 (1.20-2.77)†	1.82 (1.20-2.77)†
TUG time ≥14.9 seconds (ref. <14.9 seconds)	-	-
Chair rise test ≥15.9 seconds (ref. <15.9 seconds)	-	-

Significant risk factors for having multiple falls:

Respiratory condition
 OR_{1+Falls v. 0}: 1.22 (0.94-1.59)
 OR_{2+Falls v. 0 or 1}: **1.55 (1.03-2.32)**

Impaired balance
 OR_{1+Falls v. 0}: 1.17 (0.87-1.57)
 OR_{2+Falls v. 0 or 1}: **1.82 (1.20-2.77)**

* Values are the odds ratio (OR) (95% confidence interval). ref. = reference; TUG = timed-up-and-go.

† P < 0.05.

Letter to the Editor

Arthritis Care & Research

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Factors affecting the risk of falling in people with knee osteoarthritis: comment on the article by Wilfong et al

Chun-Chieh Chen, Yuan-Ti Lee, Shiu-an-Chih Chen 

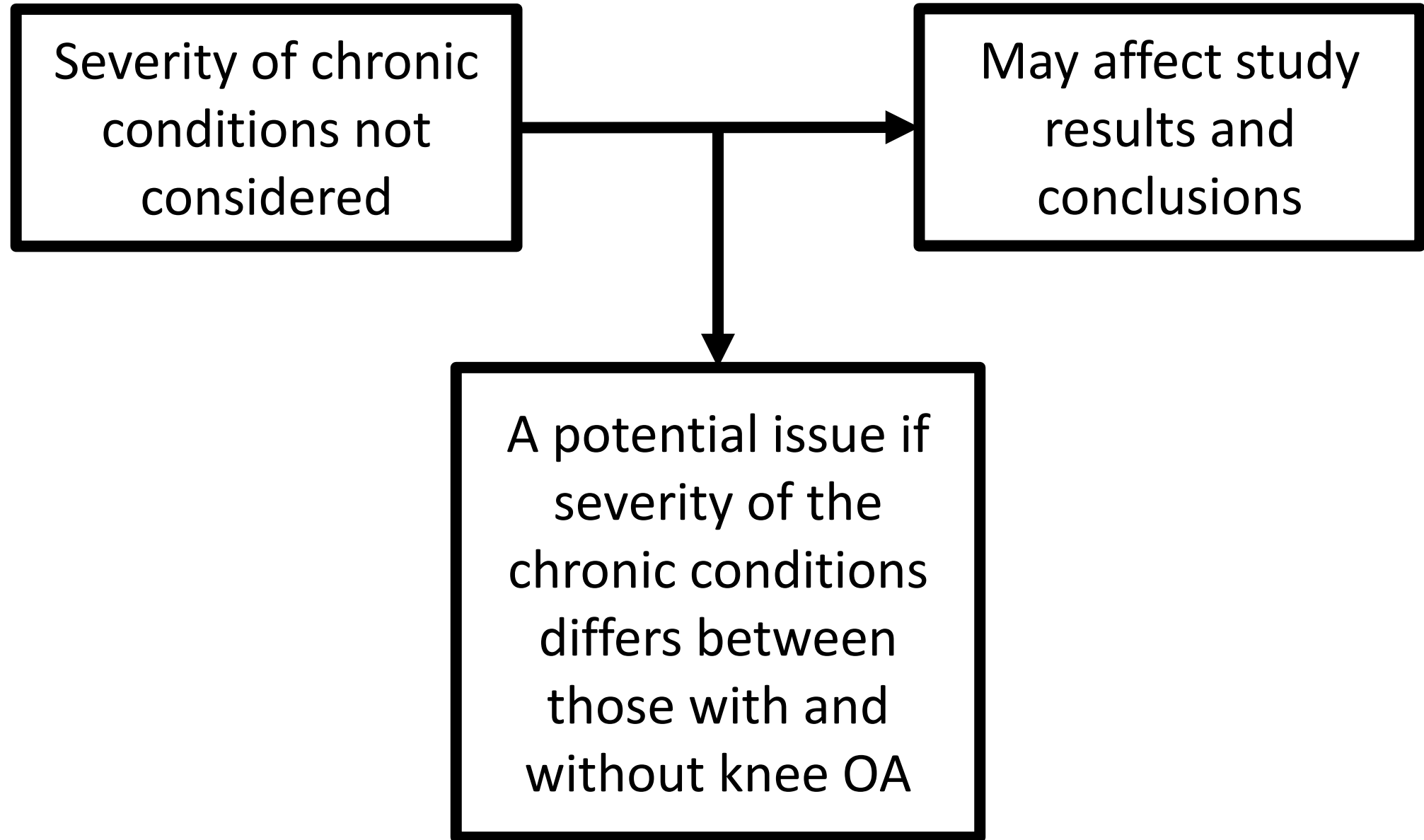
Arthritis Care & Research

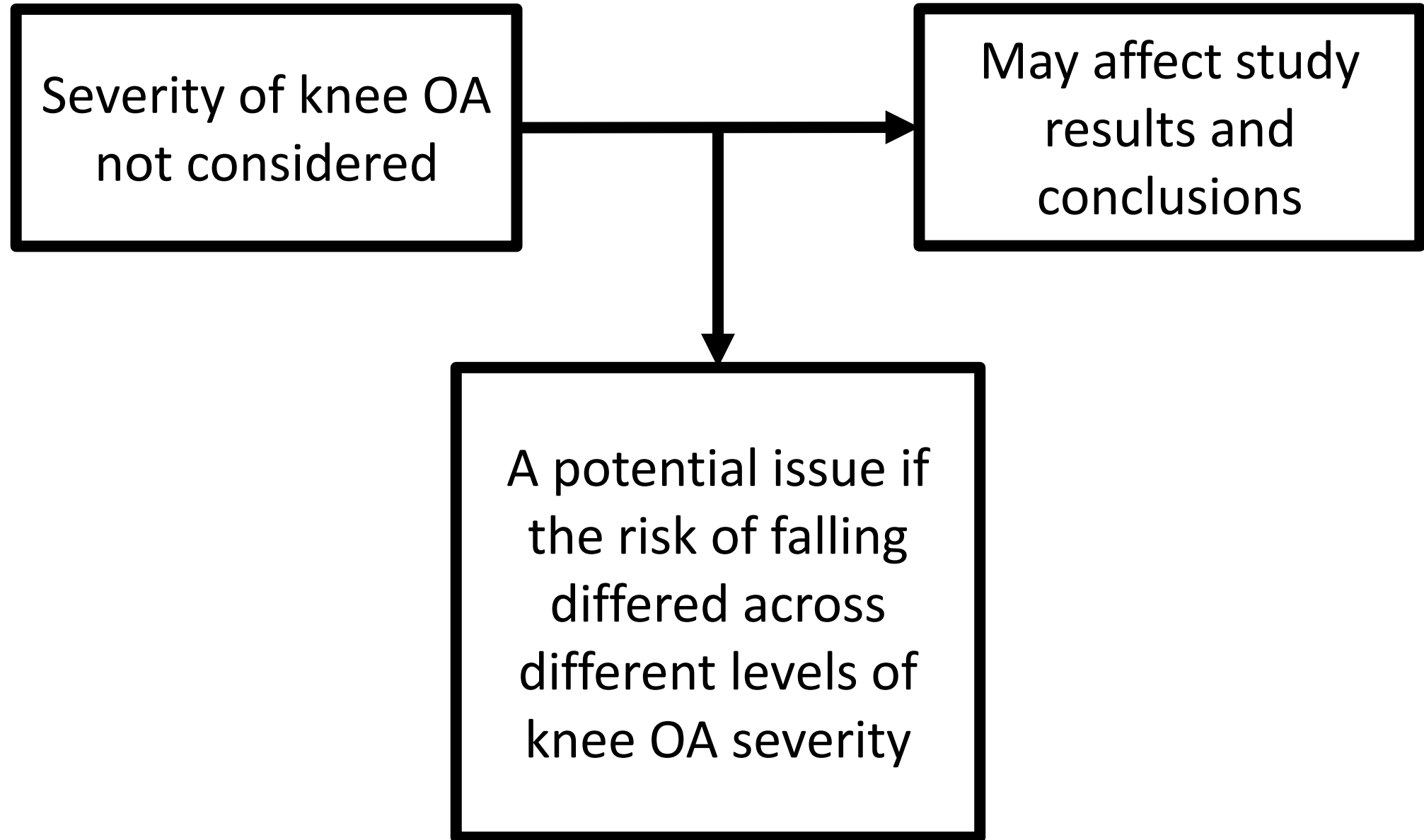
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Reply

Anthony V. Perruccio  Jessica M. Wilfong, Elizabeth M. Badley





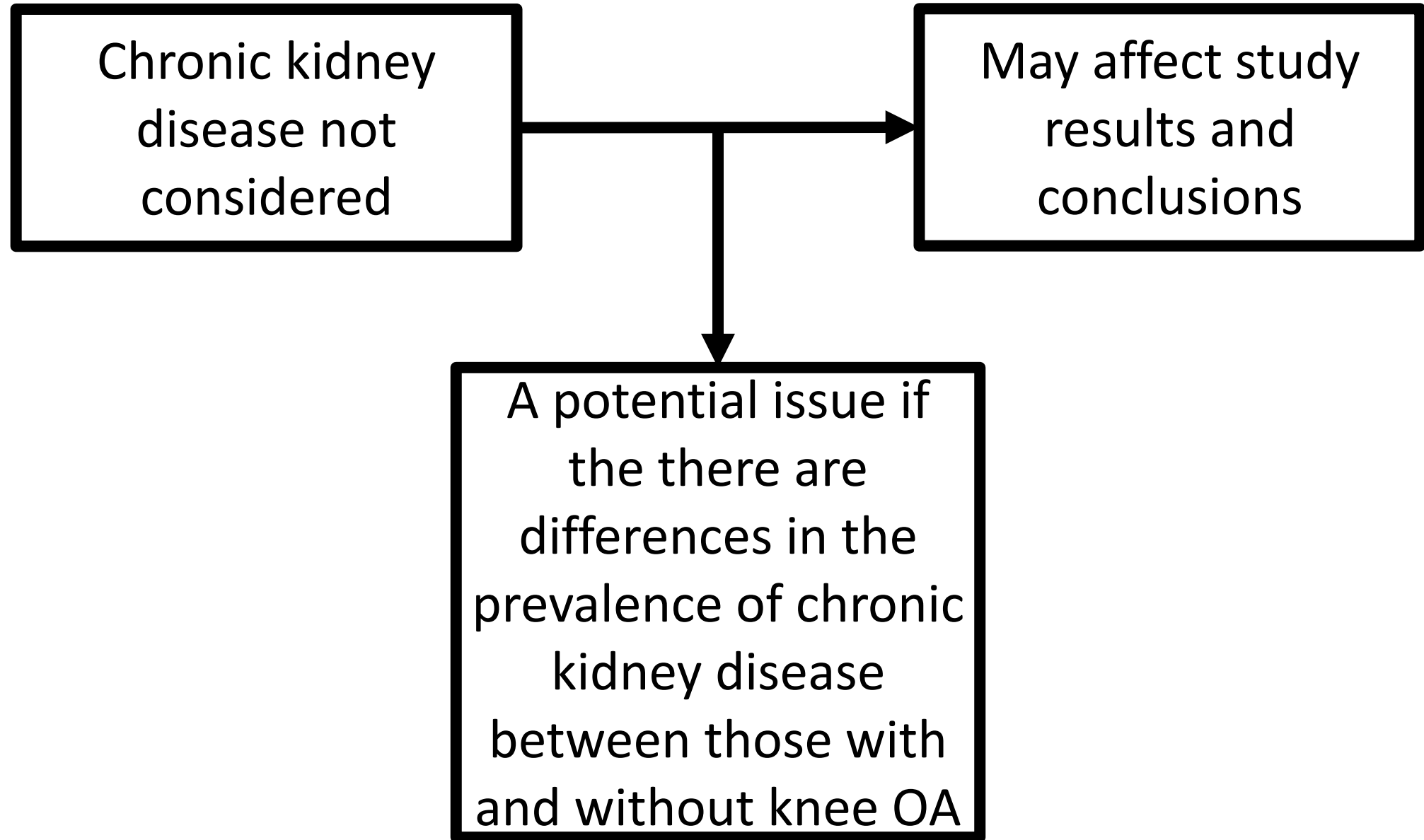


Table 1. Examination of the predictors of reporting an injurious fall in the overall sample (outcome: reported fall(s) vs. no reported fall)*

Model Variables	Variable Category	Model 1 OR (95% CI)	Model 2 OR (95% CI)
Knee OA (ref. No)			1.32 (1.12–1.54)†
Age (ref. 75–85)			0.95 (0.76–1.15)
			0.88 (0.73–1.07)
			0.85 (0.70–1.03)
Sex (ref: male)			1.44 (1.28–1.63)†
BMI (ref. underweight)			0.97 (0.84–1.11)
			0.87 (0.74–1.03)
Alcohol use (0–1 times/week)			1.19 (1.01–1.40)†
			1.10 (0.97–1.26)
Baseline fall (ref. No)			1.86 (1.52–2.28)†
Knee symptoms (ref. No)			1.13 (0.98–1.29)
Lower fracture (ref. No)			1.38 (1.22–1.57)†
Vision problems (ref. No)			1.11 (0.89–1.37)
Respiratory (ref. No)			1.16 (1.00–1.34)†
CVD (ref. No)			1.13 (0.95–1.34)
Urinary incontinence (ref. No)			1.28 (1.05–1.55)†
Neurological (ref. No)			1.61 (1.16–2.24)†
Diabetes mellitus (ref. No)			1.03 (0.87–1.22)
High blood pressure (ref. No)			0.97 (0.85–1.10)
Depression (ref. No)			1.40 (1.21–1.62)†
One leg balance (ref. No)			1.33 (1.11–1.59)†
TUG time (ref. <14.2s)			1.33 (0.96–1.85)
Chair rise test (ref. <15s)			1.08 (0.92–1.25)
Chronic kidney disease (ref. No)	Yes	–	1.55 (1.15–2.09)†

Chronic kidney disease is a significant risk factor for falling
 OR= 1.55 (1.15-2.09)
 The risk of falling remains significantly higher for individuals with knee OA compared to those without
 OR = 1.32 (1.12-1.54)

* 95% CI = 95% confidence interval; CVD = cardiovascular disease; OA = osteoarthritis; OR = odds ratio; ref = reference; TUG = Timed-Up-and-Go.

† P < 0.05.

Strengths

- The use of a large longitudinal population-based sample (CLSA)
 - Allows for the inclusion of adults with knee OA across a wide range of ages from middle aged to elderly adults
- The ability to stratify by number of falls

Limitations

- Self-reported nature of the questions about falls
 - Individuals with poorer cognitive function are less likely to recall falling in the previous 12 months
- Self-reported nature of the question about knee OA
- Unable to assess the contribution of extrinsic or behavioural factors
- The use of a very specific definition for falls

Conclusions

Summary of our findings

- Knee OA is an independent risk factor for experiencing 1 or more injurious falls
- Urinary incontinence and neurologic conditions were unique risk factors for falling among those with knee OA
- It is important to consider environmental factors when assessing the risk of falling among those with knee OA
- The fall risk profile differs for those with knee OA who experience multiple falls

Thank you!

