

Supplementary Material

Supplementary Table 1: PICOS criteria to guide the systematic review

Population	Community-dwelling adults; and among those, the subgroup with OAB or urgency incontinence. Those with urinary incontinence, stress incontinence, nocturia, frequency, urgency incontinence, or OAB were included in a sensitivity analysis.
Interventions/ Comparators	Not applicable.
Outcomes	Estimates of the risk or rate of: <ul style="list-style-type: none">• Falls• Serious or recurrent falls• Fractures Among those who have fallen or experienced a fracture, the unadjusted attributable risk of falls due to OAB or its symptoms
Study Design	<ul style="list-style-type: none">• Prospective cohort studies / registries• Retrospective cohort studies / database studies

Supplementary Table 2: Medline/EMBASE search strategy (1985-2018)

	Search term
1	nocturia.mp,hw,tw. or Nocturia/
2	Overactive bladder.mp,hw,tw. or Urinary Bladder, Overactive/
3	urinary incontinence.mp,hw,tw. or Urinary Incontinence/
4	urge incontinence.mp,hw,tw. or Urinary Incontinence, Urge/
5	urinary urgency.mp,hw,tw.
6	(mirabegron or Myrbetriq).mp,hw,tw. or Adrenergic beta-3 Receptor Agonists/
7	Muscarinic Antagonists/ or anti-muscarinics.mp,hw,tw.
8	1 or 2 or 3 or 4 or 5 or 6 or 7
9	Accidental Falls/
10	fall\$.mp,hw.
11	faller\$.mp,hw,tw.
12	fallen.mp,hw,tw.
13	falling.mp,hw,tw.
14	injurious fall\$.mp,hw,tw.
15	fracture.mp,hw,tw.
16	9 or 10 or 11 or 12 or 13 or 14 or 15
17	cohort studies.mp. or Cohort Studies/
18	epidemiologic methods.mp. or Epidemiologic Methods/
19	epidemiologic studies.mp. or Epidemiologic Studies/
20	epidemiology.mp. or Epidemiology/
21	cohort analysis.mp. or Cohort Studies/
22	Longitudinal Studies/ or longitudinal stud*.mp.
23	Prospective Studies/ or prospective stud*.mp.
24	Prospective Studies/ or prospective stud*.mp.
25	Follow-Up Studies/ or follow-up stud*.mp.
26	Retrospective Studies/ or retrospective stud*.mp.
27	observational stud*.mp.
28	(observational adj3 (study or studies or design or analysis or analyses)).mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, px, rx, ui, sy]
29	17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28
30	8 and 16 and 29
31	limit 30 to animals
32	30 not 31
33	limit 32 to yr=1985-2018
34	remove duplicates from 33

Supplementary Table 3: STROBE assessment

Citation	STROBE Item Number																						Notes
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Brown, 2000	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Q1: Does not indicate study design in title
Darkow, 2005	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Q1: Does not indicate study design in title
Foley, 2012	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Q1: Does not indicate study design in title
Gomes, 2011	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Q1: Does not indicate study design in title
Jayadevappa, 2018	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Q1: Does not indicate study design in title
Kao, 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	N	Y	N	Q15: Methods indicate that results were stratified by age, sex and index year but are not presented
Kurita, 2013	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Q1: Does not indicate study design in title
Luukinen, 1997	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Q1: Does not indicate study design in title
Luukinen, 1996	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Q1: Does not indicate study design in title
Moon, 2011	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Q1: Does not indicate study design in title
Noguchi, 2016	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Q1: Does not indicate study design in title
Takazawa, 2005	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Q1: Does not indicate study design in title Q4: No mention of study type
Teo, 2006	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Q1: Does not indicate study design in title
Wagner, 2002	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y	N	N	Q1: Does not indicate study design in title
Yehoshua, 2016	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Q1: Does not indicate study design in title
Sensitivity analysis																							
Asplund, 2006	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	N	N	Y	Y	N	Y	N	Y	N	Q1: Does not indicate study design in title or abstract Q4: No mention of study type
Cesari, 2002	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Q1: Does not indicate study design in title or abstract
de Rekeniere, 2003	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Q1: Does not indicate study design in title
Endeshaw, 2009	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	3	Y	Y	Y	Y	Y	Q1: Does not indicate study design in title Q4: No mention of study type
Galizia, 2012	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N	Y	N	Y	N	N	Q1: Does not indicate study design in title

Hedman, 2013	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Q1: Does not indicate study design in title
Huang, 2004	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	N	N	Q1: Does not indicate study design in title	
Johansson, 1996a	N	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Q1: Does not indicate study design in title Q4: No mention of study type	
Johansson, 1996b	N	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Q1: Does not indicate study design in title Q4: No mention of study type	
Marshall, 2016	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Q1: Does not indicate study design in title	
Nakagawa, 2010	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Q2: No mention of hypothesis	
Nevitt, 1989	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Q4: No mention of study type	
Parsons, 2009	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Q1: Does not indicate study design in title	
Schluter, 2017	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Q1: Does not indicate study design in title	
Sohn, 2018	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Q1: Does not indicate study design in title	
Stenhagen, 2013	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	
Temml, 2009	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Q1: Does not indicate study design in title or abstract	
Tinetti, 1988	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Q1: Does not indicate study design in title	
Tromp, 1998	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Q1: Does not indicate study design in title	
Tromp, 2001	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Val Helder, 2007	N	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Q1: Does not indicate study design in title or abstract	
Vaughan, 2010	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y		
Wu, 2012	N	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	N	Y	N	Y	N	Y	N	N	Q1: Does not indicate study design in title or abstract	

Supplementary Table 4: Characteristics of included studies of falls and fractures among those diagnosed with OAB (core analyses)

Citation	N	Study design (setting)	OAB measure	Falls or fracture measure	Follow up period
Brown, 2000	6,049	Prospective cohort (US) of community-dwelling women from the Study of Osteoporotic Fractures	Urge incontinence by self-report over the past 12 months	Falls or fractures by self-report	Mean 3 years
Darkow, 2005	23,132	Retrospective cohort (US) from a managed care database	OAB by ICD codes	Falls by ICD codes	1 year
Foley, 2012	5,162	Cross-sectional study of community-dwelling adults (UK)	Urge incontinence by self-report	Falls by self-report	1 year
Gomes, 2011	81,126	Retrospective population-based cohort (Canada)	OAB by medication dispensation records	Serious fall or fracture, by emergency room records	3 months
Jayadevappa, 2018*	284,625	Retrospective cohort (US) of Medicare registrants	OAB by ICD codes	Falls by ICD codes	3 years
Kao, 2018	14,635	Retrospective cohort (Taiwan) from the Taiwan Longitudinal Health Insurance Database	OAB by ICD codes	Fractures by ICD codes	3 years
Kurita, 2013	941	Cross-sectional community-dwelling population (Japan)	OAB by self-report	Falls by self-report	1 month
Luukinen, 1996	1,016	Population-based case-control study (Finland)	Urge incontinence by self-report	Recurrent falls by self-report	1 year
Luukinen, 1997**	792	Nested population-based case-control study (Finland)	Urge incontinence by self-report	Fractures by self-report	N/A
Moon, 2011	514	Cross-sectional community-dwelling national sample (Korea)	OAB by self-report	Falls by self-report	1 year
Noguchi, 2016	1,390	Prospective cohort of community-dwelling men in metropolitan Sydney	OAB by self-report	Falls by self-report	1 year
Takazawa, 2005	118	Prospective cohort of community-dwelling adults (Japan)	Urge incontinence by self-report	Falls (one or more; recurrent) by self-report	1 year
Teo, 2006	782	Cross-sectional survey of community-dwelling adults (Australia)	Urge incontinence by self-report	Falls by self-report	1 year
Yehoshua, 2016	620	Retrospective cohort of patients within a network of medical groups and physicians serving greater LA	OAB by ICD codes	Falls and fractures by ICD codes	At least 1 year

Citation	N	Study design (setting)	OAB measure	Falls or fracture measure	Follow up period
Wagner, 2002	919	Cross-sectional sample from NOBLE (US)	OAB by self-report	Falls, serious falls by self-report	1 year

*Follow up period included one year prior to OAB diagnosis and two years following OAB diagnosis. Sample size reflects OAB

**Study participants identified at time of fracture

ICD: International Classification of Diseases; OAB: Overactive bladder; US: United States

Supplementary Table 5: Characteristics of additional studies of falls and fractures among those with OAB symptoms (sensitivity analyses)

Citation	Country	Population setting	Study design	OAB factor	OAB measure	Falls or fracture outcome	Outcome measure	Follow up period
<i>Prospective ascertainment of falls/fractures</i>								
Marshall, 2016	US	Community-dwelling older men	Prospective cohort	LUTS	AUA Symptom Index	Fractures	Self-report	11 years
Nakagawa, 2010	Japan	Population-based study of community-dwelling older adults	Prospective cohort	Nocturia	Self-report	Fractures	Claims for admission/death due to fracture	5 years
Nevitt, 1989	US	Community-dwelling persons from San Francisco	Prospective cohort	UI	Self-report	Recurrent falls	Self-report	1 year
Parsons, 2009	US	Community-dwelling men aged ≥ 65 years (Osteoporotic Fractures in Men study)	Prospective cohort	LUTS	AUA Symptom Index	Falls	Self-report	1 year
Schluter, 2017	New Zealand	Community care recipients ≥ 65 years	Prospective cohort	UI	Self-report	Falls and fractures	ICD-10 codes (fracture) Self-report (falls)	39 months (fracture) 90 days (falls)
Stenhagen, 2013	Sweden	Community-dwelling adults from the 'Good Aging in Skane' study	Prospective cohort	UI	Self-report	Falls	Self-report	3 and 6 years
Temml, 2009	Austria	Community-dwelling males aged 40+ in Vienna	Prospective cohort	LUTS and nocturia	Self-report	Fractures	Admission to the ED	Mean, 6.2 years
Tinetti, 1988	US	Community-dwelling older adults in the Yale Healthy Aging Project	Prospective cohort	UI	Self-report	Falls	Self-report	1 year
Tromp, 1998	Netherlands	Community-dwelling adults in the Longitudinal Study of Aging, Amsterdam	Prospective cohort	UI	Self-report	Falls, recurrent falls, fractures	Self-report	Falls: 1 year Fractures: 38 months
Tromp, 2001	Netherlands	Community-dwelling adults in the Longitudinal Study of Aging, Amsterdam	Prospective cohort	UI	Self-report	Falls	Self-report	1 year

Citation	Country	Population setting	Study design	OAB factor	OAB measure	Falls or fracture outcome	Outcome measure	Follow up period
Val Helder, 2007	Netherlands	Attendees at a hospital fracture clinic	Prospective cohort	UI	Self-report	Falls	Self-report	1 year
Vaughan, 2010	US	Random Medicare sample from the Birmingham Study of Aging	Prospective cohort	Nocturia	Self-report	Falls	Self-report	3 years
Wu, 2012	Taiwan	Female registrants in the Taiwanese National Health Insurance program	Retrospective cohort	LUTS	ICD codes	Fractures	Admission to orthopedics wards	3 years
<i>Retrospective ascertainment of falls/fractures</i>								
Asplund, 2006	Sweden	Population-based community-dwelling adults	Cross-sectional	Nocturia	Self-report	Hip fractures	Self-report	5 years
Cesari, 2002	Italy	Population-based study of Italian adults admitted to home care programs	Retrospective cohort	UI	Health care provider assessment	Falls	Health care provider assessment	90 days
de Rekeniere, 2003	US	Community-dwelling older adults in the Health ABC study	Retrospective cohort	UI	Self-report	Falls	Self-report	1 year
Endeshaw, 2009	US	Community-dwelling older adults	Cross-sectional	Nocturia	Self-report	Falls	Self-report	6 months
Galizia, 2012	Italy	Community-dwelling older adults	Cross-sectional	Nocturia	Self-report	Falls	Self-report	1 year
Hedman, 2013	Sweden	Community-dwelling older (>75 years) adults in Sweden	Cross-sectional	UI	Self-report	Falls	Self-report	1 year
Huang, 2004	Taiwan	Residents within sheltered housing projects in Taiwan	Cross-sectional	UI	Self-report	Falls	Self-report	1 year
Johansson, 1996a*	Sweden	Population-based study of older (>70 years) women in Goteborg, Sweden	Cross-sectional	UI	Self-report	Hip fractures	Health care provider assessment	N/A
Johansson, 1996b	Sweden	Population-based study of women (>46 years) in Goteborg, Sweden	Cross-sectional	UI	Self-report	Fractures	Self-report	N/A
Lee, 2009	US	Community-dwelling older adults in the Health and	Cross-sectional	UI	Self-report	Falls	Self-report	2 years

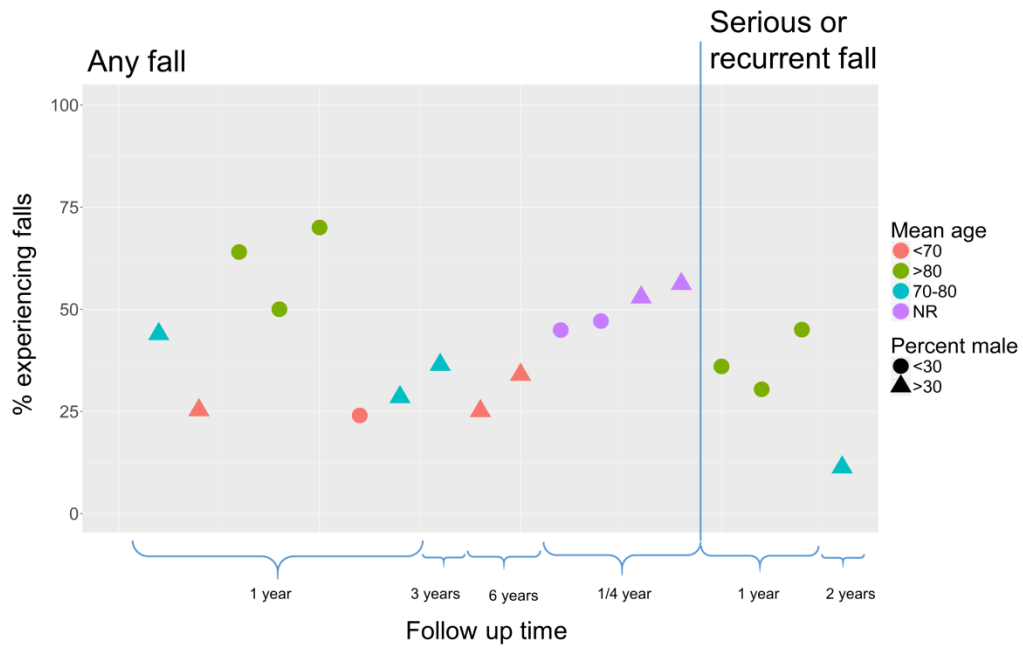
Citation	Country	Population setting	Study design	OAB factor	OAB measure	Falls or fracture outcome	Outcome measure	Follow up period
Retirement Study								
Moreira, 2007	Brazil	Community-based older adults attending outpatient clinics	Cross-sectional	UI	Nurse report	Falls	Self-report	1 year
Rosso, 2013	US	Community-dwelling women in the Women's Health Initiative observational study	Cross-sectional	UI	Self-report	Falls	Self-report	1 year
Sohn, 2018	Korea	Community-dwelling women ≥ 65 years	Retrospective cohort	UI	Self-report	Falls	Self-report	2 years
Stewart, 1992	US	Community-dwelling older adults in a geriatrics program in Florida	Cross-sectional	Nocturia	Self-report	Falls or fractures	Self-report	Falls: 1 year Fractures: 5 years
Yasumura, 1994	Japan	Community-dwelling older adults in Japan	Cross-sectional	Nocturia	Self-report	Falls	Self-report	1 year

*Characteristics of additional studies not included in core analysis only

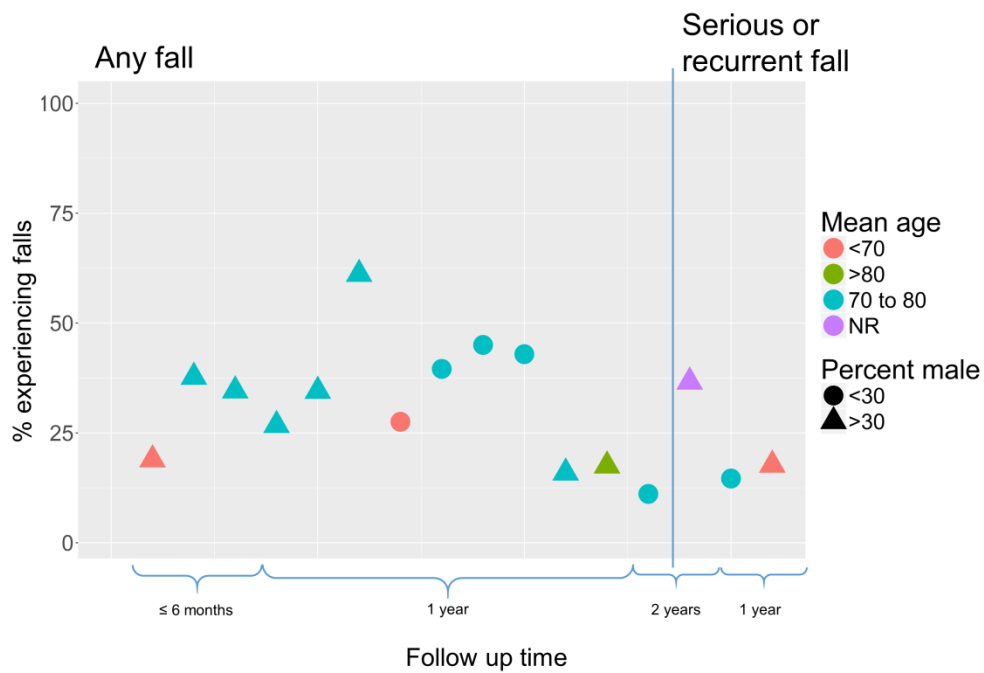
ED: Emergency department; ICD: International Classification of Diseases; LUTS: Lower urinary tract symptoms; OAB: Overactive bladder; UI: Urinary incontinence; US: United States

Supplementary Fig.1 Unadjusted estimates of the risk of A) prospectively-ascertained falls; B) retrospectively-ascertained falls; among those with OAB symptoms, according to mean age and the percentage male of the sample (sensitivity analyses)

(a)

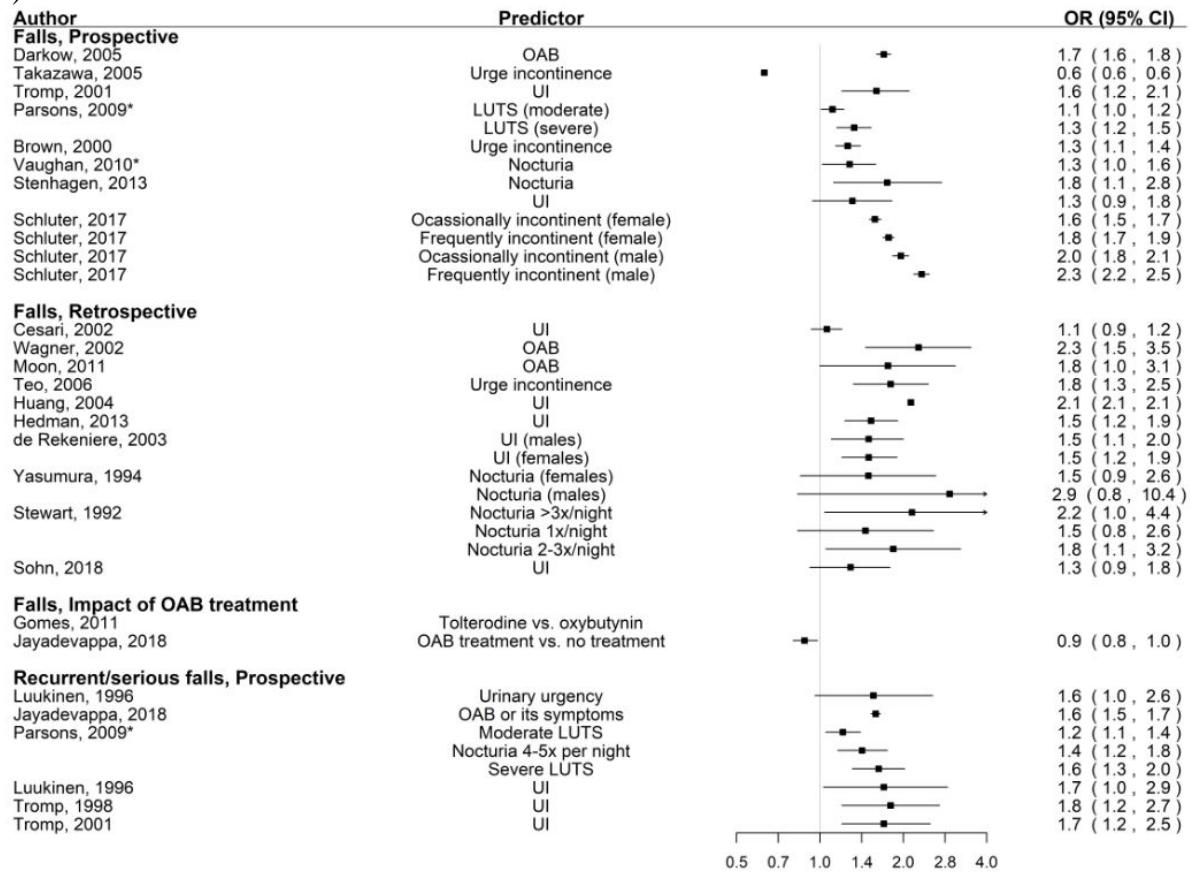


(b)



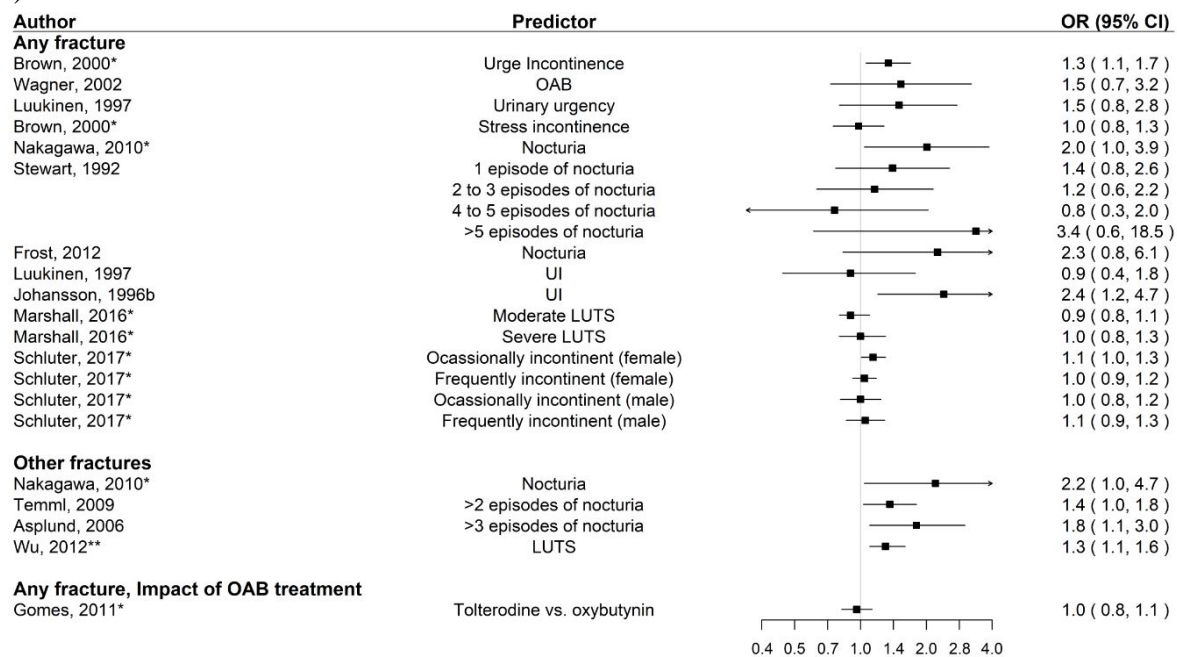
Supplementary Fig. 2 Adjusted estimates of the risk of A) falls or B) fractures, among those with OAB symptoms (sensitivity analyses)

(a)



*Presented hazard ratios rather than odds ratios

(b)



*Presented hazard ratios rather than odds ratios

**Presented incidence rate ratios rather than odds ratios