

Urinary incontinence is associated with an increase in falls: a systematic review

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Question: Is urinary incontinence associated with falls in community-dwelling older people? **Design:** A systematic review and meta-analysis of observational studies investigating falls and urinary incontinence. **Participants:** Community-dwelling older people. **Outcome measures:** Falls rather than fracture or injury, and any type of urinary incontinence. **Results:** Odds ratios of nine studies were included in the meta-analysis. The odds of falling were 1.45 (95% CI 1.36 to 1.54) in the presence of any type of urinary incontinence. The odds of falling were 1.54 (95% CI 1.41 to 1.69) in the presence of urge incontinence. The odds of falling were 1.11 (95% CI 1.00 to 1.23) in the presence of stress incontinence. The odds of falling were 1.92 (95% CI 1.69 to 2.18) in the presence of mixed incontinence. **Conclusion:** Urge urinary incontinence, but not stress urinary incontinence, is associated with a modest increase in falls. Falls prevention programs need to include an assessment of incontinence and referral for interventions to ameliorate the symptoms of urge incontinence. [Chiarelli PE, Mackenzie LA, Osmotherly PG (2008) Urinary incontinence is associated with an increase in falls: a systematic review. *Australian Journal of Physiotherapy* 55: 89–95]

Keywords: Urinary incontinence, accidental falls, systematic review, accident prevention

Introduction

Falls continue to be a major threat to the health and well-being of older people. As the population ages, the health costs of falls are escalating. In Australia, it is estimated that falls prevention strategies need to deliver a 66% reduction in falls incidence to merely contain costs over the next 50 years (Moller 2003). One-third of people over 65 years (NSW Health 2003) and 45% of those over the age of 75 years (Lord et al 2005) fall each year. Many will fall more than once in a year, and 20–30% of fallers will suffer injuries that reduce mobility and independence (Queensland Health 2003). Falls experienced by older people lead to significant negative personal consequences, such as functional decline and loss of confidence, co-morbidity and mortality, and increased risk of premature hospitalisation or long-term care (McMurdo and Harper 2003).

Multiple risk factors contributing to falls in older people have been identified, and modifiable risk factors have been incorporated into evidence-based falls prevention guidelines (National Institute for Clinical Excellence 2004, NSW Health 2003, Queensland Health 2003). Systematic reviews of effective falls prevention interventions consistently cite modifiable risk factors such as muscle weakness, history of falls, environmental hazards, impaired balance and gait, use of assistive devices, visual deficits, arthritis, reduced independence, depression, cognitive impairment, psychotropic medication and multiple medication use, and being aged over 80 years (Campbell and Robertson 2006, Chang et al 2004). However, urinary incontinence is rarely listed as a recognised risk factor in review articles related to either community or residential care settings (Department of Health and Ageing 2004), although assessment of urinary incontinence is recommended in the British National Institute for Clinical Excellence and the Queensland Health guidelines (National Institute for Clinical Excellence 2004, Queensland Health 2003).

Commonly, urine leakage is associated with stress incontinence or symptoms of overactive bladder such as urinary urgency (with or without loss of urine) and nocturia (being woken at night by the need to void). A mix of symptoms related to both stress incontinence and overactive bladder are also commonly reported by women (Bump et al 2003). Stress incontinence is characterised by involuntary leakage on effort or exertion, or on sneezing or coughing (Abrams et al 2003), and has a peak prevalence for women aged 45 to 59 years (McGrother et al 2006). Urge urinary incontinence includes accidental urine loss that is accompanied by or preceded by feelings of urgency. (Abrams et al 2003). The prevalence of urge incontinence in both men and women increases with age (Milsom et al 2001). Nocturia is also a symptom associated with overactive bladder syndrome; it is defined as being woken from sleep at night by the need to urinate (Abrams et al 2003) and can have a significant impact on quality of life and quality of sleep for older people (Milsom et al 2001, Stewart et al 2003). Older people are more likely to experience symptoms of overactive bladder or mixed bladder symptoms rather than pure stress incontinence.

Overactive bladder is estimated to affect up to 41% of older men and 31% of older women respectively (Hannestad et al 2000, Milsom et al 2001) although these estimates are likely to be imprecise. Older people in the community do not seek help for their bladder control problems (Miller et al 2003) for a variety of reasons including not considering incontinence a problem worth bothering the doctor about, thinking it will go away of its own accord, or accepting incontinence as an inevitable component of ageing (Byles et al 2003). It is estimated that fewer than half of adults with a urinary incontinence problem report their condition to a healthcare provider (Dugan et al 2001). Unfortunately, untreated incontinence tends to become progressively

worse (Goldstein et al 1992). The prevalence of urinary incontinence in community-dwelling populations overall is estimated to be around 35% in women and 5–10% in men (Chiarelli et al 2005), and the ageing of the population suggests the prevalence of urinary incontinence will increase (Collette et al 2003). Therefore it is a priority to investigate this group further with respect to falls risk.

While there have been a number of studies including urinary incontinence within multifactorial analyses of falls risk, there have been few studies of urinary incontinence as an individual risk factor for falls. The aim of this study was to systematically review the epidemiologic evidence to answer the question:

Is urinary incontinence associated with falls in community-dwelling older people?

Method

Identification and selection of studies

A search of MEDLINE, EMBASE, CINAHL and Cochrane Library databases (from 1985 to 2008) was undertaken using the MeSH terms: overactive bladder, urinary urgency, nocturia, urinary incontinence, nocturnal polyuria, reduced voided volumes, frequent night-time micturition or urination AND falls, accidents or accidentally falling. Reference lists from retrieved studies were examined for any studies that might not have been retrieved by the database searches. The search was limited to studies published in English. Two investigators (PC, LM) independently screened the titles and abstracts of studies without blinding to authorship or journal.

For studies to be included in this review, several important factors were considered relevant. There are significant differences between the prevalence of both urinary incontinence and accidental falls in aged care units, acute care hospitals, and the community (Fonda et al 2005). Urinary incontinence is also highly prevalent in neurological conditions such as stroke, Parkinson's disease, and multiple sclerosis (Fowler 2004). In estimating the prevalence of accidental falls, while self-report of falls using prospective, calendar-recorded incidents is preferred, retrospective self report of falls is still considered reliable (Mackenzie et al 2006). See Box 1 for inclusion criteria. Two investigators (PC, LM) independently assessed the eligibility of the studies for inclusion in the review.

Data analysis

Two investigators independently extracted odds ratio data from each study (PO, LM). Any discrepancies were resolved by discussion between the investigators.

Comprehensive meta-analysis software (Borenstein 2006) was used to generate pooled estimate of the effect size. For meta-analyses we used the random effects model as it is a more conservative measure (Borenstein 2006). Heterogeneity was assessed with the Q-test and further validated with the I^2 formula for variability (Higgins et al 2003). For this latter statistic the values of 25%, 50%, and 75% indicate low, moderate, and high variability. We also explored the influence of different types of urinary incontinence on the estimate of the effect size.

Box 1. Inclusion criteria

Design

- Observational studies

Participants

- Community-dwelling older people
- Not related to any specific clinical group

Outcome measures

- Falls and urinary incontinence measured
- Falls rather than fracture or injury
- Falls measured by self report or calendar
- Urinary incontinence defined broadly or defined more specifically according to symptoms, eg, urge, stress, overactive bladder

Data

- Estimated odds ratios related to incontinence and falls or sufficient data to enable odd ratios to be calculated

Results

Flow of studies through the review

The primary literature search using the specified search terms identified 119 studies. Based on a review of the abstracts, 82 papers were excluded for the following reasons: 20 studies were not community based, 22 made only general comments regarding urinary incontinence, 12 were reviews of prevalence studies, eight studied specific symptoms of urinary incontinence, six were studies of faecal incontinence or related combined symptoms of urinary and faecal incontinence, four reported the prevalence of urinary incontinence in specific medical conditions, three were studies of measurement, two studied urinary incontinence in specific samples. Finally, five were discarded, one each related to: nocturnal polyuria; costs of urinary incontinence; urinary incontinence and risk of death; risk factors for recurrent falls, falling, and urinary incontinence; and quality-of-life aspects of urinary urge incontinence. A total of 39 potentially-relevant studies were retrieved for scrutiny of the full text: 37 from the database search and a further two studies from the reference lists of these papers. A total of nine studies met all inclusion criteria and were eligible for inclusion in the review (Figure 1).

Characteristics of studies

Characteristics of the individual studies are summarised in Table 1. Eight of the nine studies appeared to have adequate sample sizes ($n = 405$ to 6049). While the study by Takazawa and Arisawa (2005) had a smaller sample size ($n = 127$), it was prospective and participants were interviewed every four months using a well-founded instrument to measure urinary incontinence. Five of the studies collected fall data prospectively (Brown et al 2000, Luukinen et al 1996, Takazawa and Arisawa 2005, Tromp et al 2001, Tromp et al 1998) and two reported using validated measures of bladder symptoms (Brown; et al 2000, Takazawa and Arisawa 2005). Most studies adjusted for important potential confounders.

Association between falls and urinary incontinence

Odds ratios of all nine studies were included in this analysis. Incontinence types within studies were separated and individual odds estimates utilised producing 14 individual strata. The association between incontinence and falling was

Table 1. Summary of included studies.

Study	Design	Participants	Falls measure	Incontinence measure	Association statistic
Brown et al (2000)	Prospective cohort	n = 6049 Sex = 6049 F Age = 72 to 99 yr	Method = self report supplemented by postcards every 4 months Criterion = not stated	Method = questionnaire Criterion = classification of stress, urge, or mixed incontinence based on response to question 'Under what circumstances does your leakage of urine usually occur?' and frequency of incontinence	Odds ratios stratified by frequency of incontinence
Huang (2004)	Cross-sectional	n = 405 Sex = F and M Age = > 65 yr	Method = not stated Criterion = not stated	Method = positive response to item 'urinary frequency or incontinence' Criterion = not stated	Odds ratio
Luukinen et al (1996)	Prospective cohort	n = 979 Sex = 602 F, 377 M Age = > 70 yr	Method = record of fall in diary or reported by telephone Criterion = fall to ground from an upper level or same level or found on ground without being able to give a history	Method = not stated Criterion = classification as urinary urgency or urinary incontinence	Odds ratio
de Rekeneire et al (2003)	Cross-sectional	n = 3075 Sex = 1925 F, 1150 M Age = 70 to 79	Method = self report of number of falls experienced in previous 12 months Criterion = not stated	Method = self report coded as incontinent or not Criterion = not stated	Odds ratio stratified by gender
Stewart et al (1992)	Cross-sectional	n = 1508 Sex = 988 F, 520 M Age = >65 yr	Method = self report Criterion = fall to the ground or floor within previous 12 months	Method = self report Criterion = Yes to question 'Do you get up at night to urinate?' followed by questions asking number of times	Odds ratios stratified by number of nocturia events per night.
Takazawa and Arisawa (2005)	Prospective cohort	n = 127 Sex = 127 F Age = 70 to 93 yr	Method = self report on interview Criterion = not stated	Method = self report of symptoms Criterion = symptoms classified as urge, stress or mixed incontinence	Odds ratio
Teo et al (2006)	Cross-sectional	n = 782 Sex = 782 F Age = 75 to 86	Method = self report on questionnaire Criterion = falling to the ground or other level	Method = Female urinary incontinence questionnaire Criterion = classified as stress, urge and mixed	Odds ratio
Tromp et al (1998)	Prospective cohort	n = 1469 Sex = 764 F, 705 M Age = > 65 yr	Method = not stated Criterion = unintentional change in position resulting in coming to rest on the ground or other lower level	Method = self report verified by information obtained from general practitioner Criterion = not stated	Odds ratio
Tromp et al (2001)	Prospective cohort	n = 1285 Sex = 656 F, 629 M Age = > 65 yr	Method = falls self recorded on a weekly calendar Criterion = unintentional change in position resulting in coming to rest on the ground or other lower level	Method = self report Criterion = not stated	Odds ratio stratified by any fall or recurrent fall

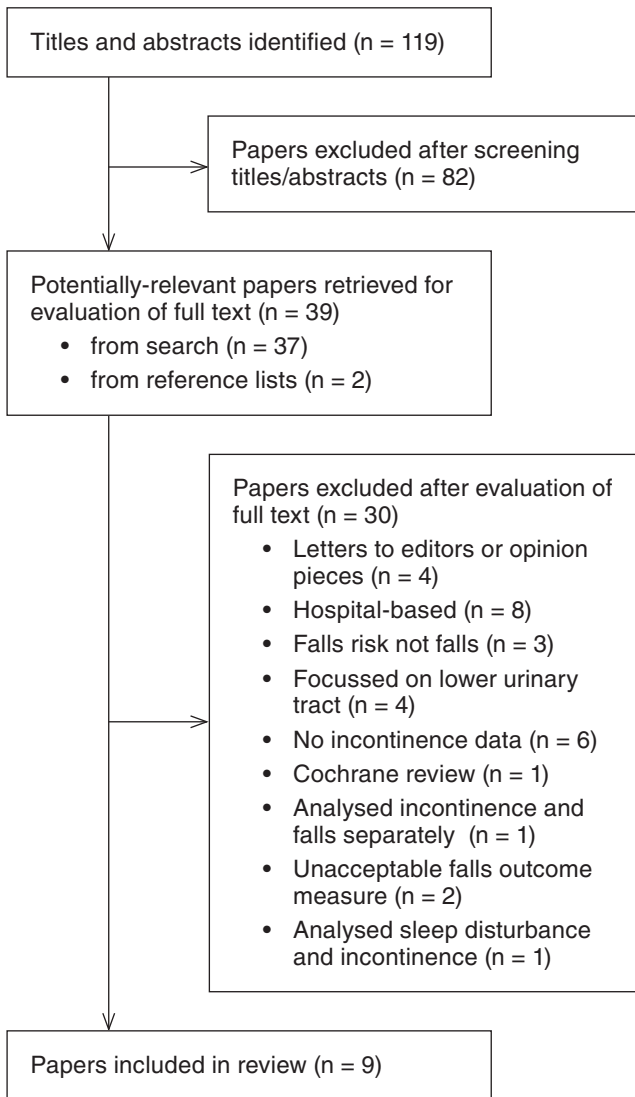


Figure 1. Flow of studies through the review.

examined by pooling data from the 14 strata with 15 679 participants. The odds of falling were 1.45 (95% CI 1.36 to 1.54) in the presence of any type of urinary incontinence (Figure 2, see also Figure 3 on the eAddenda for detailed forest plot).

Association between falls and urge incontinence

The association between falling and urge incontinence was examined by pooling data from four strata. The odds of falling were 1.54 (95% CI 1.41 to 1.69) in the presence of urge incontinence (Figure 2, see also Figure 3 on the eAddenda for detailed forest plot). Since there was significant statistical heterogeneity in this analysis, it was repeated without Takazawa and Arisawa (2005) because the width of the CI indicates low precision in comparison to the other studies. This increased the odds of falling to 1.94 (95% CI 1.33 to 2.84) in the presence of urge incontinence.

Association between falls and stress incontinence

The association between urge incontinence and falling was examined by pooling data from three strata. The odds of falling were 1.11 (95% CI 1.00 to 1.23) in the presence of stress incontinence (Figure 2, see also Figure 3 on the eAddenda for detailed forest plot).

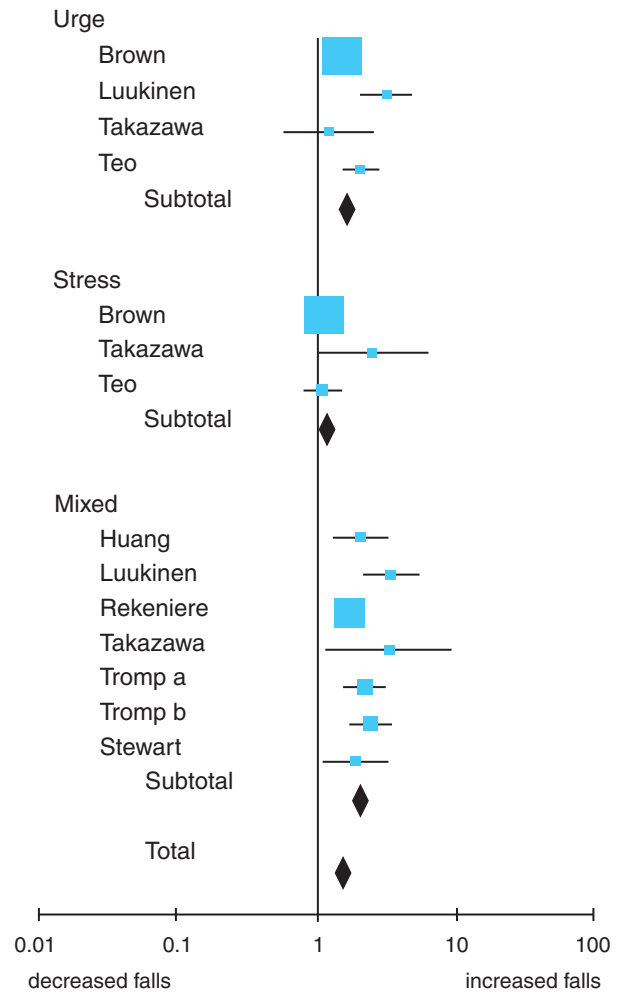


Figure 2. OR (95% CI) of association between incontinence and falls by pooling data from 9 studies (n = 15 679).

Association between falls and mixed types of incontinence

The association between urge incontinence and falling was examined by pooling data from seven strata. These seven studies described the incontinence as nocturia (n = 1), mixed incontinence (n = 1), or it was not specified (n = 5). Some unspecified incontinence may have included symptoms of urge or stress incontinence. The odds of falling were 1.92 (95% CI 1.69 to 2.18) in the presence of mixed incontinence (Figure 2, see also Figure 3 on the eAddenda for detailed forest plot).

Discussion

Measures of falls and urinary incontinence

The loss of bladder control is an important issue for older people and can lead to isolation and feelings of low self-worth. However, the extent to which urinary incontinence is associated with falls among older people has not previously been explored in detail. The results from this meta-analysis revealed a clear association between falls and urinary incontinence and, more specifically, the review highlighted the fact that falls are predominantly associated with the symptoms of overactive bladder rather than those of stress incontinence.

This is understandable in view of different symptoms associated with different types of urinary incontinence. People with symptoms related to overactive bladder experience a real sense of urinary urgency, and may leak large, sudden volumes that come away in a gush. The sense of impending embarrassment and shame associated with a public loss of bladder control is heightened. On the other hand, people with stress incontinence lose small amounts of urine associated with specific activities and may therefore may not feel the same urgency to rush to the toilet, which can put older people at risk of falls.

The link between urinary incontinence and falls is likely to be related to the need to rush to the toilet/commode (Miller et al 2003) and the distress and anxiety related to the aftermath of not being able to get to the toilet in time (Brown et al 2000). Consequently, falls are commonly reported as occurring in the bathroom (Aminzadeh et al 2000). The cognitive demands of performing multiple tasks simultaneously, such as walking, concentrating on controlling the flow of urine, and negotiating household obstacles, in order to get to the toilet quickly may also have a detrimental effect on maintaining balance in older people (Wolf et al 2000). Consideration should also be given to the possibility of slips where urine has been expelled on the floor.

Nocturia is a symptom of overactive bladder syndrome in itself and sleep patterns altered by nocturia in the elderly have been associated with daytime dizziness, drowsiness, and decreased function (Asplund 2005). The frequency of night time journeys to the toilet, often combined with poor lighting, the effects of disturbed sleep, and rapid changes in body position from lying to standing and walking, can increase the odds of falling significantly.

Management of urinary incontinence in the community

Factors associated with falls and urinary incontinence experienced by older people may often be related. For instance, mobility impairments, the need to use assistive devices, activity limitations especially difficulty transferring from one chair to another, visual impairment, cognitive decline, use of multiple medications, environmental hazards, orthostatic hypotension, and dizziness can contribute both to increased falls and increased urinary incontinence related to difficulty getting to or using the toilet. The modification of any of these risk factors may have an effect on reducing both falls and urinary incontinence.

Also of concern is the response of primary care physicians when older people seek help for their urinary incontinence. Are older people with overactive bladder symptoms routinely linked with falls prevention interventions? There is evidence that quality of primary care for older community-dwelling incontinent people is inadequate, with few being consulted about the importance of the problem, their toileting abilities or previous interventions (Gnanadesigan et al 2004). While effective management of urinary incontinence is available, the intervention is not included in the curricula for health professionals, eg, nursing (Collette et al 2003), causing such health professionals discomfort and frustration when faced with the issue of urinary incontinence in practice. For instance, 86% of occupational therapists acknowledged that they should have a role in the management of incontinence, but felt that they were inadequately educated (Supk and Vickerman 2004).

Incorporation of urinary incontinence management into falls prevention programs

Falls prevention interventions in the community are commonly undertaken by a range of healthcare professionals including physiotherapists, occupational therapists, nurses, and general practitioners, and there is need a more integrated approach to continence management within these teams. When older people seek help for either falls prevention or management of urinary incontinence, they need to be routinely linked with interventions addressing both issues. There is little evidence to suggest that investigating the presence of symptoms of an overactive bladder is a routine component of falls prevention assessment. Falls prevention assessments may need to extend beyond purely environmental considerations focused on getting onto the toilet, such as the height of toilet seats, to the need to change the extended environment so that older people can rush to the toilet safely. Without reference to the primary issues related to urinary incontinence during a falls assessment, the need for intervention to better manage urinary incontinence could be overlooked.

The onus must fall on health care providers to screen for urinary incontinence whenever they encounter an older person, and even more so in a falls prevention program. Furthermore, those with mild symptoms are reported less likely to spontaneously report any difficulties, meaning they may not be detected when early intervention may resolve the problem or prevent its progress over time.

The effects of urinary incontinence may be subtle but they include reduced social contact, reduced physical activity outside the home, increased shame, and potential depression. These are also factors commonly linked to the experience of falls and can contribute to increased falls. For those older people who have urinary incontinence and experience falls, the consequences of both may be very similar, and interventions to address falls without addressing the symptoms of urinary incontinence, may be ineffective.

This review suggests that since overactive bladder and falls are associated, intervention to decrease the symptoms of overactive bladder should be incorporated into falls prevention strategies. Behavioural strategies and lifestyle measures, such as biofeedback to assist bladder and pelvic muscles (Burgio et al 1998), as well medications (Wagg et al 2007) have been shown to be effective in older people with symptoms of overactive bladder. There is also evidence that they can be managed effectively in the community on an individual as well as a group basis (Sampselle et al 2005).

Limitations of the study

The selection of English-language only publications for the review may have reduced the thoroughness of the review, and increased the potential for systematic bias perhaps due to the higher prevalence of positive results in English versus non-English publications. Whilst a significant association was identified between urge incontinence and falls, it is possible that the association could also be the result of a third variable such as mobility status. The fact that the analyses in the original studies were all adjusted for age suggests that the results are unlikely to be confounded by age.

In conclusion, falls are significantly associated with the symptoms of overactive bladder such as urgency and nocturia, but not with stress incontinence. Effective intervention to

manage these symptoms is available and should be included in falls prevention programs. This will necessitate an interdisciplinary approach involving all the health professionals who design and deliver such programs. ■

eAddenda: Figure 3 available at AJP.physiotherapy.asn.au

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