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Potentially reversible risk factors and urinary incontinence in frail older people living in community

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Abstract

Background: urinary incontinence is a common problem among older people living in different community settings. The multifactorial origin of urinary incontinence has been largely addressed and many previous studies have identified several reversible factors associated with incontinence. However, few data exist concerning the potentially reversible causes of this condition among frail community-dwelling older individuals.
Objective: the aim of the present study is to estimate, in a large population of frail elderly people living in the community, the prevalence of urinary incontinence and to determine physical, social, and psychological factors associated with it.
Design: observational study.
Subjects and methods: we analysed data from a large collaborative observational study group, the Italian Silver Network Home Care project, that collected data on patients admitted to home care programmes ($n=5418$). A total of 22 Home Health Agencies participated in this project evaluating the implementation of the Minimum Data Set for Home Care instrument. The main outcome measures were the prevalence and factors associated with urinary incontinence.
Results: urinary incontinence was recorded in 51% of patients, and it was more common in women than men (52% *versus* 49%, respectively; $P=0.01$). After adjustment for each of the variables considered in this study, three potentially reversible factors were strongly associated with urinary incontinence: urinary tract infection (adjusted odds ratio, 3.46; 95% confidence interval, 2.65–4.51), use of physical restraints (adjusted odds ratio, 3.20; 95% confidence interval, 2.19–4.68), environmental barriers (adjusted odds ratio, 1.53; 95% confidence interval, 1.15–2.02). These associations were consistent in both men and women.
Conclusions: the major finding of our study is that potentially reversible factors were strongly and independently associated with urinary incontinence. Failure to make all reasonable efforts to assess and to treat all these factors among frail elderly people should be considered one of the most important indicators of poor quality of care.

Keywords: *urinary incontinence, risk factors, older people, geriatric assessment*

Introduction

Urinary incontinence is one of the most common, disruptive and often disabling conditions affecting frail older people living in the community [1, 2]. Several studies have explored the prevalence of urinary incontinence in the community and in nursing homes [3–7]. Urinary incontinence is highly prevalent, especially among frail elderly individuals, affecting from 5–30% of elderly persons living in the community [3, 4], 40–70% of acute hospital elderly inpatients [5], and 40–50% of nursing home residents [6, 7]. The high variation between different studies depends on the definition of incontinence, the population characteristics, and the methodological approach.

Along with its medical, psychological and social consequences, urinary incontinence represents a large economic burden, increasing the costs of health care [1, 8].

In the United States this condition ranks first in total charges to Medicare for nursing services per person served in home care programmes. Also, urinary incontinence is a leading cause of hospitalisation and/or institutionalisation among frail older persons [9].

There is general agreement on the multifactorial origin of urinary incontinence [1]. Permanent urinary incontinence is typically the result of neurological damage or intrinsic bladder or urethral pathology. However, several studies have documented that urinary incontinence is associated with several potentially remediable conditions [1, 10, 11]. Incontinence caused by transient factors is usually reversible if the underlying problems are adequately addressed. In fact, continence status may be affected not only by lower urinary tract function, but also by environmental factors, physical functioning, cognitive status, psychological distress, mobility, manual dexterity, motivations, medical conditions and medications [1, 10–12].

Despite the large amount of information about the magnitude, the mechanisms, and the options available to manage the urinary incontinence, few data exist concerning the potentially reversible causes of this condition among frail community-dwelling older individuals. We therefore conducted an observational study on data from a large population of frail elderly people living in the community and receiving home care services to estimate the prevalence of urinary incontinence, and to determine the associated physical, social, and psychological factors.

Methods

Study population

This study used data from the Silver Network Home Care project [13]. This project and the relative database have been described in detail elsewhere [13] and are briefly summarised herein. The purpose of this project, under the sponsorship of the Italian Geriatrics Society and Pfizer Italy, was to reorganise the care of the frail older people living in the community, adopting an integrated social and medical care programme along a case management approach and using, as screening and geriatric assessment tool, the Minimum Data Set for Home Care instrument (MDS-HC) [14, 15], in order homogeneously to evaluate all the enrolled patients.

Since the 1st January 1997 more than 20 Health Agencies, equally distributed over the Italian territory, decided to participate in this national home care project, and collected and computerised all MDS-HC assessments for each patient judged eligible for the home care programmes. A population of 5,418 patients was initially considered for this study. Patients who were comatose ($n=3$) and all patients with mental illness or any other mental health disorders that had been manifested since youth or adulthood ($n=43$) were considered not eligible for the study. As a result, the final analysis sample consisted of 5,372 patients.

MDS-HC assessment data

The MDS-HC [15] contains over 350 data elements including socio-demographic variables, numerous clinical items about both physical and cognitive status, as well as all clinical diagnoses. The MDS-HC also includes information about an extensive array of signs, symptoms, syndromes, and treatments being provided [15]. Among others, two summary scales based on MDS-HC items are designed to describe the performance in personal Activities of Daily Living (ADL), and the level of cognitive function (Cognitive Performance Scale(CPS)) [16]. MDS items have been found to have excellent inter-rater and test-retest reliability when completed by nurses performing usual assessment duties (average weighted $\kappa=0.8$) [16, 17]. Data elements contained in the Silver Network Home Care database used in this study have been previously validated [16] making it a reliable tool for epidemiological researches [18, 19].

A multidisciplinary team of professionals (general practitioner, nurses, and geriatrician) evaluated urinary incontinence during the MDS-HC assessment. According to the MDS-HC training manual [15] urinary incontinence was measured with a five-point scale ranging from 0 (complete control) to 4 (inadequate control with multiple daily episodes). The assessors were instructed to ask simple and direct questions about whether the patients experienced incontinence. Because some patients had limitations in verbal communication, the assessors were also instructed to observe such persons for indications of incontinence, recording all voids and incontinence episodes for 14 days. Independent, dual assessments of urinary incontinence in a diverse sample of nursing home patients during the testing and revision of the MDS showed that the inter-rater reliability for incontinence of all grades was excellent (weighted κ correlation coefficient=0.90) [17, 20, 21].

Statistical analysis

According to the International Continence Society [22], patients were divided into two groups: normal continence (MDS-urinary incontinence scale=0) and incontinence (MDS-urinary incontinence scale $\geqslant 1$). Data were analysed first to obtain descriptive statistics. Continuous variables are presented as mean values $\pm$ standard deviation. Using a cross-sectional study design, we compared the distribution of socio-demographic, functional and clinical characteristics according to different gender. Quantitative parameters with normal distribution were tested by one-way ANOVA, after a pre-test for homogeneity of variances. If abnormal distribution was present, a non-parametric test was used (the Kruskal–Wallis rank test). Categorical variables were analysed by the chi-square test.

A logistic regression analysis determined predictors of urinary incontinence. Based on previous researches, we considered all the possible risk factors (addressed in the MDS-HC form) associated with urinary incontinence, including age, gender, indices of functional ability (ADL score), cognitive performance (CPS score), signs of delirium, constipation, alcohol abuse, cerebrovascular disease, congestive heart failure, arrhythmia, depression, Parkinson's disease, hip fracture, diabetes mellitus, urinary tract infection, physical restraints, and environmental factors.

The odds ratios (OR) and corresponding 95% confidence intervals (CI) derived from the model provided estimates of effect simultaneously adjusted for other factors in the model.

Statistical analyses were performed using SPSS software (Version 8.0; 1998 Chicago, IL).

Results

Patients were Caucasian, predominantly women (59%) and mean age was 78.6 ± 9.5 years. Table 1 presents selected demographic and functional characteristics of the study population by gender. Women had a mean age of 79.5 ± 9.5 years and were approximately 2 years older than men (77.4 ± 9.4 years; $P < 0.001$). Marital status was substantially different between the two groups, with a higher prevalence of widowed among women compared to men (58% *vs* 24% respectively; $P < 0.001$).

Overall, patients had a moderate-to-severe impairment in basic activities of daily living; similarly, cognitive function was compromised in a large number of patients (more than 30% showed a CPS score > 2, indicating moderate to severe cognitive impairment). For both these functional measures there were no observed differences among men and women.

Urinary incontinence was recorded in 51% of patients, with a greater number of women than men showing this problem (52% *vs* 49%, respectively; $P = 0.01$).

Table 2 presents the adjusted relative risks for the association of all functional and health-related factors with urinary incontinence by gender. After adjustment for each of the variables considered in this study, advanced age was significantly associated with incontinence in both men and women. Among the indices describing the overall clinical severity, limitation in physical function and cognitive impairment were associated with an increased risk in both genders, while indicators of delirium were associated with urinary incontinence only among women.

Most of the comorbid conditions considered were not associated with an increased risk of incontinence. Only diabetes was associated with an increased risk in both men and women, while stroke showed a significant association in women but not in men.

Finally, three potentially reversible causes of urinary incontinence showed the strongest association in both men and women. In decreased order these are: urinary tract infection (adjusted OR, 3.46; 95% CI, 2.65–4.51), use of physical restraints (adjusted OR, 3.20; 95% CI, 2.19–4.68), environmental barriers (adjusted OR, 1.53; 95% CI, 1.15–2.02).

Discussion

Urinary incontinence is a highly prevalent condition among frail older people and significantly influences quality of life through negative effects on physical function and social interaction. Urinary incontinence is correlated to multiple and interacting factors, traditionally divided into established or potentially reversible factors. This multifactorial origin of urinary incontinence has been largely addressed and many previous studies identified several reversible factors associated with incontinence, such as infection, medical conditions that cause polyuria or nocturia, delirium, impaired physical functioning, faecal impaction, alcohol abuse, and drug side effects [1, 10–12]. While research on permanent and reversible causes of urinary incontinence has been

Table 1. Descriptive analysis of baseline socio-demographic, functional, and clinical parameters according to gender[a]

Characteristics	Total ($n = 5372$)	Male ($n = 2178$)	Female ($n = 3194$)
Age (mean ± SD)	78.6 ± 9.5	77.4 ± 9.4	79.5 ± 9.5
Marital status			
Married	2468 (46)	1491 (68)	1007 (31)
Widowed	2392 (45)	519 (24)	1843 (58)
Never married	512 (9)	168 (8)	344 (11)
Living alone	918 (17)	228 (10)	690 (22)
ADL score (mean ± SD)	4.7 ± 2.7	4.7 ± 2.6	4.6 ± 2.7
CPS score (mean ± SD)	2.3 ± 2.1	2.2 ± 2.1	2.3 ± 2.2
No. of diseases (mean ± SD)	3.3 ± 2.1	3.2 ± 2.1	3.3 ± 2.1
No. of medications (mean ± SD)	3.9 ± 2.5	3.9 ± 2.5	3.9 ± 2.5
Urinary incontinence	2711 (51)	1056 (49)	1655 (52)

[a]Data are given as number (percent) unless otherwise indicated.

ADL = Activities of Daily Living (range 0–7, a higher number indicates higher impairment); CPS = Cognitive Performance Scale (range 0–6, a higher number indicates higher impairment).

Table 2. Predictors of urinary incontinence

Variable	Continent/incontinent		Odds ratio (95% CI)[a]	
	Male	Female	Male	Female
Age, years				
65–74	154/67	162/79	1.0 (Referent)	1.0 (Referent)
75–84	375/220	429/246	0.97 (0.66–1.44)	0.91 (0.63–1.32)
⩾85	595/767	948/1330	1.99 (1.39–2.84)	1.61 (1.15–2.26)
ADL score				
0–1	393/69	630/111	1.0 (Referent)	1.0 (Referent)
2–4	178/86	245/101	1.91 (1.29–2.83)	1.81 (1.30–2.52)
⩾5	551/901	664/1443	4.42 (3.25–6.01)	5.99 (4.68–7.66)
CPS score				
0–1	712/278	1018/408	1.0 (Referent)	1.0 (Referent)
2–4	328/417	415/589	2.04 (1.61–2.58)	2.01 (1.64–2.45)
⩾5	82/361	106/658	5.37 (3.90–7.38)	6.11 (4.67–7.99)
Heart Failure				
No	970/879	1283/1346	1.0 (Referent)	1.0 (Referent)
Yes	152/177	256/309	1.06 (0.79–1.41)	0.98 (0.78–1.24)
Atrial Fibrillation				
No	997/907	1359/1415	1.0 (Referent)	1.0 (Referent)
Yes	125/149	180/240	1.11 (0.82–1.52)	0.95 (0.72–1.24)
Hip Fracture				
No	1037/959	1328/1326	1.0 (Referent)	1.0 (Referent)
Yes	85/97	211/329	1.06 (0.74–1.51)	1.26 (0.99–1.59)
Diabetes				
No	937/856	1266/1319	1.0 (Referent)	1.0 (Referent)
Yes	185/200	273/336	1.37 (1.05–1.78)	1.27 (1.02–1.58)
Parkinson's disease				
No	1058/940	1475/1524	1.0 (Referent)	1.0 (Referent)
Yes	64/116	64/131	1.27 (0.87–1.85)	0.99 (0.68–1.43)
Stroke				
No	875/694	1277/1118	1.0 (Referent)	1.0 (Referent)
Yes	247/362	262/537	1.23 (0.98–1.54)	1.31 (1.06–1.61)
Depression				
No	569/465	743/787	1.0 (Referent)	1.0 (Referent)
Yes	553/591	796/868	1.15 (0.93–1.41)	1.05 (0.88–1.25)
Delirium				
No	968/750	1375/1190	1.0 (Referent)	1.0 (Referent)
Yes	154/306	164/495	1.18 (0.90–1.53)	1.66 (1.31–2.11)
Constipation				
No	920/799	1274/1282	1.0 (Referent)	1.0 (Referent)
Yes	202/257	265/373	1.10 (0.86–1.41)	1.19 (0.95–1.48)
Environmental barriers				
No	1105/937	1520/1475	1.0 (Referent)	1.0 (Referent)
Yes	17/119	19/180	3.58 (2.06–6.23)	2.95 (1.75–4.96)
Urinary tract infection				
No	1071/890	1492/1437	1.0 (Referent)	.0 (Referent)
Yes	51/166	47/218	3.20 (2.20–4.66)	3.66 (2.51–5.33)

[a]Adjusted simultaneously for all the variables listed in the table.

ADL score = Activities of daily living score (range 0–7, a higher number indicates higher impairment); CPS score = Cognitive Performance Scale score (range 0–6, a higher number indicates lower impairment); Alcohol abuse = more than 0.5 litres per day; Environmental barriers = any environment hazardous or uninhabitable (such as inadequate or no lighting in toilet, non-operating toilet, no rails though needed, slippery bathtub, difficulty entering/leaving home); Physical restraints = limbs restraints, used bed rails, constrained to chair when sitting.

directed at the assessment and care of acute in-hospital patients and those individuals living in long-term care institutions, surprisingly few data exist for home care patients.

The major finding of our study is that potentially reversible causes, such as urinary tract infections, use of physical restraints, and environmental barriers were strongly and independently associated with urinary incontinence among frail older people in home care.

Our results support the hypothesis that urinary tract infections are correlated with urinary incontinence. Although the relationship of urinary infections to incontinence in elderly patients is unclear, it is argued that genitourinary infections cause frequency and urgency

that, in turn, can precipitate incontinence. In this respect, the Scientific Committee of the First International Consultation on Incontinence [23] identified urinalysis and the treatment of urinary infection as the first step in the assessment and treatment of urinary incontinence.

Physical restraints may facilitate urinary incontinence according to several different mechanisms. Restrained patients have a drastically limited mobility and do not have free access to toilets or toilet substitutes. Prolonged immobility resulting from restraint use can indirectly facilitate urinary incontinence throughout adverse effects on the musculo-skeletal and cardiovascular system. Older adults who are confined to bed and/or chair are at risk of developing severe muscle weakness with inability to walk, to balance and to turn around, limiting their ability to reach the toilet independently [23]. Elderly people who are immobilised may also suffer from changes that occur in the cardiovascular system. For example, orthostatic hypotension and dizziness upon standing up may cause elderly patients to fear walking, further reducing their mobility.

According to our results, environmental hazards may increase prevalence of urinary incontinence to over 50%. Environmental assessment identifies and helps the removal of potential hazards, favouring mobility and safety of the patient. An environmental evaluation should include determination of toilet access both during the day and at night, assessment of the need for grab bars in the bathroom and for adjusting toilet seat height, the adequacy of lighting to reach the bathroom, and the need for equipment such as commodes and urinals. Otherwise, modification of the home environment without the other components of multifactorial intervention is adequate [24].

The multivariate analysis of our study also demonstrates that the incontinent subjects are more often dependent in ADL's and cognitively impaired. It is possible that physical impairment causes mobility limitations or prolonged immobilisation that, in turn, could be responsible for urinary incontinence through a variety of mechanisms. However, even in those situations which are apparently not reversible, appropriate steps can be instituted to reduce their contribution to the incontinence. In fact, targeted interventions of physical and/or occupational therapies may improve the patient's gait, ambulation, and orientation, and indirectly promote improved toileting and less frequent leakage.

Some limitations of our study need to be recognised. First, the cross-sectional design could not ascertain the cause-effect relationship between independent variables and urinary incontinence. However, because of the use of MDS-HC, a multidimensional assessment instrument, the present study could comprehensively investigate the different domains of elderly status influencing bladder continence. For this reason, and to permit an analysis taking into account the largest number of potential confounders, we incorporated in our model a whole series of variables, including measures of cognitive performance, functional status, and comorbid conditions. Second, we did not distinguish between different types of urinary incontinence. While this warrants additional studies, we were interested in characterising the impact of potentially reversible factors on bladder control. Finally, a more critical consideration is that patients studied were only those considered eligible for home care programs, indicating that a health debilitating problem was in place. In this respect it is not appropriate to extend the results to all community dwelling elderly individuals who do not require such services.

Despite these methodological problems, our data suggest that the rate of urinary incontinence among frail elderly people living in the community is very high and frequently correlates with potentially reversible factors. To identify those with higher risk for potentially reversible urinary incontinence, the MDS-HC assessment tool could be used by home care staff and general practitioners. After a specific intervention is instituted, a repeat assessment should be carried out thereby allowing observations to be made on the efficacy of the preventive measures and the treatment plan. Furthermore, research is required to explore the potential of MDS-HC data to target diagnostic evaluation, and to monitor the appropriateness of preventive strategies for urinary incontinence in a community setting.

Key points

- Urinary incontinence is a highly prevalent condition among frail older people and significantly influences quality of life through negative effects on physical function and social interaction.
- While research on urinary incontinence has been directed at the assessment and care of institutionalised patients, surprisingly few data exist for home care patients.
- The major finding of our study is that potentially reversible causes, such as urinary tract infections, use of physical restraints, and environmental barriers are strongly and independently associated with urinary incontinence among frail older people in home care.
- Research is needed to explore the potential of MDS-HC data to target diagnostic evaluation, and to monitor the appropriateness of preventive strategies for urinary incontinence in a community setting.

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