Articles

Predictors and Incidence of Urinary Incontinence in Elderly Canadians With and Without Dementia – A Five-Year Follow Up: The Canadian Study of Health and Aging

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RÉSUMÉ

Inspirée de l'Étude sur la santé et le vieillissement au Canada, cette étude visait à déterminer l'importance des facteurs sociodémographiques et médicaux et de l'état cognitif et fonctionnel comme prédicteurs du développement de l'incontinence urinaire et à établir des prévisions d'incontinence sur cinq ans, selon le sexe et l'âge. Les sujets de l'Étude sur la santé et le vieillissement au Canada qui avaient subi un examen clinique en 1992 et qui ne souffraient pas d'incontinence urinaire à l'époque ont fait l'objet d'un suivi et leur état a été réévalué en 1997. On a établi les résultats en modèles distincts de régression logistique à plusieurs variables pour les hommes (n = 306) et les femmes (n = 520) survivants en ce qui a trait à l'incontinence quotidienne et à l'incontinence quotidienne ou inférieure. On a introduit des variables prédictives dans les catégories suivantes: facteurs sociodémographiques, état cognitif, état fonctionnel, diabète et ACV. On a également établi des prévisions d'incidence cumulative d'incontinence de cinq ans pour l'incontinence quotidienne et pour l'incontinence quotidienne ou inférieure, selon l'âge et le sexe. Les résultats indiquent que l'incidence d'incontinence urinaire est plus élevé chez les femmes que chez les hommes et qu'elle augmente avec l'âge dans les deux groupes. Particulièrement chez les hommes, les aîné(e)s en établissements sont beaucoup plus susceptibles de développer de l'incontinence urinaire que ceux qui demeurent dans leur milieu. L'incontinence augmente fortement lorsqu'il y a démence grave et pas nécessairement autant en cas d'immobilité physique. Le diabète sucré entraîne l'incontinence chez les hommes mais non chez les femmes. Un ACV s'associe à l'établissement de l'incontinence chez les deux sexes. En guise de conclusion, l'incontinence urinaire est commune chez les aîné(e)s et il faudrait déceler sa présence par des examens de routine et l'évaluation médicale des aîné(e)s. Les patients qui développent de l'incontinence souffrent souvent de démence et de déficience physique. La portée de l'évaluation et la gestion devraient être soigneusement établies en fonction de chaque patient.

ABSTRACT

Based on the national Canadian Study of Health and Aging, the objective of this study was to determine the importance of socio-demographic and medical factors, cognitive and functional status as predictors of the development of urinary incontinence, and to estimate five-year incidence by sex and age group. Participants from the Canadian Study of Health and Aging who underwent a clinical examination in 1992 and were continent for urine at the time were followed up and their continence status was again determined in 1997. Multivariate logistic regression models with daily incontinence and daily or less than daily incontinence as the outcomes were developed separately for male (n = 306) and female (n = 520) survivors. Predictor variables were introduced in the following chunks: socio-demographic factors; cognitive status; functional status, diabetes and stroke. Five-year cumulative incidence of daily and less than daily incontinence by sex and age group was also estimated. Results indicated that the incidence of urinary incontinence was higher in women than in men, and increased by age in both men and women. Especially among men, those in institutions were much more likely to develop urinary incontinence than those in the community. Incontinence increased dramatically with severity of dementia, less so with physical immobility. Diabetes mellitus was related to the development incontinence in men but not in women, prior stroke was related to development of incontinence in both sexes.

It is concluded that urinary incontinence is common in older persons, and enquiries about its presence should be part of routine medical and nursing assessment of older persons. Those who develop incontinence commonly have dementia and are physically impaired. The extent of assessment and management should be carefully tailored to each individual patient.

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Background

Urinary incontinence has been defined as the involuntary loss of urine, which is objectively demonstrable and a social and hygienic problem [1]. It is a common and distressing problem in older persons, with reported prevalence, depending on the population studied and the strictness of diagnostic criteria, ranging from 6–37 per cent in the community [2–5] and from 20–60 per cent in long-term institutions [6]. The prevalence in men is usually reported to be about one-half of that in women [7]. Incontinence is frequently an important factor in deciding whether to institutionalize older persons [7, 8] .

A series of different studies from many countries have shown associations between urinary incontinence and other health factors in older persons. The prevalence of incontinence increases with age [4, 9–12], is usually reported to be more common in women [11,12] and is much more common in older persons living in institutions than in those living in the community [12, 13]. Strong correlations between incontinence on the one hand and general physical [9–11, 13, 14] and cognitive impairment (especially dementia) [10, 11, 14–16] on the other, have also been consistently observed. Associations have also been found with specific genitourinary diseases such as recurrent genitourinary tract infections [17], as well as with stroke [7, 10, 12] and diabetes mellitus [7,12].

Most of these reported associations have been based on cross-sectional data. Cross-sectional analyses of data from the Canadian Study of Health and Aging reported baseline prevalence of incontinence as well as cross sectional correlates of incontinence at baseline [18]. In women, prevalences of daily incontinence were 2.4 per cent in those aged 65–75 years, 9.4 per cent in those 75–84 years and 23.5 per cent in those 85 years of age and older, the corresponding numbers in men were 4.2, 5.3 and 14.8 per cent. The prevalence increased with severity of dementia and decreasing ambulatory function. In this follow-up, we document the risk, among those older persons who were continent at baseline, of developing incontinence within a five-year period, relative to demographic, functional and cognitive status as well as certain specific diseases present at baseline.

Materials And Methods

The Canadian Study of Health and Aging (CSHA) is a multicentre epidemiological study of dementia and other health problems in elderly Canadians [19–21].

The study surveyed 10,263 randomly selected older persons aged 65 and over across Canada (excluding the Northwest and Yukon territories) in 1991 (CSHA-1). There were 9,008 living in the community and 1,255 in long-term care institutions. An extensive neurological and neuropsychological examination was performed on all subjects in the long-term care institutions, those in the community who screened positive for cognitive impairment (according to the Modified Mini-Mental State Examination [22]) and a subsample of those in the community who screened negative. The clinical examination was performed on 2,914 subjects.

In 1996, five years after the baseline assessments, all subjects were recontacted (CSHA-2). Again, everyone in institutions as well as those who scored positive for cognitive impairment in the community and a subsample of those in the community who screened negative, underwent an extensive neurological and neuropsychological examination. For those who had died since CSHA-1, the Registrar General in each province was contacted to provide information about death from the death certificates.

The study was approved by the ethics review boards committees in the 18 participating centres.

For the present incontinence analyses, those subjects were selected who (1) underwent a clinical examination in CSHA-1 and were continent for urine and (2) were still alive and had continence information in CSHA-2. Five hundred and twenty women and 306 men were included.

Based on a combination of the available data on urinary incontinence (primarily from the clinical assessment, but supplemented with data from an interview with the main caregiver), each subject was classified as (1) having daily incontinence; (2) having less than daily incontinence; (3) incontinent with unknown frequency (not included in the following analyses); or (4) continent. If the subject was incapable of answering, the questions were directed to the subject's caregiver. The questions to the subjects were: "Do you have any difficulty with incontinence of urine?" If "Yes," "Is it daily, less than daily but more than once a month, or less than once a month?". Subjects with an indwelling catheter were classified as having daily incontinence. Those who were incontinent less than once a month were considered continent.

The weighted five-year cumulative incidence rates of daily and less than daily urinary incontinence were calculated by sex and age group. The sample weights were adjusted for age, sex, region and institutional status in CSHA-1.

In preliminary multivariate analyses, there was an interaction among several predictor variables and sex. The data were therefore analysed separately for men and women. This is also logical given the differences in anatomy and physiology of micturition between men and women.

The unadjusted, univariate, proportions of individuals with (1) daily or (2) daily or less than daily incontinence in various subgroups based on the predictor variables included were calculated. Using logistic regression analysis, development of (1) daily incontinence or (2) daily or less than daily incontinence at CSHA-2 were chosen as the outcomes. Predictor variables (at CSHA-1) were introduced in conceptual chunks. Socio-demographic variables included age group (65–74, 75–84, 85+) and institutional status. Cognitive function was classified as normal, cognitive impairment no dementia (CIND), mild dementia and moderate dementia [23]. The diagnosis CIND was used for a broad, heterogeneous, group of older persons who were diagnosed clinically with cognitive impairment that did not meet the criteria for dementia; examples of such cognitive impairment include that due to alcohol abuse, depression or age-associated memory impairment. Nearly all of those who were diagnosed as having severe dementia in CSHA-1 were already incontinent at baseline, or were dead at CSHA-2, and were therefore not included in the analyses. Other health variables included physical mobility, diabetes and stroke. SAS (version 6.12; SAS Institute Inc., Cary, NC) under SunOS (UNIX) was used for data management and analysis.

Results

A relatively large proportion of those who were continent at CSHA-1 died prior to CSHA-2 (885/1999 = 44%, weighted: 41%). The five-year mortality (weighted) ranged from 16 per cent in women who were 65–74 at CSHA-1 to 66 per cent in men who were over 85 at CSHA-1. No continence information was available for those who died, and the results therefore relate to those who were still alive at CSHA-2.

The five-year cumulative incidence of urinary incontinence was higher in women than in men, and increased by age in both sexes (Table 1). The proportion who developed daily incontinence ranged from 14 per cent in men who were 65–74 at CSHA-2 to 52 per cent in women over 85 at CSHA-1; daily or less than daily incontinence from 16 to 56 per cent.

Table 1: Five year cumulative incidence of urinary incontinence by gender and age-group (weighted data).

	Five-year Cumulative Incidence of Urinary Incontinence			
	Females		Males	
Age group (at baseline)	Daily incontinence	Less than daily incontinence	Daily incontinence	Less than daily incontinence
65–74 years	28%	13%	14%	2%
75–84 years	31%	12%	17%	8%
85+ years	52%	4%	29%	11%

Table 2: Percent of *women* who developed incontinence five years after CSHA-1 in the different sub-groups. Relative odds of developing urinary incontinence adjusting for other variables in the models.

	Daily Incontinence (CSHA-2)				Daily or Less than Daily Incontinence (CSHA-2)			
Predictor variables (CSHA-1)	% incont.	Odds Ratios			% incont.	Odds Ratios		
		Model 1 (n = 463)	Model 2 (n = 463)	Model 3 (n = 459)		Model 1 (n = 520)	Model 2 (n = 520)	Model 3 (n = 459)
Age 65–74	22.7	ref. §	ref.	ref.	32.0	ref.	ref.	ref.
Age 75–84	27.5	1.3	1.1	1.1	35.6	1.2	1.0	1.0
Age 85+	42.2	2.6**	1.8	1.7	47.8	2.0**	1.4	1.4
Community	26.1	ref.	ref.	ref.	35.0	ref.	ref.	ref.
Institution	40.2	2.0**	1.6	1.2	44.8	1.6*	1.2	1.0
Normal cognition	11.6		ref.	ref.	20.5		ref.	ref.
CIND §§	38.6		3.1***	2.9***	46.4		2.6***	2.4***
Mild dementia	53.7		6.4***	5.1***	59.6		4.7***	3.8***
Moderate dementia	75.6		15.9***	11.7***	77.8		10.7***	8.0***
Physically mobile	22.0			ref.	30.9			ref.
Physically immobile.	58.7			3.8*	62.6			2.8***
No diabetes	30.4			ref.	38.3			ref.
Diabetes mellitus	26.7			0.7	32.6			0.7
No stroke	27.8			ref	35.7			ref.
Stroke	53.3			2.1	58.0			1.7

* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$
§ Reference category
§§ Cognitive Impairment, No Dementia

Table 3: Percent of *men* who developed incontinence five years after CSHA-1 in the different subgroups. Relative odds of developing urinary incontinence adjusting for other variables in the models.

	Daily Incontinence (CSHA-2)				Daily or Less than Daily Incontinence (CSHA-2)			
Predictor variables (CSHA-1)	**% incont.**	**Odds Ratios**			**% incont.**	**Odds Ratios**		
		Model 1 (n = 286)	Model 2 (n = 286)	Model 3 (n = 286)		Model 1 (n = 306)	Model 2 (n = 306)	Model 3 (n = 305)
Age 65–74	12.0	ref. §	ref.	ref.	15.4	ref.	ref.	ref.
Age 75–84	13.3	1.3	1.1	1.1	19.8	1.5	1.2	1.2
Age 85+	22.2	2.3	1.7	1.8	30.0	2.6*	1.9	2.0
Community	9.8	ref.	ref.	ref.	14.3	ref.	ref.	ref.
Institution	40.0	6.4***	6.6***	6.4***	48.9	6.0***	6.1***	5.7***
Normal cognition	7.7		ref.	ref.	11.4		ref.	ref.
CIND §§	15.1		1.6	1.7	18.9		1.3	1.3
Mild dementia	33.3		5.2**	4.8**	46.2		6.2***	5.1**
Moderate dementia	63.6		22.1***	18.3***	73.3		19.2***	14.6***
Physically mobile	10.8			ref.	15.5			ref.
Physically immobile	36.1			2.6*	45.2			2.6*
No diabetes	12.1			ref.	18.2			ref.
Diabetes mellitus	29.0			3.0*	29.0			1.8
No stroke	13.0			ref.	17.8			ref.
Stroke	24.0			1.3	36.7			1.5

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

§ Reference category

§§ Cognitive Impairment, No Dementia *

Especially among men, those in institutions were much more likely to develop urinary incontinence than those in the community (Tables 2 and 3). This relationship remained after the functional and disease variables were included in the models for men, but disappeared for women. The risk of incontinence increased dramatically with severity of dementia, and was an especially common development among those with moderate dementia at baseline. Physical immobility at baseline was associated with a threefold increase in the risk of developing incontinence. Diabetes mellitus was associated with the development of incontinence in men. In univariate analyses, a previous stroke doubled the occurrence of incontinence in both men and women, with more than half of women with stroke developing incontinence. Although this relationship remained in the multivariate analyses, it was no longer statistically significant. There were no significant interactions among the socio-demographic variables.

Discussion

Urinary incontinence is more than a physical problem. It has widespread psychological and social effects as well, such as isolation, feelings of loneliness and disturbed relationships with friends and relatives. It also increases the demand for nursing and home services [24, 25].

What constitutes clinically significant incontinence has been discussed elsewhere, but remains undefined [26]. Caution must be shown when using self- and proxy reported data, but we believe that the combined information regarding incontinence from the clinical history and the caregiver interview strengthens the validity of the incontinence diagnosis used for these analyses.

Since continence information was not available for those who died between CSHA-1 and CSHA-2, our findings relate only to those who survived. Arguably, those who died may have been more likely to develop

incontinence than those who survived, i.e. the cumulative incidence rates are low estimates.

In most earlier studies, information about incontinence and its correlates were collected in a cross-sectional fashion. A strength of our analysis is that it relates predictors, collected at baseline from individuals who at that time were continent, to the presence of incontinence measured at follow-up five years later.

The risk of developing incontinence clearly increases with age, but when other factors are adjusted for, age per se becomes less important. Although the risk is higher in women than in men, the increase with age appears to be steeper in men than in women. Similarly, older persons in institutions have a highly increased risk of developing incontinence. In women, being in an institution loses its significance when adjusting for other risk factors, but it remains a strong risk factor in men. The institutional environment may make older persons more dependent and thus more likely to develop incontinence. However, institutionalization is closely related to general frailty and it can therefore not be concluded from our data that institutionalization per se leads to incontinence.

The strongest risk factor for the development of incontinence is cognitive impairment, and specifically dementia. Incontinence and dementia are closely associated, but the relationship may be through various mechanisms. Confusion, an inability to plan micturition, poor mobility and an inability to find the toilet can precipitate urinary incontinence in older persons with some underlying detrusor instability. Loss of sphincter control is considered to be a hallmark of the later stages of dementia, especially of Alzheimer's disease [27].

The distinction between "incontinence secondary to dementia" and "incontinence associated with dementia" has been emphasized [28]. This difference may be more than semantic. A belief in the former may easily lead to therapeutic nihilism. Not considering the complicated interrelationship among age, disease, medications and functional and cognitive impairment, may lead to a neglect of both potential therapeutic modalities and improved patient outcomes. Incontinence may in many cases be more related to the functional dependence than to neurological and neuromuscular changes due to dementia per se [17]. The realisation that the link between dementia and incontinence is confounded by other factors, especially functional impairment, is possibly already leading to a more aggressive approach to incontinence in nursing homes [28].

Even if our longitudinal data imply that incontinence follows dementia, this does not mean that many older persons with dementia and incontinence cannot gain better control of their incontinence [29], especially since improved mobility can be considered an important mediating factor for incontinence in dementia. The finding that incontinence is closely associated with poor mobility suggests that improvement in mobility can improve incontinence in elderly women [4]. For example, in a study of cognitively impaired nursing home residents, a daily exercise program designed to improve walking had a significant impact on reducing daytime incontinence [30].

It has been suggested [31] that in many geriatric patients urinary incontinence is more closely related to general functional impairment than to specific medical conditions of the uro-genital organs and the central nervous system. It is therefore important that the physician consider the patient from a broad perspective and not focus only on the "bladder level".

With proper assessment many older persons with incontinence can be significantly improved by surgery, medication or conservative measures. Services to deal with incontinence, including incontinence teams, urodynamic clinics and community incontinence nurses, are becoming more common [32, 33]. Effective delivery of such services requires identification of people with the disorder and this is assisted by knowledge of who is at increased risk. Subjects referred to incontinence clinics are usually a select group, and older persons with dementia may be less likely to be referred. Most of these interventions require active patient participation and thus some level of intact cognitive capacity [15]. As one would expect, in a study of behavioural therapy to reduce incontinence, those with better cognition showed markedly better results from the intervention [32], and Seidel et al. [15] suggest that intact cognitive function appears to be an important factor in successfully maintaining or regaining continence. However, the important implication of these findings is that in patients with dementia, improvement in mobility may well lead to a reduction in incontinence [29].

Conclusion

These findings may help identify older persons at greater risk for developing incontinence and may also potentially be used to develop assessment tools that will help identify older persons at risk for developing incontinence. Since urinary incontinence is a common disorder in older persons, enquiries about incontinence should be part of routine medical and nursing assessment. Those who develop incontinence commonly have dementia and are physically impaired. The extent of assessment and management should be carefully tailored to each individual patient.

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