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ORIGINAL ARTICLE

# Urinary incontinence in the prediction of falls in hospitalized elderly\*

INCONTINÊNCIA URINÁRIA NA PREDIÇÃO DE QUEDAS EM IDOSOS HOSPITALIZADOS

INCONTINENCIA URINARIA EN LA PREDICCIÓN DE CAÍDAS EN ANCIANOS HOSPITALIZADOS

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## ABSTRACT

**Objective:** Analyzing the effect of urinary incontinence as a predictor of the incidence of falls among hospitalized elderly. **Method:** Concurrent cohort study where 221 elderly inpatients were followed from the date of admission until discharge, death or fall. The Kaplan-Meier methods, the incidence density and the Cox regression model were used for the survival analysis and the assessment of the association between the exposure variable and the other variables. **Results:** Urinary incontinence was a strong predictor of falls in the surveyed elderly, and was associated with shorter time until the occurrence of event. Urinary incontinence, concomitant with gait and balance dysfunction and use of antipsychotics was associated with falls. **Conclusion:** Measures to prevent the risk of falls specific to hospitalized elderly patients who have urinary incontinence are necessary.

## RESUMO

**Objetivo:** Analisar o efeito da incontinência urinária como preditora da incidência de quedas entre idosos hospitalizados. **Método:** Estudo de coorte concorrente onde foram acompanhados 221 idosos internados, desde a data da admissão hospitalar até a alta, óbito ou queda. A análise de sobrevivência e a verificação da associação entre a variável de exposição e as demais variáveis foram realizadas pelos métodos de Kaplan-Meier, densidade de incidência e o modelo de regressão de Cox. **Resultados:** A incontinência urinária foi um forte preditor de quedas nos idosos pesquisados e esteve associada ao menor tempo de ocorrência do evento. A incontinência urinária, concomitante à disfunção de equilíbrio e marcha e uso de antipsicóticos foram associadas às quedas. **Conclusão:** São necessárias medidas de prevenção de risco de quedas específicas aos pacientes idosos hospitalizados que apresentam incontinência urinária.

## RESUMEN

**Objetivo:** Analizar el efecto de la incontinencia urinaria como pronosticadora de la incidencia de caídas entre ancianos hospitalizados. **Método:** Estudio de cohorte concorrente en el que se acompañaron a 221 personas mayores en estancia hospitalaria, desde la fecha del ingreso hasta el alta, defunción o caída. El análisis de supervivencia y la verificación de la asociación entre la variable de exposición y las demás variables se llevaron a cabo por los métodos de Kaplan-Meier, densidad de incidencia y el modelo de regresión de Cox. **Resultados:** La incontinencia urinaria fue un fuerte pronosticador de caídas en los añosos investigados y estuvo asociada con el menor tiempo de ocurrencia del evento. La incontinencia urinaria, concomitante con la disfunción de equilibrio y marcha y el uso de antipsicóticos, estuvieron asociadas con las caídas. **Conclusión:** Son necesarias medidas de prevención de riesgo de caídas específicas a los pacientes añosos hospitalizados que presentan incontinencia urinaria.

## DESCRIPTORS

Aged  
Inpatients  
Urinary incontinence  
Accidental falls  
Survival analysis  
Geriatric nursing

## DESCRITORES

Idoso  
Pacientes internados  
Incontinência urinária  
Acidentes por quedas  
Análise de sobrevivida  
Enfermagem geriátrica

## DESCRIPTORES

Anciano  
Pacientes internos  
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## INTRODUCTION

Urinary incontinence (UI) and the accident by falls are considered two of the most important and recurrent geriatric syndromes due to the magnitude of its occurrence and its consequences<sup>(1-2)</sup>. They can affect the elderly in all age groups, especially those of advanced age<sup>(3-5)</sup>.

It is estimated that one-third of the elderly living in the community and about half of hospitalized or living in long-stay institutions present UI<sup>(5)</sup>. Between 30% and 50% of hospitalized elderly and residing in long-stay institutions suffered falls once in a lifetime<sup>(6-7)</sup>.

Both syndromes are related to the need for institutional care, increased hospitalization time and also, the prevalence of anxiety and depression<sup>(5,8-9)</sup>.

Studies have reported associations between UI and falls<sup>(9-11)</sup>. Most of them were carried out with elderly residing in the community, with cross-sectional epidemiological designs and showed that this condition is often associated with the occurrence of falls in this population, especially the urge incontinency<sup>(5,9)</sup>. However, to date, longitudinal studies with hospitalized elderly identifying UI as a risk factor associated with falls are scarce<sup>(12-13)</sup>.

The prevention of falls among the elderly in hospitals is an imperative action in these institutions. In addition to suffering more falls, the elderly with UI have longer hospital stays and higher use of health resources<sup>(12-14)</sup>. However, additional studies on the influence of UI on the occurrence of falls among the elderly with incontinence are necessary in order that specific prevention strategies are adopted for these patients.

Thus, this study aimed at analyzing the effect of urinary incontinence as a predictor of the incidence of falls among elderly patients in hospitals.

## METHOD

This is a concurrent, prospective cohort study, which followed 221 elderly patients admitted to medical wards in three large general hospitals, under the Unified Health System (SUS) of Cuiabá, Mato Grosso, in the period from March to August 2013.

This study included people of both genders, aged 60 years or older, hospitalized in the internal medicine division of the aforementioned hospitals. Three elderly patients with compromised mental capacity, evaluated with the Mini-Mental State Examination (MMSE)<sup>(10)</sup> and without companions able to respond to the survey questionnaire were excluded.

The exposure variable, urinary incontinence (UI), was obtained by questioning the involuntary loss of

urine. The following sociodemographic variables were included in the analysis: gender (female and male), age (categorized in years, subsequently re-categorized into three age groups [60 – 69 years, 70 – 79 years and 80 years or older]), education (< 3 years and 4 years or more), income of the elderly in minimum wages (SM) (less than 1 and 2 or more SM). The presence of some comorbidities in the medical records were considered as variables on the health of the elderly, namely: hypertension, diabetes, osteoporosis and stroke. The presence of gait disturbance assessed by applying the Tinetti gait and balance examination was also included<sup>(15)</sup>, as well as the use of antihypertensive drugs, hypoglycemic agents, anxiolytics, antipsychotics and anti-convulsants.

The analysis of the time until the occurrence of falls and the identification of the association between the exposure variable and the other predictive variables was done using the Kaplan-Meier method, which estimates the function and survival curve<sup>(16)</sup>. The date of admission to hospital was used as time zero. Initially, were assessed the ratios of incidence rate (Hazard Ratio - HR) of exposed and unexposed, having as explanatory variables the presence or absence of UI and other variables, and as the response variable, the occurrence of falls or not. The method used was the incidence density, in which the number of people / time is calculated by estimating the time of observation of each individual from the date of admission until the date of occurrence of the event (fall) or discharge / death (censoring). For the final analysis was used the Cox regression model, in which the p-value of 0.20 was considered for entry of predictive variables in the initial model, and for the variable remaining in the final model was considered the 0.05 level of significance. Analyses were done using the *Statistical Package for Social Sciences* 18.0 (SPSS).

The study was approved by the Ethics Committee in Research of the Hospital Universitário Julio Muller – under protocol number 206.880/2013 of the Plataforma Brasil.

## RESULTS

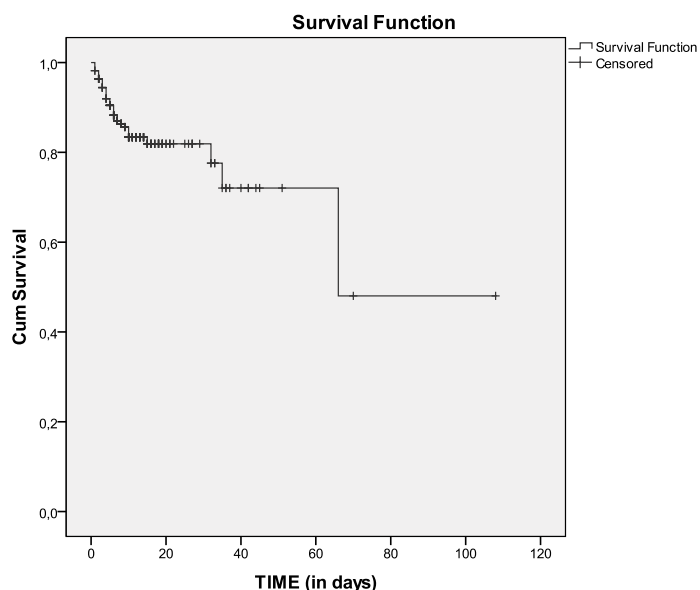
Among the 221 surveyed seniors, the majority were male (n = 117, 52.9%), aged 70-79 years (n = 85, 38.5%), mean age of 73.9 years ( $\pm$  8.6 years), with less than three years of study (n = 156, 70.6%) and income of less than one minimum wage (n = 191, 86.5%).

The results of the survival analysis (life table) are shown in table 1 and figure 1. The overall survival obtained by the Kaplan-Meier method was 42.0% at the end of the study period, while between 20 and 39 days the estimated survival was 70.0%.

**Table 1** – Life table for the time until occurrence of falls in hospitalized elderly – Cuiabá, MT, 2013

Time (in days)	Individuals	Censored events	Exposure to risk	Occurrence of event	Occurrence of event (proportion)	Survival (proportion)	Cumulative survival	Standard error of survival
	n	n	n	N				
0 to 19	221	158	142	32	0.23	0.77	0.77	0.04
20 to 39	31	20	21	2	0.10	0.90	0.70	0.06
40 to 59	9	6	6	0	0.00	1.00	0.70	0.06
60 to 79	3	1	2	1	0.50	0.50	0.42	0.22
80 and more	1	1	1	0	0.00	1.00	0.42	0.22

Note: (N = 221)



**Figure 1** – Survival function of hospitalized elderly until the occurrence of falls obtained by the method of Kaplan-Meier – Cuiabá, MT, 2013.

The variables associated with falls were the following: presence of urinary incontinence (RR= 6.80; CI 95%: 3.38–13.64), presence of gait and balance dysfunction (RR= 5.30; CI 95%: 2.32–12.09), use of hypoglycemic agents (RR= 2.22 CI 95%: 1.12–4.40), use of anxiolytics (RR= 4.36 CI 95% 1.84–10.30) and use of antipsychotics (RR= 3.51 CI 95%: 1.38–8.89) (Table 2).

**Table 2** – Distribution of hospitalized elderly patients who suffered falls by incidence density of hospital stay, according to the variables of health conditions – Cuiabá, MT, 2013

Variables	Fall	People-time	Incidence(*)	RR	(CI 95%)	p value
<b>Urinary incontinence</b>						
No	24	2609	9.20	1.00		
Yes	11	176	62.50	6.80	(3.38–13.64)	<0.001
<b>Age range (years)</b>						
≤ 69	16	82	19.5	1.00		
≥ 70	19	139	13.7	1.42	(0.78–2.62)	0.251
<b>Hypertension</b>						
No	2	441	4.53	1.00		
Yes	33	2339	14.11	3.11	(0.75–12.92)	0.066*
<b>Diabetes</b>						
No	19	1914	9.95	1.00		
Yes	16	866	18.47	1.86	(0.96–3.60)	0.061
<b>Balance/gait</b>						
No dysfunction	7	1584	4.42	1.00		
With dysfunction	28	1196	23.41	5.30	(2.32–12.09)	<0.001
<b>Antihypertensive</b>						
No	2	397	5.04	1.00		
Yes	33	2383	13.85	2.74	(0.66–11.41)	0.067*

Continue...

Continuation...

Variables	Fall	People-time	Incidence(*)	RR	(CI 95%)	p value
<b>Hypoglycemic agents</b>						
No	13	1579	8.23	1.00		
Yes	22	1201	18.32	2.22	(1.12–4.40)	<b>0.018</b>
<b>Anxiolytics</b>						
No	29	2654	10.93	1.00		
Yes	6	126	47.62	4.36	(1.84–10.30)	<b>&lt;0.001</b>
<b>Antipsychotics</b>						
No	30	2654	11.30	1.00		
Yes	5	126	39.68	3.51	(1.38–8.89)	<b>0.019*</b>
<b>Anticonvulsants</b>						
No	32	2700	11.85	1.00		
Yes	2	80	37.50	3.16	(0.99–10.12)	0.077*

RR: relative risk; CI 95%: confidence interval for the proportion of 95%.

(\*): per 1000 people-time

\* Fisher's test

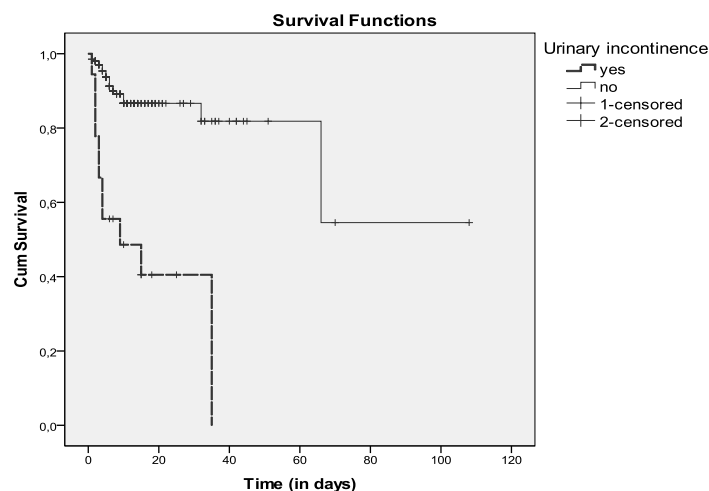
The variables that remained in the final model of Cox were the presence of urinary incontinence (RR= 5.46; (2.48-12.01)), presence of gait and balance dysfunction (RR=4.56; (1.81-11.45)) and use of antipsychotics (RR= 3.62; (1.33-7.04)) (Table 3).

**Table 3** – Regression of proportional risks of Cox for incidence of falls in hospitalized elderly – Cuiabá, MT, 2013

Variables	RR	(CI 95%)	p value
<b>Age range (years)</b>			
≤ 69	1.00		
≥ 70	1.51	(0.71 – 3.19)	0.274
<b>Urinary incontinence</b>			
No	1.00		
Yes	5.46	(2.48-12.01)	0.001
<b>Balance/gait</b>			
With dysfunction	1.00		
Without dysfunction	4.56	(1.81-11.45)	0.001
<b>Use of antipsychotics</b>			
No	1.00		
Yes	3.62	(1.33-7.04)	0.049

RR: relative risk; CI 95%: confidence interval for the proportion of 95%.

In Figure 2, the Kaplan-Meier curve indicates the influence of urinary incontinence on the survival of hospitalized elderly. Compared with individuals without UI, patients with incontinence had significantly shorter survival, i.e., were more likely to suffer falls in the first days of hospitalization.



**Figure 2** – Survival function (Kaplan-Meier) of hospitalized elderly patients with urinary incontinence – Cuiabá, MT, 2013.

## DISCUSSION

In this study, the UI was a strong predictor of falls in the studied population, similar to that found in existing longitudinal studies<sup>(12-13)</sup>. Another relevant finding was that incontinent patients suffered falls with shorter hospital stay than those without UI, reinforcing the assumption that this condition influences the occurrence of falls in hospitalized elderly. One explanation is the more frequent need to urinate of the elderly, as well as their inability to postpone urination, forcing them to go to the bathroom more often than expected hence, exposing them to increased risk of falls<sup>(17)</sup>. In a study with 77 hospitalized adults with UI, it was found that 85.2% of them woke up to go to the bathroom<sup>(18)</sup>. This task can be even more difficult by the concomitant presence of other risk factors such as comorbidities and poor ambient lighting<sup>(19)</sup>. Allied to this, it must be considered that especially at nighttime, the elderly tend not to call the nurse to help them with activities they believe to be able to perform<sup>(20-21)</sup>.

In this study, the UI and the gait and balance dysfunction were independently associated with falls, and remained in the final model. Similar results were found in one of the existing longitudinal studies<sup>(12)</sup>, in which the balance deficit was one of the predictor factors for falls in hospitalized elderly.

The deficiencies in the visual, vestibular and somatosensory systems occur with aging and can lead to difficulties in gait and balance. In the elderly, this dysfunction concomitantly with UI may result in falls due to the combination of postural instability, the urgent need to go to the bathroom and the concern about not urinating on the clothes<sup>(20)</sup>.

The use of antipsychotics was associated with the risk of falls. Previous studies demonstrated the use of antipsychotics as a risk factor for falls in hospitalized elderly<sup>(22-23)</sup>. A possible explanation is that these drugs lead to higher rates of adverse effects, among them, incontinence and / or urinary tract infections, and possible changes in gait and balance, which, combined, can lead to greater incidence of falls<sup>(24-25)</sup>.

In this study, survival was not affected by the age of the elderly. This finding is different from that found in other studies<sup>(12-13)</sup>. However, it was chosen to maintain the age variable in the Cox regression, which allowed a better fit in the final model.

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Concurrent prospective cohort studies, such as the present research have greater validity than other observational studies, because they allow the assessment of the outcome at the time it occurred, not being susceptible to bias of memory and information, among other common limitations of nonconcurrent studies. Moreover, taking into account the proposed objective, the survival analysis has greater advantage than other methods of statistical analysis, since it uses the estimation of the incidence density and comparison rates through people-time, and not prevalence data. However, because this is an observational method, the presence of other possible biases cannot be excluded.

Finally, the results of this study deepen the knowledge about two of the major syndromes that affect the elderly, urinary incontinence and falls, and future studies should consider them. The clinical implication of these findings lies in the need to implement multidisciplinary and intersectoral interventions that help to reduce the risk of falls in elderly incontinent patients. There are nursing interventions based on evidence that have contributed to this reduction<sup>(26-27)</sup>. These measures include identification of patients with UI, specific treatment and care, as well as protective measures to increase the safety of these patients (bars on beds, protection bars and adequate lighting in bedrooms and bathrooms, bedpans and urinals next to the bed).

There is also the need for implementing educational measures with patients and caregivers on the risk of falls and the ways of preventing them. Generally, patients and caregivers have no knowledge about the factors that lead to greater incidence of falls in hospitals. People with more knowledge about their health situation and the ways of dealing with it are more likely to adopt appropriate health behaviors and prevent problems. Studies on educational interventions for preventing falls in hospitals have been carried out and show evidence that, to some extent, such interventions contribute to the reduction of the event<sup>(28-29)</sup>.

## CONCLUSION

The UI was a strong predictor of falls in the surveyed elderly and associated with shorter time until occurrence of the event. This study also demonstrated that UI, concomitant with gait and balance dysfunction and antipsychotics were associated with falls. These results suggest that measures for preventing risk of specific falls should be adopted with hospitalized elderly patients who have urinary incontinence.

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