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Association of physical performance in the Timed Up and Go test with self-report of falls in hospitalized elderly

Associação do desempenho físico no teste *Timed Up and Go* com autorrelato de quedas em idosos hospitalizados

Bruno Prata Martinez[1], Wende Bonifacio Lopes[2], Giovani Assunção de Azevedo Alves[3], Luiz Alberto Forgiarini Júnior[4], Fernanda Warken Rosa Camelier[5], Aquiles Assunção Camelier[6]

[1]Author for correspondence. Federal University of Bahia. State University of Bahia. Salvador, Bahia, Brazil. ORCID: 0000-0002-4673-8698. brunopmartinez@hotmail.com
[2]State University of Bahia. Salvador, Bahia, Brazil. ORCID: 0000-0002-1317-913X. lopeswende@gmail.com
[3]Aliança Hospital. Salvador, Bahia, Brazil. ORCID: 0000-0002-5332-8574. giovaniassuncao@bol.com.br
[4]La salle University. Canoas, Rio Grande do Sul, Brazil. ORCID: 0000-0002-6706-2703. forgiarini.luiz@gmail.com
[5]State University of Bahia. Salvador, Bahia, Brazil. ORCID: 0000-0003-2540-0142. fcamelier@uneb.br
[6]BAHIANA - School of Medicine and Public Health, State University of Bahia. Salvador, Bahia, Brazil. ORCID: 0000-0001-5410-5180. aquilescamelier@yahoo.com.br

RESUMO | INTRODUÇÃO: Episódios de quedas estão associados com redução da mobilidade e mortalidade e são mais comuns em idosos. O *Timed up and Go* (TUG) é um dos principais instrumentos para rastrear o risco de cair em idosos. **OBJETIVO:** Avaliar a associação do teste TUG para autorrelato de quedas no último ano em idosos hospitalizados. **MATERIAIS E MÉTODOS:** Estudo transversal realizado em um hospital privado da cidade de Salvador/BA, no período de Agosto de 2013 a Janeiro de 2014. Foram incluídos indivíduos de ambos os sexos, a partir do 1º ao 5º dia de internação. A acurácia do teste foi calculada pela curva ROC (*Receiver Operator Characteristic*) e análise dos valores de sensibilidade e especificidade. Os resultados foram dispostos em média e desvio padrão ou valor absoluto e percentual. Foi considerado significativo um valor de p <0,05. **RESULTADOS:** Foram inclusos 68 idosos, com idade média 70,4 ± 7,7 anos, IMC = 25,66 ± 5,26 kg/m2, índice de Charlson 5,35 ± 1,97 e tempo médio de internação 2,76 ± 1,71 dias. O tempo médio de realização do TUG foi 10,02 ± 5,38 segundos. A acurácia do TUG foi considerada moderada (0,67; IC = 0,54 - 0,80; p=0,029). O ponto de corte de 9,2 segundos encontrado na curva ROC foi o ponto de maior associação com autorrelato de quedas com uma sensibilidade de 67,7% e especificidade 68,2%. **CONCLUSÃO:** O desempenho no TUG tem associação com autorrelato de quedas no último ano em idosos hospitalizados.

PALAVRAS-CHAVE: Saúde do idoso. Hospitalização. Limitação de mobilidade. Queda.

ABSTRACT | INTRODUCTION: Episodes of falls are associated with decreased mobility and mortality and are more common in the elderly. Timed up and Go (TUG) is one of the key tools for tracking the risk of falling in the elderly. **OBJECTIVE:** To evaluate the association of the TUG test for self-report of falls in the last year in hospitalized elderly. **MATERIALS AND METHODS:** A cross-sectional study was conducted at a private hospital in the city of Salvador, Bahia, from August 2013 to January 2014. Individuals of both sexes were included from the 1st to 5th day of hospitalization. The accuracy of the test was calculated by the Receiver Operator Characteristic (ROC) curve and analysis of the sensitivity and specificity values. The results were arranged as mean and standard deviation or absolute and percentage values. A value of p <0.05 was considered significant. **RESULTS:** We included 68 elderly people, mean age 70.4 ± 7.7 years, BMI = 25.66 ± 5.26 kg / m2, Charlson index 5.35 ± 1.97 and mean time of hospitalization 2.76 ± 1.71 days. The mean TUG time was 10.02 ± 5.38 seconds. The cutoff point of 9.2 seconds found in the ROC curve was the point of greatest association with self-report of falls with a sensitivity of 67.7% and specificity of 68.2%. **CONCLUSION:** TUG performance is associated with self-report of falls in the last year in hospitalized elderly.

KEYWORDS: Elderly health. Hospitalization. Mobility limitation. Fall.

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Introduction

Old age is an evident risk factor for fall episodes and is related to high rates of morbidity and mortality and loss of functional capacity[1]. People over the age of 60 have a high chance of falling at least once a year, and this rate is even higher than 80 years old[2,3].

The outcomes associated with the fall episode are diverse: reduced mobility, fear of a new episode, fractures, increased fragility, total loss of functional independence and even death[3,4]. In addition, falling is also considered a serious social problem[2]. Losses caused by falls affect the whole family group due to the loss of health conditions and promote impacts on health services to treat falls associated with falls, including high costs[2].

The fall is of multifactorial origin and there are numerous factors associated with the risk of falls in the elderly, including history of previous falls, muscle weakness, gait and balance changes, reduction of visual and cognitive acuity, arthrosis, depression, medication use, and higher age to 80 years[1]. There are a variety of evaluative tools that can track this risk of falling in the elderly, such as the Timed up and Go (TUG) test[5]. Initially described in 1991, the TUG originated from a study called Get up and Go and since then has undergone modifications in the scientific nomenclature[6,7]. The TUG was validated for Portuguese in 2016, including elderly institutionalized and residents of the community[8]. This instrument allows assessment of gait and balance by discriminating individuals with high or low risk of falls[2].

Elderly hospitalized or inserted in the community are exposed to different chances of falling[5]. The risk of falls is influenced by acute illness, which may be temporary and may have an impact on physical and cognitive function[5]. Although TUG is a good predictor of falls in community-dwelling elderly, few studies have evaluated its association with self-report of falls in hospitalized elderly[4]. In this way, the present study had as main objective to evaluate the association of the TUG test for self-report of falls in the last year in hospitalized elderly, as well as to identify the association between falls and age, mental function, hospitalization time and comorbidities by the Charlson index.

Methods

Cross-sectional study was carried out at the Hospital da Cidade in Salvador, Bahia, from August 2013 to January 2014. Subjects aged 60 and over, of both sexes, were hospitalized between the 1st and 5th day, independent for ambulation and able to sit and stand without assistance, BMI <30 kg/m^2, with medical clearance to walk and reported being able to perform a new TUG measurement after a rest period of 1 minute. Patients who were using vasoactive and/or inotropic drugs, with complaints of pain and cardiorespiratory alterations that incapacitated the TUG were excluded.

For the selection of the patients in the study, the physiotherapists responsible for the research identified daily the medical records through the electronic system of the hospital. The project was approved by the Ethics and Research Committee and all patients who agreed to participate in the study signed the informed consent form (TCLE).

The primary variables measured were the TUG test, cognitive function through the Mini-Mental State Examination (MMSE), Charlson's comorbidities index, and self-report of falls in the last year. The secondary data collected were age, sex, length of hospital stay during collection, clinical diagnosis, admission profile (clinical or surgical) and comorbidities in the analysis of medical records.

The TUG test was performed by a previously trained physiotherapist. The patient was asked to lift, walk a distance of 3 meters and return to the sitting position in the same chair[10,11]. The time spent to perform the test was marked by a stopwatch that was finished only when the individual sat in the chair with a trunk and arms resting on the appropriate backrests, and the time to perform the activities in seconds was measured[10]. No external assistance was offered to perform the test and no patient used gait assisted device. To evaluate cognitive function, the MMSE was used, which includes several cognitive functions such as orientation, attention and calculation, visuospatial ability, language and recall. The score ranges from 0 to 30 points[6]. To identify comorbidities, we used the Charlson index, which was collected in the first 24 hours of hospitalization[11]. The Charlson index is a system of classification of severity from the identification of 19 predetermined clinical conditions with different weights[11]. The drop was defined as any unintentional event that resulted in the change of the individual's position to a lower level, relative to their initial position[9]. The self-report of falls was recorded after a simple positive affirmation about the question of the occurrence of falls in the last year.

Quantitative data were described by mean and standard deviation, categorical data by absolute frequency and proportion. To measure the accuracy, the Receiver Operator Characteristic (ROC) curve was calculated, with subsequent extraction of sensitivity and specificity values. The highest point between the TUG test with self-reported falls was 9.2 seconds. For intergroup comparisons of the highest accuracy point of the TUG for self-report of falls and the numerical variables (age, mental function, length of stay and Charlson index), Student's t-test was used. Statistical analysis and the database were performed in the Statistical Package for Social Science (SPSS) version 20.0 (Chicago, Illinois, USA). The p value adopted was 5%.

Results

The total sample of the study consisted of 68 hospitalized elderly, mean age of 70.4 ± 7.7 years, BMI 25.6 ± 3.3 kg / m2, Charlson index 5.35 ± 1.97 and mean time of hospitalization during the collection of 2.76 ± 1.71 days. There was a predominance of male (58.8%) and clinical admission profile (64.7%). Regarding the report of fall before hospitalization, 30.9% of the sample reported at least one episode in the last year (Table 1).

The TUG accuracy for self-reported falls in the last year was considered moderate (0.67, CI = 0.54 - 0.80, p = 0.029) in the sample of elderly individuals studied, with a sensitivity of 67.7% and specificity, 2% (Figure 1). The ROC curve was found to be associated only with elderly individuals who walk independently and are eutrophic but limited. The value greater than or equal to 9.2 seconds was the cutoff point with the highest association with self-report of falls, which was found at the point of greatest accuracy in the ROC curve. In the sample of 68 elderly subjects, the mean value of the TUG test was 10.02 ± 5.38 seconds, and 26.4% presented low physical performance from the cutoff point ≥ 9.2 seconds.

In the intergroup comparison of TUG performance, the group with poor physical performance (time ≥ 9.2 seconds) presented a statistically significant difference in relation to age, Charlson's comorbidities score and cognitive function by MMSE. There was no significant difference between the mean time of hospitalization during the time of collection (Table 2).

Table 1. Clinical characteristics of 68 hospitalized elderly. Salvador-BA. 2018

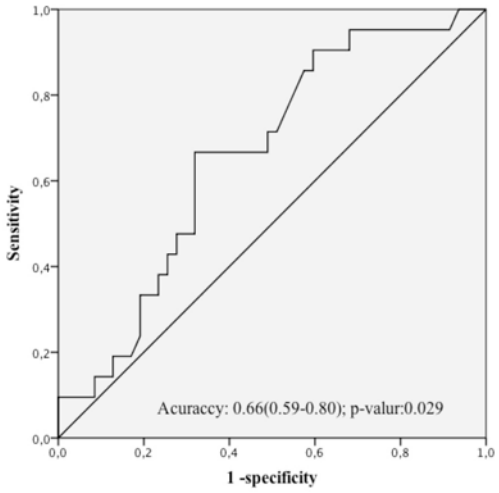
Variable	Mean±SD
Age (years)	70,42 ± 7,72
Body mass index (kg/m^2)	25,66 ± 3,26
Length of hospital stay during collection (days)	2,76 ± 1,71
Index Charlson	5,35 ± 1,97
Mental State Mini Exam	23,7 ± 5,0
Timed Up and Go (seconds)	10,02 ± 5,38
Sex	**n (%)**
Male	40 (58,8)
Female	28 (41,2)
Admission profile	
Clinical	44 (64,7)
Surgical	24 (35,3)
Falls (number)	21 (30,9)

SD= Standard Deviation

Table 2. Intergroup comparison from the Timed Up and Go of 68 hospitalized elderly. Salvador-BA. 2018

Timed Up and Go	<9,2 s	≥9,2 s	Value of p
Age	68,2±6,3	73,4±8,5	0,005
Mental State Mini Exam	25,4±3,6	21,6±5,8	0,002
Index of Charlson	4,76±1,66	6,18±2,1	0,003
Length of hospital stay during collection (days)	2,61±1,69	2,97±1,74	0,41

Figure 1. Assessment of TUG sensitivity and specificity for prediction of falls reported in the elderly



Discussion

This study demonstrated a moderate association between the TUG test and the self-report of falls in the last year in hospitalized elderly, which demonstrates a possible association between poor physical performance and occurrence of falls, suggesting the need for specific interventions by the multidisciplinary team for falls prevention in this at-risk population.

The frequency of self-report of falls in the last year was 30% in the sample of elderly people evaluated in the hospital environment and was similar to that found in a population older than 65 years with hip osteoarthritis[12]. It is necessary to direct attention from an almost fall episode, since individuals who reported two or more near falls are twice as likely to suffer a subsequent fall[12]. Shumway-Cook et al. identified the TUG as a sensitive and specific tool to predict falls in the community in the elderly, being possible to be applied in specific patients in the hospital environment due to its ease of accomplishment.

Nino and Tinete et al.[14,15] showed that 50% of the circumstances related to falls are involved in locomotion activities, which may be justified by changes in gait patterns, since many elderly people suffer from joint pain (mainly in the hip and knee), a change in the center of gravity , environmental obstacles and changes in visual acuity.

Regarding the cutoff points, a great variability was observed between the studies, being these variations from 8 to 33 seconds[12,13]. These differences can be justified by the different profiles of populations that make up the studies and the orientations given at the beginning of the test. Alexandre et al.[3] stratified the cutoff point for the Brazilian population, showing the best accuracy in 12.47 seconds, which was higher than our 9.2 second study. One of the justifications for this is that the authors evaluated[3] the predictor effect over time in a prospective study, different from what we did and that was based on the association with the self-report of falls. In addition, the populations were in different environments (community x hospital). The TUG behavior can be differentiated by the age group in which the subject belongs, and the older individuals perform worse on the physical test (60 to 69 years = 8.1 seconds, 70 to 79 years = 9.2 seconds and 80 to 99 years = 11.3 seconds)[16], given these similar to those obtained in our study.

The present study evidenced a moderate accuracy of the TUG test for self-report of falls in the last year in hospitalized elderly, however, Haines et al[4]. defined the test as incapable of predicting the outcome of fall in this population. According to the authors, the acute condition may compromise the individual's balance and its execution at the admission of the patient is of little use to predict the risk of falls when performed alone[4,17]. The structured and planned hospital environment may be a confounding factor in the evaluation of accuracy of the test by creating preventive strategies and also by limiting the activities of individuals, thus reducing the risk of falling. Therefore, the TUG is more effective in assessing the risk of falls in the elderly in the home or even in the outpatient setting[3,17]. Although, the association of TUG with sarcopenia was identified in hospitalized elderly individuals, but with time <10.85 seconds[18]).

The different guidelines and standardizations may justify the divergent points found in the literature and even the discrepant accuracy values that make TUG satisfactory or not for predicting falls in hospitalized elderly. These differences are not restricted only to the walking speed[19], but may also differ in relation to the use of a walking device or not, use a chair with arms or without, differences in height of chairs that presents a variability of 40 to 50 centimeters and still walk with arms crossed over the body[20-23]. In this way, the wide variation of cut points found in the literature can be explained. However, even with all divergences, it has been proven that the execution of two tests is necessary for the individual's familiarization with the test and consequently better execution[20]. In addition, the central idea of the test is preserved, the better the test performance (the shorter the time for its application) the better the functional level of the elderly and the lower the risk of falls[19,24].

Acute illness can compromise patient balance and may increase the chances of falling. But unlike previous studies, the present sample revealed to be able to identify those elderly individuals at risk of falling even in the hospital environment[4,17], which can be explained by the different hospitalization times, whereas this study was performed with a maximum time of 120 hours, which is equivalent to five days of hospitalization, the others recorded prolonged periods exposing the patients to a chronic condition and leading to a higher rate of comorbidities[23]. These findings corroborate with those found in this study, since the elderly with a higher number of

comorbidities and a worse Charlson index and still those with longer hospitalization registered a worse performance in the TUG test.

The fall is described as an adverse risk of those hospitalized in the hospital setting and is considered to have a major impact on the health of these individuals, making the evaluation of their risk extremely useful and necessary[4,18]. Tracking the elderly person more susceptible to fall will provide planning and interventions that will significantly reduce the chances of falling during periods of hospitalization[26].

This study presents some limitations as the cross-sectional nature of the study and because self-reports of falls are dependent on the memories of the elderly, which may increase the risk of a temporal bias. Another limitation is related to the application of the TUG test between the 1st and 5th day of hospitalization, which may influence a bias for physical performance, as well as the performance in only the independent and eutrophic elderly, which limits the external validity of the study. We suggest a more specific study with a more rigid design to prove this accuracy between TUG and self-report of falls in the elderly.

Conclusion

TUG had a moderate association with self-report of falls in the last year in hospitalized elderly. The cut-off point as predictor of falls was 9.2 seconds, and the elderly with poorer performance in the test had worse cognitive function, older age and severity score.

Author contributions

Martinez BP, Camelier AA, Camelier FWR participated in the study design and conception, statistical analysis of the research data, interpretation of the results and writing of the scientific article. Martinez BP and Lopes WEB participated in the data collection of the research and writing of the scientific article. Júnior LAF and Alves GAA participated in the statistical analysis of the research data, interpretation of the results and writing of the scientific article.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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