Predicting a long hospital stay after admission to a geriatric assessment unit: Results from an observational retrospective cohort study

Olivier Beauchet[a,b,c,*], Shek Fung[d], Cyrille P. Launay[e], Jonathan Afilalo[f], Paul Herbert[g], Marc Afilalo[h], Julia Chabot[a,d]

[a] Department of Medicine, Division of Geriatric Medicine, Sir Mortimer B. Davis - Jewish General Hospital and Lady Davis Institute for Medical Research, McGill University, Montreal, Quebec, Canada
[b] Dr. Joseph Kaufmann Chair in Geriatric Medicine, Faculty of Medicine, McGill University, Montreal, Quebec, Canada
[c] Centre of Excellence on Longevity of McGill integrated University Health Network, Quebec, Canada
[d] Department of Medicine, Division of Geriatric Medicine, St. Mary's Hospital Center, McGill University, Montreal, Quebec, Canada
[e] Geriatric Medicine and Geriatric Rehabilitation Division, Department of Medicine, Lausanne University Hospital, Switzerland
[f] Division of Cardiology and Centre for Clinical Epidemiology, Jewish General Hospital and McGill University, Montreal, Quebec, Canada
[g] Department of Medicine, Montreal University Hospital and University of Montreal, Montreal, Quebec, Canada
[h] Department of Emergency Medicine, Jewish General Hospital, McGill University, Montreal, Quebec, Canada

ARTICLE INFO

ABSTRACT

Objective: Morbidities and related disabilities often lead to older inpatients having a long hospital stay. The aim of this study was to examine whether the 6-item brief geriatric assessment (BGA), developed and validated in France to determine *a priori* levels of risk of a long hospital stay (i.e.; low, moderate, high), could be successfully used with patients admitted to a geriatric assessment unit (GAU) in Quebec.
Study design: Observational retrospective cohort design.
Setting: A GAU of a McGill University affiliated hospital (Montreal, Quebec, Canada).
Participants: 499 inpatients (84.7 ± 7.2 years; 73.3% female) recruited upon their admission.
Main outcome measures: The BGA comprises 6 items: age $\geq$ 85 years, male gender, ≥ 5 drugs per day, use of home-help support, history of falls and temporal disorientation. It was administered at baseline and *a priori* levels of risk of a long hospital stay (i.e., low, moderate, high) were determined. Length of hospital stay (LHS, in days) was calculated using the hospital registry. The association between *a priori* levels of risk from the BGA and LSH was examined using regression models and Kaplan-Meier curves.
Results: The LHS increased with the 6-item BGA *a priori* level of risk (P = 0.010). High-risk (Hazard ratio (HR) = 1.68 with P < 0.001) and moderate-risk (HR = 1.24 with P = 0.039) of a long hospital stay successfully predicted a long stay. Kaplan-Meier distributions of time to discharge showed that inpatients classified as having high and moderate risk levels for a long hospital stay were discharged later than those with a low risk level (P < 0.001 and P = 0.013).
Conclusion: The 6-item BGA *a priori* levels of risk for a long hospital stay successfully predicted a long stay among patients admitted to a GAU in Quebec.

1. Introduction

Older adults (i.e., aged 65 and over) are the largest group of patients admitted to hospitals in Europe and in North America [1–4]. The prevalence of this age group in McGill University hospitals (Montreal, Quebec, Canada) was around 45% in 2015 [5]. Morbidities and related disabilities are clinical characteristics of older inpatients exposing to high risk of non-fatal health outcomes like long length of hospital stay (LHS) [3,2,6]. Hospital care organization is mainly shaped around the management of a single acute disease rather than multimorbidities and disabilities, that may lead to mismanagement, increased LHS in older inpatients and health expenditures [1–6]. Hospitals are over capacity in North America, regardless of the type of hospital (i.e., urban versus non-urban hospital; teaching versus non-teaching hospital) [7]. Thus,

---

* Corresponding author at: Department of Medicine, Division of Geriatric Medicine, Sir Mortimer B. Davis - Jewish General Hospital, McGill University, 3755 chemin de la Côte-Sainte-Catherine, Montréal, QC H3T 1E2, Canada.
E-mail address: olivier.beauchet@mcgill.ca (O. Beauchet).

Table 1
Baseline characteristics of older inpatients separated in three groups based *on a priori* levels of risk for long length of hospital stays (i.e.; low, moderate, high) determined with the 6-item brief geriatric assessment tool (n = 499).

Baseline Characteristics	Total population (n = 499)	6-item brief geriatric assessment *a priori* risk levels			P-Value[a]			
		Low (n = 161)	Moderate (n = 265)	High (n = 73)	Over all	Low *versus* moderate risk	Low *versus* high risk	Moderate *versus* high risk
Brief geriatric assessment items								
Age (years)								
Mean ± SD	84.7 ± 7.2	84.3 ± 8.0	84.4 ± 7.1	86.6 ± 5.2	**0.045**	1.000	0.067	0.057
≥ 85 years, n (%)	278 (55.7)	92 (57.1)	138 (52.1)	48 (65.8)	0.103	–	–	–
Male, n (%)	133 (26.7)	46 (28.6)	52 (19.6)	35 (47.9)	**< 0.001**	**0.043**	**0.005**	**< 0.001**
Home support[b], (%)	388 (77.8)	120 (74.5)	203 (76.6)	65 (89.0)	**0.009**	0.642	**0.008**	**0.006**
Number of therapeutic classes taken daily								
Mean ± SD	7.9 ± 4.2	7.7 ± 4.4	7.8 ± 4.1	9.2 ± 3.8	**0.026**	1.000	**0.034**	**0.039**
≥ 5, n (%)	397 (79.6)	124 (77.0)	207 (78.1)	66 (90.4)	**0.044**	0.811	**0.018**	**0.019**
Temporal disorientation[d], n (%)	82 (16.4)	0 (0)	30 (11.3)	52 (71.2)	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**
History of falls in the previous 12-months, n (%)	308 (61.7)	0 (0)	235 (88.7)	73 (100)	**< 0.001**	**< 0.001**	**< 0.001**	**0.001**
Place of living home, n (%)	337 (67.5)	111 (68.9)	175 (66.0)	51 (69.9)	0.742	–	–	–
Use psychoactive drug[c], n (%)	234 (46.9)	64 (39.8)	123 (46.4)	47 (64.4)	**0.002**	0.192	**0.001**	**0.008**
Reason for admission, n (%)								
Mobility disorders[e]	301 (60.3)	94 (58.4)	166 (62.6)	41 (56.2)	0.539	–	–	–
Neuropsychiatric disorders[f]	106 (21.2)	34 (21.1)	57 (21.5)	15 (20.5)				
Organ failure[g]	38 (7.6)	11 (6.8)	18 (6.8)	9 (12.3)				
Acute functional decline requiring increase in social care[h]	54 (10.8)	22 (13.7)	24 (9.1)	8 (11.0)				
Length of stay[i] (days)								
Mean ± SD	15.8 ± 14.5	12.7 ± 11.8	16.0 ± 14.6	21.8 ± 17.3	**< 0.001**	0.062	**< 0.001**	**0.007**
> 15, n (%)	176 (35.3)	50 (31.1)	89 (33.6)	37 (50.7)	**0.010**	0.670	**0.005**	**0.009**

SD: standard deviation; P-value significant (i.e.; < 0.05) indicated in bold.

[a] Comparison based on an analysis of variance (ANOVA) with Bonferroni correction for multiple comparisons.

[b] Use of formal (i.e., health and/or social professional) and/or informal (i.e., family and/or friends) home support.

[c] Use of benzodiazepines or antidepressants or neuroleptics.

[d] Inability to give the month and/or year.

[e] Defined as gait and/or balance disorders and/or fall defined as unintentionally coming to rest on the ground, floor, or other lower level.

[f] Defined as delirium, dementia or behavioral disorders.

[g] Defined as an acute organ decompensation.

[h] Defined as the absence of symptoms of acute diseases combined with an acute increase of the use of formal and/or informal home and social services leading to an inability to stay in its place for life.

[i] Based on the administrative registry of St. Mary's Hospital Center. Corresponds to the delay in days between the first day of admission to geriatric ward and the last day of hospitalization in the same geriatric ward.

finding solutions to reduce the occurrence of age-related burden of non-fatal health outcomes like long LHS are an objective to achieve [7–9].

An effective and efficient care plan for older inpatients requires an early screening of frail inpatients who are at higher risk of non-fatal health outcomes compared to their non-frail counterparts. [2,10]. This screening may be helpful to target interventions, which may prevent the occurrence of non-fatal health outcomes [2,4,10]. Regardless of the reason for the admission, simple interventions can be implemented to reduce the LHS. Delirium, motor deconditioning, adverse drug reactions due to polypharmacy, and inappropriate home support are the main geriatric conditions to target when taking care of older ER users [3,8,11]. We previously demonstrated that acting on these conditions significantly facilitate discharge planning and reduce the LHS [3,11].

In Quebec, the "Program of Research on the Integration of Services for the Maintenance of Autonomy" (PRISMA-7) tool is recommended by health authorities to screen for frailty in older adults [12]. It is a standardized and validated self-reported questionnaire composed of 7 questions using older adults' health perceptions [12]. However, there are issues related to the use of this short perception-based questionnaire in older inpatients. First, PRISMA-7 has been validated in community dwellers and not in hospitalized patients. Second, the high prevalence of cognitive impairment in older inpatients exposes to invalid answers [3,6,10]. A clinical tool similar to PRISMA-7 has been developed in France: the 6-item brief geriatric assessment (BGA) [3,13–15]. This tool is a short-standardized questionnaire, but compared to PRISMA-7, the 6-item BGA depends on an objective clinical examination performed by a health professional like a nurse [3,13]. This clinical tool has specifically been validated in older inpatients [3,13–15], and classified them in three levels of risk (i.e., high, moderate and low) for long LHS [14,15]. As the long LHS is considered as a marker of a high burden of non-fatal health outcomes, the 6-item BGA seems to be a good prognosis tool to screen frail older inpatients who are at risk of non-fatal health outcomes like long LHS. The predictive value of the 6-item BGA for long LHS has not been examined and validated in Quebec older inpatients. We hypothesised that the 6-item BGA could be used to predict long LHS in older inpatients admitted to a Geriatric Assessment Unit (GAU) in Quebec. The aim of this study was to examine whether the 6-item BGA *a priori* three levels of risk (i.e.; low, moderate, high) for long LHS successfully predicted long LHS in Quebec geriatric inpatients admitted to a GAU of McGill University hospital, in order to validate externally the predictive value of the 6-item BGA for LHS.