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Prediction of in-hospital mortality with the 6-item Brief Geriatric Assessment tool: An observational prospective cohort study

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ABSTRACT

Background: The 6-item Brief Geriatric Assessment (BGA) is a screening tool to identify frail inpatients who are at risk of adverse health events. Its predictive value for in-hospital mortality has not been examined yet.
Objective: This study examined whether the BGA is able to predict in-hospital mortality in older patients.
Methods: A total of 1082 participants were included in this observational prospective cohort study. At their admission to the medical wards of Angers University Hospital (France), all inpatients aged ≥65 years were screened with the BGA. Its 6 items are: age ≥85 years, male gender, polypharmacy (i.e., ≥5 drugs per day), non-use of home-help services, history of falls in the previous 6 months, and temporal disorientation (i.e., inability to give the month and/or year). Three levels (low, intermediate and high) of risk of adverse health events had previously been identified, based on different combinations of BGA items. Patients were separated into 2 groups using the occurrence of in-hospital death. The length of stay was calculated as the number of days in hospital using the hospital registry. The use of psychoactive drugs and the reason for admission were used as covariates.
Results: Older inpatients who died were more frequently admitted for an acute organ failure ($P < 0.001$). Cox regression models showed that *a priori* intermediate risk (HR = 1.89, $P < .001$) and high risk (HR = 2.34, $P < .001$) risk levels predicted in-hospital mortality. Kaplan-Meier survival curves confirmed that inpatients at high risk ($P = .047$) and those at intermediate risk ($P = .013$) died earlier than patients at low risk.
Conclusions: Combinations of items on the BGA successfully predicted the risk of in-hospital mortality in this sample of older inpatients.

1. Introduction

Medical progress in the management of acute diseases has reduced overall hospital death rate by 20% in 10 years [1]. However, the hospital is still a place where older inpatients die, especially older inpatients aged 80 and over [1–3]. This subgroup of inpatients represents nearly half of the mortality cases in hospital [1,3–5]. Their death usually occurs in emergency department (ED) and short-stay units [1,4,5]. The higher rate of in-hospital mortality in older patients compared to younger patients may in part be explained by the accumulation of severe chronic diseases, which leads to atypical clinical presentations of acute diseases and, thus, care mismanagement like delay in clinical decision-making and interventions [4–7].

Failure to consider the risk of in-hospital mortality in the context of clinical decision making can lead to poor care [8]. It would therefore be helpful to estimate the risk of in-hospital mortality of older inpatients especially when evaluating the risks and benefits of investigations and potential treatments [8–10].

A systematic review on the description of the prognostic indices predicting risk of in-hospital mortality in older patients showed that there is insufficient evidence to recommend the use of these indices in clinical practice because of lack of validation [8]. In addition, this study underscores that all previous studies focused on prediction of one-year mortality after the Index hospital admission [8]. Thus, there is a need to develop a tool which can provide an objective estimation of risk of in-hospital mortality in older inpatients. This also potentially offers to move beyond arbitrary age-based cutoffs in clinical decision-making for older adults [8,11].

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Many studies showed that mortality following admission to ED is a combination of biological, functional, psychological, pathological and environmental factors [12,13]. Impairments in physical function, cognition, and nutrition have also been associated with an increased risk of death in older adults [13]. All these results highlight that a multidimensional assessment is needed to identify in-hospital mortality. Avelino et al. confirmed that comprehensive geriatric assessment (CGA), successfully identified older patients at high risk of in-hospital mortality [14]. However, CGA is time consuming and requires a multidisciplinary assessment which is often not compatible with clinical practice in ED and non-geriatric short-stay units [15]. To overcome CGA's complexity, several tools and indices have been created [8,16–18]. However, most of them focus on patients with specific diseases [18]. Ideally, the use of a tool would allow to predict the risk of in-hospital mortality. Also, such a tool would have to respect specific characteristics including an easy and rapid clinical screening, the possibility of being used by non-geriatricians and the ability to provide a helpful answer in clinical decision-making. The 6-item Brief Geriatric Assessment (BGA) is a screening tool which has all these characteristics [19–22]. It has been developed to predict adverse health events and it predicts one-year mortality of older inpatients [19–22]. The 6-item BGA risk of in-hospital mortality is stratified into three levels (low, moderate, severe) with a significant increased risk of mortality for moderate and high risk levels [22]. The 6-item BGA has been designed to be used by non-geriatrician and health professional working in ED [19–22]. Thus, a tool like the 6-item BGA could be a solution to help all professionals taking care of older inpatients.

The first step to confirm or not that the 6-item BGA may be use as a prognostic tool is to demonstrate whether its risk stratification is associated with an increased risk of in-hospital mortality. In case of positive results, the second step will be to validate the risk stratification in large diverse samples. The present study focuses on the first step. Because the 6-item BGA predicts the risk of long-term mortality, we hypothesized that it could also predict the in-hospital mortality. The aim of this study was to examine whether the 6-item BGA predict the in-hospital mortality in older inpatients.

2. Methods

2.1. Participants

A total of 1082 (mean age 83.7 ± 7.4years, 58.6% women) older patients (i.e., aged ≥65years) were recruited during their hospitalization from 11 acute and post-acute medical wards of the Angers University Hospital (France). The patients were prospectively included in an observational cohort study from April 2013 and October 2013. The inclusion criteria were: hospitalization in acute or post-acute medical wards, age 65 years and over, no identified treatment-limiting decision (defined as a predetermined choice not to implement therapies that would otherwise be required to sustain life). No inpatients with this inclusion criteria refused to participate in this study.

2.2. Assessment

The 6-item BGA was performed by a nurse at admission in each unit and was composed of the following items: age (≥85years or < 85), male gender, polypharmacy defined as ≥5 drugs per day, non-use of formal and/or informal home-help services (yes or no), history of falls in the previous 6 months (yes or no), and temporal disorientation (i.e., inability to give the month and/or year). In addition, the reason for admission (i.e., acute organ failure, mobility disorders, neuropsychiatric disorders and social-related conditions) and the use of psychoactive drugs were collected. Three levels of risk of adverse health events (i.e.; prolonged length of hospital stay, readmission and long term mortality) have been previously determined (21)(20)(22). The high-risk level is defined as the combination of temporal disorientation + history of falls. The intermediate level of risk was defined by history of falls or time disorientation or the combination of age > 85years +male gender + polypharmacy + no use of home help services. The low-risk level was defined by the combination of 3 items or less among age > 85years + male gender + polypharmacy + no use of home help services.

2.3. Outcome measures

In-hospital mortality was recorded from the administrative registry of Angers University Hospital. The number of days in hospital has been calculated using the administrative registry of the University Hospital. It has been defined as the length between the first day of admission and the last day of hospitalization in acute or post-acute unit corresponding to discharge or death.

2.4. Standard protocol approvals, registrations, and participant consents

All participants recruited in this study provided a verbal informed consent because the ethics committee considered that the study did not change the usual clinical practice. The verbal informed consent was obtained from the patients themselves in the presence of a reliable caregiver who was usually a family member assisting in decision making for medical issues. Posters were settled in every patient's room of acute and post-acute medical wards participating in the study. These posters provided information about the study and the possibility to use patient medical data for a research purposes. The patient, family members or legal representative could express refusal to the use of patient's data by informing the principal investigator or its representatives. The study and the consent procedure have been approved by the Ethical Committee of Angers, France.

2.5. Statistical analysis

The participants' baseline characteristics were summarized using means and standard deviations or frequencies and percentages, as appropriate. Participants were separated into 2 groups based on the occurrence or not of death during the hospital stay. First, between-group comparisons were performed using the Chi-square test. Second, Cox regression models were used to identify the most significant baseline characteristics related to the occurrence of in-hospital death. Third, the time elapsing to death among inpatients was studied with survival curves computed according to the Kaplan-Meier method and compared by the log-rank test. Participants were censored when they were discharged from the hospital. P-values less than 0.05 were considered statistically significant. All statistics were performed using SPSS (version 19.0; SPSS, Inc., Chicago, IL).

3. Results

As shown in Table 1, inpatients with intermediate (HR = 1.89, P < .001) and high-risk level (HR = 2.34, P < .001) had a higher risk of dying during their hospitalization compared to inpatients with a low risk level. Older patients who died were more frequently admitted to hospital for an acute organ failure (P < .001). In addition, being admitted for geriatric syndromes such as mobility (HR = 0.48, P < .001) or neuropsychiatric (HR = 0.38, P < .001) disorders were associated with a lower risk of death compared to an admission for an acute organ failure. Kaplan-Meier survival curves revealed that individuals with intermediate and high-risk levels had an increased risk of death in comparison to low-risk level (P = .031) (Fig. 1). Comparison of survival curves showed that inpatients considered at high-risk (P = .047) and those classified at intermediate-risk (P = .013) died faster compared to those with a low risk. There was no significant difference between inpatients classified in high and intermediate risk levels (P = .934)