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Original article

An operationalized version of the Mini-Nutritional Assessment Short Form using comprehensive geriatric assessment

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SUMMARY

Background and aims: We sought to operationalize some of the items of the Mini-Nutritional Assessment Short Form (MNA-SF) according to Barthel Index (BI), Mini Mental State Examination (MMSE) and Geriatric Depression Scale (GDS) scores among older hospitalized patients in order to optimize the concordance of aforementioned tools. In addition, we assessed comparability and interchangeability of operationalized MNA-SF and standard MNA-SF which have not been performed so far.

Methods: 358 older participants (250 women) aged ≥60 years who were consecutively admitted at geriatric hospital ward were included in this retrospective cross-sectional study.

Results: According to MNA-$SF_{standard}$, in total study population, the prevalence of the patients at risk of malnutrition and malnourished subjects were 48.6% and 48.9%, respectively. A substantial agreement between MNA-$SF_{standard}$ and MNA-$SF_{operationalized}$, which is based on the items mobility of BI and MMSE score, was observed ($k = 0.74$, $P < 0.001$) whereas including the GDS into model did not show a significant impact on overall agreement in this population ($k = 0.73$, $P < 0.001$). According to the MNA-$SF_{operationalized}$, 50.2% and 49.2% were categorized as malnourished and being at risk of malnutrition, respectively. The false positive rate and the false negative rate of the MNA-$SF_{operationalized}$ vs. MNA-$SF_{standard}$ was 10% and 12% of the entire population.

Conclusion: The MNA-$SF_{operationalized}$, which is operationalized with the items mobility of BI and MMSE-score, emerged as a comparable and feasible tool in older hospitalized patients. It identified the high proportion of malnourished or being at risk of malnutrition and revealed a substantial agreement with the MNA-$SF_{standard}$.

1. Introduction

Malnutrition is the most predominant and common clinical problem among older individuals which has detrimental effect on their overall health and functional status [1]. Despite the high prevalence of malnutrition in elderly, it remains an undertreated problem [2]. Therefore, early recognition and treatment of older patients at risk of malnutrition is of great importance to decrease or even prevent the development of its clinical sequelae. Nutritional screening is not a mandatory component of the comprehensive geriatric assessment (CGA) in Germany and probably other countries.

Notwithstanding the lack of a unique definition of malnutrition, several screening tools have been proposed to evaluate the nutritional status in elderly or hospital populations and community. Some of these tools which have been validated in different settings comprise the Mini Nutritional Assessment Long Form (MNA-LF) [3], Malnutrition Universal Screening Tool (MUST) [4] and Nutritional Risk Screening 2002 (NRS-2002) [5]. In addition, the Mini-Nutritional Assessment Short Form (MNA-SF) [6], a reduced and validated [7] version of MNA-LF, has been proposed as an effective diagnostic tool for malnutrition in aging population that can be performed in a shorter time. However, some of the items in the MNA-SF, such as dementia, depression and mobility, are obtained by other components of the geriatric assessment and could be operationalized with the use of objective test results, rather than using just the clinical impression.

Nevertheless, in geriatric settings, the CGA was developed to demonstrate an older individual's functional impairment, neuropsychological problems and comorbidities [8]. Among these

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tools, the Barthel Index (BI) [9], Mini Mental State Examination (MMSE) [10] and Geriatric Depression Scale (GDS) [11] are routinely utilized to measure functional ability, cognitive and emotional status of patients, respectively. One major limitation of the CGA is that although a number of these assessment tools cover a pool of domains with different definitions and cut-off scores, they have a big overlap with each other in terms of their items. Namely, co-existing in some of the intersections within these screening/assessment tools is apparent. Unfortunately, there is a lack of a single comprehensive assessment tool comprising a set of non-redundant elements concerning the patients' medical, psychological, cognitive, nutritional, social and mobility status. This leads to simultaneous use of several existing screening and assessment tools, resulting in redundancy and time-consumption.

In recent study by Christner et al. [12] among 201 older hospitalized patients, the items 'mobility and neuropsychological problems' of the MNA-SF have operationalized based on the results of CGA (i.e. BI, MMSE and GDS [9–11]) with the aim of standardizing the objectivity of the MNA-SF [6] for use in this population. However, in that study, a substantial agreement between operationalized MNA-SF and standard MNA-LF [3] was observed, but the authors did not compare and validate the operationalized MNA-SF with the corresponding standard MNA-SF. We therefore sought to i) operationalize some of the items of standard MNA-SF according to BI, MMSE and GDS scores among older hospitalized patients in order to optimize the concordance of aforementioned tools and ii) assess comparability and interchangeability of operationalized MAN-SF and standard MNA-SF which have not been performed so far.

2. Subjects and methods

2.1. Study design and subjects

This cross-sectional investigated older participants (age ranged between 60 and 99 years) who were consecutively hospitalized between March 2015 and December 2016 to a geriatric acute care ward at Marien-Hospital, Herne, Germany. We retrospectively analyzed a set of 358 geriatric assessment (250 women), including MNA-SF, and compared the results of conventionally obtained MNA-SF with the operationalized version. The operationalized version was obtained by deleting the results of the items cognition and mobility of the conventional form and substituting them by the operationalized items, which were calculated from CGA. The study protocol had been approved by the ethical committee of Ruhr-University Bochum.

2.2. Geriatric assessment

2.2.1. Barthel-Index (BI)

The range of the German version of the BI is 0–100 pts., with 100 pts. indicating independency in all activities of daily living [9]. Mobility status was defined according to walking ability as described by the BI.

2.2.2. Mini Mental State Examination (MMSE) and Geriatric Depression Scale (GDS)

Cognitive status was assessed using the MMSE [10] and depression was investigated by the use of the GDS [11] as described in the literature. All assessments were performed and recorded within the first two working days of hospital admission by attending physician.

2.3. Malnutrition screening tools

2.3.1. MNA-$SF_{standard}$

The screening of patients in relation to malnutrition was evaluated using Mini Nutritional Assessment Short Form (MNA-$SF_{standard}$) [6] on the day after hospital admission. The MNA-SF is a reduced version of the MNA-LF [3] which assesses 6 items (A-F). Participants are categorized as malnourished (0–7 points), at risk of malnutrition (8–11 points) and having normal nutritional status (12–14 points).

2.3.2. MNA-$SF_{operationalized}$

In the operationalized version of MNA-SF of the current study, item C and E (mobility and neuropsychological problems, respectively) were revised according to the results of comprehensive geriatric assessment tools. An overview of the MNA-SF versions is presented in Table 1 that indicates the operationalized version of mobility and neuropsychological problems' items, as used in this study, and of the previous standard MNA-SF. Item E 'neuropsychological problems' in MNA-$SF_{standard}$ was operationalized based on cognitive status as assessed by MMSE (E_1) [10], depression as investigated by GDS (E_2) [11] and combined as assessed by MMSE and GDS simultaneously (E_3). All other items of the MNA-$SF_{operationalized}$ were identical to the MNA-$SF_{standard}$.

2.4. Data analysis

The statistical analysis was performed with SPSS statistical software (SPSS Statistics for Windows, IBM Corp, Version 23.0, Armonk, NY, USA). Continuous variables are reported by their means and standard deviations (SDs) for normally distributed variables and median values with interquartile ranges (IQR) were expressed for non-normally distributed data. Categorical variables are expressed as absolute numbers and relative frequencies (%). A group comparison was performed using the *t*-test for continuous data with normal distribution, the Mann–Whitney *U* test for continuous variables with non-normal distribution and Pearson Chi-square test for categorical variables.

Pairwise agreement between MNA-$SF_{standard}$ and MNA-$SF_{operationalized}$ was performed by Cohen's Kappa coefficient (k) [13] which suggested value < 0 as no agreement, 0–0.20 as slight, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial and 0.81–1.0 as almost perfect agreement between tools. Several cut-off values with regard to the mobility item of BI, MMSE and GDS were examined and the optimal cut-off values with higher Kappa agreement between MNA-$SF_{standard}$ and MNA-$SF_{operationalized}$ versions were used in the final operationalized version.

Accordingly, three following comparisons were performed: between MNA-$SF_{standard}$ and MNA-$SF_{operationalized1}$ (based on items C and E_1), between MNA-$SF_{standard}$ and MNA-$SF_{operationalized2}$ (based on items C and E_2) and between MNA-$SF_{standard}$ and MNA-$SF_{operationalized3}$ (based on items C and E_3, Table 1). The rationale behind this was to understand the impact of MMSE and GDS on Kappa agreement's result individually. In addition, comparison between MNA-$SF_{standard}$ and operationalized MNA-SF according to different cut-off points as of the previous study by Christner et al. (MNA-$SF_{operationalized4}$) [12] was performed. False positive rate and false negative rate for MNA-$SF_{operationalized}$ in relation to MNA-$SF_{standard}$ were calculated. A P value < 0.05 was accepted as the limit of significance.

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