Clinical Nutrition 33 (2014) 844–849

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Original article

Mini Nutritional Assessment and short-form Mini Nutritional Assessment can predict the future risk of falling in older adults – Results of a national cohort study

Alan C. Tsai [a,b,*], Mei-Yen Lai [a,c]

[a] Department of Healthcare Administration, Asia University, 500 Liufeng Road, Wufeng, Taichung 41354, Taiwan, ROC
[b] Department of Health Services Management, School of Public Health, China Medical University, Taichung 40402, Taiwan, ROC
[c] Nursing Department, Taichung Veterans General Hospital, Taichung, Taiwan, ROC

ARTICLE INFO

Article history:
Received 24 June 2013
Accepted 16 October 2013

Keywords:
Elderly
Falling
Malnutrition
Mini Nutritional Assessment
Predicting falls

SUMMARY

Background & aims: Falling is a major issue in geriatric health. Tools that identify individuals at risk of falling can help reduce the risk of falling. The study aimed to determine whether the full and short-form Mini Nutritional Assessment (MNAs) have the ability to predict the risk of falling in older adults.
Methods: Subjects were 3118 ≥ 53-year old Taiwanese who completed both the 1999 and 2003 "Taiwan Longitudinal Study on Aging" surveys. We rated these subjects with normalized versions of the MNA and applied the standard cut-offs to define under-nutrition (≤23.5 and ≤11 points, respectively). We used multivariate logistic regression analysis and receiver operating characteristics to evaluate the ability of these tools in predicting the risk of falling three years later.
Results: Older adults rated as at risk of malnutrition with the full MNA (OR = 1.87, 95% confidence interval = 1.33–2.63, $p < 0.001$) or the short-form (1.39, 1.07–1.80, $p = 0.014$) were associated with increased risk of falling three years later. Both versions significantly predicted the risk of falling and performed slightly better in ≥65-year old persons than in younger (53–64-year old) persons. The short-form performed relatively well compared to the full scale.
Conclusions: Results suggest that the full and short-form MNAs, in addition to rating the risk of malnutrition, also predict the risk of falling in older adults. Although the short-form is slightly less effective than the full scale in predicting the future risk of falling, its simplicity, effectiveness and efficiency make it ideal as a multipurpose screening tool in clinical settings.

1. Introduction

Falling is a major issue in geriatric health. Falls can often lead to bodily injuries, physical functional disability, cognitive impairment, institutionalization or even death.[1,2] Falls also often affect psychological health. Elderly who experienced falling are less likely to go out and may become physically dependent. The cause of falling is complex and multi-factorial.[3] People who have multiple risk factors such as physical functional impairment, poor visual acuity, cognitive impairment, frailty, general weakness, postural hypotension or psychotropic medication have increased risk of falling.[3–6] Poor nutrition, especially protein-energy malnutrition (PEM), that contributes to general weakness or frailty, also increases the risk of falling.[7,8]

PEM is common in the elderly. It often accelerates loss of muscle mass and weakens muscle strength or the ability to maintain balance.[9] PEM or malnutrition often develops inconspicuously. It may not be noticed unless screened or examined. Thus, nutrition screening is a necessary step in identifying those who are at risk of malnutrition for early intervention.

The Mini Nutritional Assessment (MNA) is a simple, non-invasive and efficient tool designed for assessing/screening the risk of malnutrition in elderly adults.[10,11] It consists of 18 items, and rates anthropometric, dietary, global and self-viewed aspects of nutrition. MNA has a simplified short-form (SF) consisting of 6 key MNA items.[12,13] Both scales are multifunctional, and have been

Abbreviations: CC, calf circumference; MAC, mid-arm circumference; MNA, Mini Nutritional Assessment; MNA-SF, short-form Mini Nutritional Assessment; T1, Taiwan version-1; T2, Taiwan version-2; TLSA, Taiwan Longitudinal Survey on Aging.

* Corresponding author. Department of Healthcare Administration, Asia University, 500 Liufeng Road, Wufeng, Taichung 41354, Taiwan, ROC. Tel.: +886 4 2332 3456x1943; fax: +886 4 2332 1206.
E-mail addresses: atsai@umich.edu (A.C. Tsai), bs88877@yahoo.com.tw (M.-Y. Lai).

0261-5614/$ – see front matter
http://dx.doi.org/10.1016/j.clnu.2013.10.010

reported to predict hospital length of stay, hospitalization outcome, physical functional status and mortality.[14–16] Both scales include items that assess mobility, weight loss, and dementia that are associated with the risk of falling. Thus, in theory, the scale should be able to predict the risk of falling. Recent studies also have shown that elderly who have poorer nutritional status have higher risk of falling.[1,8,17,18] However, the ability of the MNAs to predict the risk of falling has not been robustly examined in a large prospective study. Thus, the present study was undertaken to examine the abilities of the MNA and the MNA-SF in predicting the future risk of falling in a large sample of older Taiwanese.

2. Materials and methods

2.1. Source of data

The study analyzed data sets of the "Taiwan Longitudinal Survey on Aging" (TLSA), a population-based cohort study conducted by the Bureau of Health Promotion of Taiwan.[19] The survey employed a multi-stage sampling process to draw a population-representative sample of 4412 ≥ 60-year old Taiwanese men and women from non-institutionalized citizens, and 4049 of these participants completed the initial survey in 1989 (Fig. 1). The cohort was surveyed every 3 or 4 years. In 1996, a second sampling of 2462 persons, 50–66 years old, drawn with the same methods, was added to the cohort to extend the age range of the cohort. Subjects in the combined cohort were interviewed in 1999 and 2003. The 1999 interview had expanded survey on dietary intake and included items in the MNA. Thus, the 1999 survey was chosen as baseline for the present study and the 2003 survey as end point.

In each survey, trained interviewers conducted face-to-face interviews using a structured questionnaire at respondents' residence. Of the combined cohort, 4440 persons completed the interview in 1999, and 3778 persons completed the interview in 2003. Among these subjects, 3656 completed both surveys (Fig. 1).

The TLSA survey from which the present study is based upon was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by government-appointed representatives. All participants signed a written consent before taking part in the study. The detail of survey design and procedure has been described elsewhere.[20]

2.2. The outcome measure

The outcome measure was the incidence of falling during the 12-month period prior to the time of the questionnaire interview according to the question "Did you have any fall during the past 12 months?" Those who answered "yes" were considered having fallen for that year regardless of the number of falls.

2.3. Rating the baseline nutritional status

We used a normalized and slightly modified MNA (Taiwan version-2, T2) and its short-form (SF), to rate the baseline nutritional status of the participants.[21,22] MNA-T2 was derived from Taiwan version-1 (T1), which was normalized from the original MNA by adopting the population-specific anthropometric cut-off points and dietary features.[23] MNA-T2 further replaced CC and MAC for BMI item in full MNA by transferring 1 of the 3 BMI points to the MAC item and 2 to the CC item.[23,24] Therefore, the MNA-T2 is based on 17, rather than 18 items but has the same total score (30 points). The MNA-T2 has been shown to perform at least as well as the MNA-T1.[24] With the exception of fluid intake, all items in the MNA were available in the questionnaire. Thus, grading with the MNA-T2 was based on 16 items and the total score was proportionately adjusted to a 30-point basis. A total score <17 was considered as malnourished; 17–23.5, as at risk of malnutrition; ≥24, as normal. The MNA-T2-SF is similar to the original MNA-SF, except that item F (BMI) was replaced by item R (CC). A total score ≤7 was considered as malnourished; 8–11, as at risk of malnutrition, and ≥12, as normal.[12]

2.4. Other variables

All other variables were derived from the 1999 data sets. Alcohol drinking status was classified as non-drinker, drinking <1 time/wk, and >1 time/wk; cigarette smoking as never smokers, current smokers and past smokers; and betel nut chewing was classified as no chewers, current chewers and past chewers. Routine physical activity was classified according the number of times performing physical exercise >30 min/day. Body mass index (BMI) was calculated according to kg (weight)/m^2 (height). The status of chronic diseases/conditions including hypertension, diabetes, heart disease, stroke, osteoarthritis, gout, hip fracture, lower-back pain,

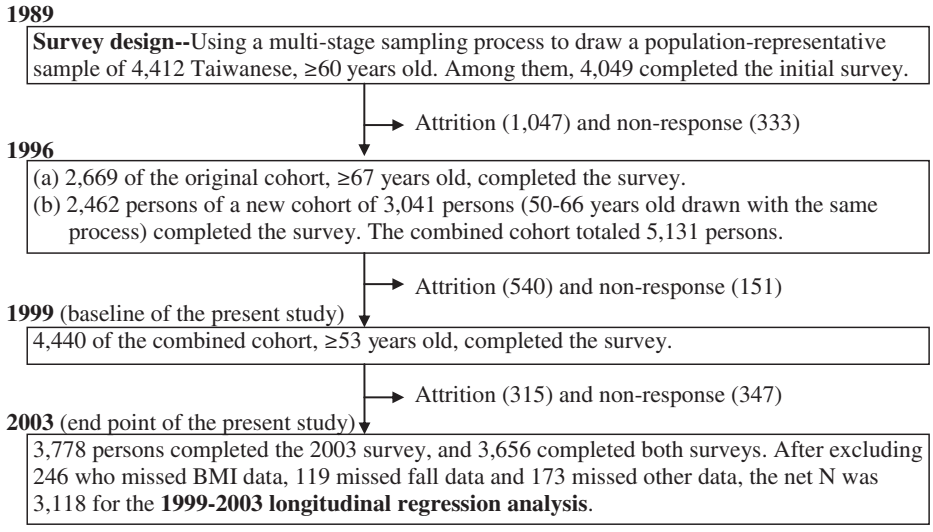

Fig. 1. Flowchart of the Taiwan Longitudinal Survey on Aging (TLSA), the data source of the present study.