Risk of Malnutrition Is an Independent Predictor of Mortality, Length of Hospital Stay, and Hospitalization Costs in Stroke Patients

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Background: Malnutrition is associated with poor outcomes after stroke. Nutrition screening tools (NSTs) are used to identify patients at risk of malnutrition, but so far no NST has been validated for use with patients who have had a stroke. This study aimed to determine the ability of the Malnutrition Universal Screening Tool (MUST) to predict poor outcomes in stroke patients, including mortality, cumulative length of hospital stay (LOS), and hospitalization costs. *Methods:* Patients were recruited from consecutive admissions at 2 hyperacute stroke units in London and were screened for risk of malnutrition (low, medium, and high) according to MUST. Six-month outcomes were obtained for each patient through a national database. *Results:* Of 543 recruited patients, 51% were males, the mean age was 75 years, and 87% had an ischemic stroke. Results showed a highly significant increase in mortality with increasing risk of malnutrition ($P < .001$). This association remained significant after adjusting for age, severity of stroke, and a range of stroke risk factors ($P < .001$). For those patients who survived, the LOS and hospitalization costs increased with increasing risk of malnutrition ($P < .001$ and $P = .049$, respectively). This association remained significant in the adjusted model ($P < .001$ and $P = .001$, respectively). *Conclusions:* Risk of malnutrition is an independent predictor of mortality, LOS, and hospitalization costs at 6 months post stroke. Research is needed to determine if nutritional support for medium- or high-risk patients results in better outcomes. Routine screening of stroke patients for risk of malnutrition is recommended. **Key Words:** Malnutrition—stroke—nutrition screening tool—mortality—length of hospital stay—hospitalization costs.

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Introduction

Malnutrition has been identified as a common problem that affects stroke patients and is associated with poor outcomes, including increased mortality and morbidity.[1-4] Moreover, malnutrition poses a significant burden on healthcare resources[5] and it has been suggested that disease-related malnutrition is an important determinant of hospitalization costs,[6] but, to date, this association has not been tested in patients who have had a stroke.

Furthermore, it has been shown that malnutrition is often an under-recognized and undertreated problem and, in this context, the wide use of simple strategies to quickly identify patients at risk of malnutrition is advocated.[7-9] One way of identifying patients with nutritional problems who may benefit from nutritional intervention is to use a validated nutrition screening tool (NST). Current guidelines recommend all stroke patients to be screened for risk of malnutrition at the time of admission to hospital and regularly thereafter.[10] Patients who are identified as at risk of malnutrition should be referred for further assessment and have an appropriate nutritional care plan implemented. However, no published studies have validated an NST for use in stroke patients[11-13] and this is an area that lacks a strong evidence base.[13]

The Malnutrition Universal Screening Tool (MUST) is an NST, launched in 2003, that involves assessment of body mass index (BMI), percentage of weight loss over the previous 3-6 months, and the effect of acute illness on dietary intake.[9] It was designed for use in any patient group in any healthcare setting and has been suggested as an appropriate tool for patients who have had a stroke.[10] A different NST was designed for use in stroke patients in the acute phase,[14] but neither of these NSTs has been specifically validated in this patient group.

The present study was designed to determine the ability of MUST to independently predict negative outcomes in acute stroke patients, more specifically mortality, length of hospital stay (LOS), and hospitalization costs during the first 6 months post stroke. If patients who are at risk of malnutrition are correctly and promptly identified, they should be more likely to benefit from nutritional support and, ultimately, this could have a positive impact on their recovery.

A preliminary report of these results has been presented in abstract form.[15]

Subjects and Methods

Study Sample

In this prospective observational study, patients were recruited from consecutive admissions at 2 hyperacute stroke units in south London between June 2011 and May 2012. Patients were considered eligible for the study if they were 18 years or older, not pregnant, with a diagnosis of stroke (confirmed by a computerized tomography scan, a magnetic resonance imaging scan, or the consultant's clinical judgment) and with a National Health Service (NHS) number (which was a requirement to assess each patient's outcomes 6 months subsequent to recruitment). Ethical approval was obtained from the Yorkshire and the Humber–Leeds West Research Ethics Committee (reference: 11/YH/0054) and written, informed consent to participate in the study was obtained from patients or, if they lacked capacity, from a consultee.

Baseline Data Collection

The following data were collected on admission to hospital: date of admission, date of stroke, gender, ethnic group, type of stroke, living conditions prior to stroke, medical history (as identified by the medical team, potentially relevant as stroke risk factors and chronic conditions likely to affect nutritional status prior to admission), record of previous stroke, the result of a routinely applied scale that measures the severity of stroke (the National Institutes of Health Stroke Scale score), and the result of the swallow screening test. Current weight was measured with either chair or hoist clinical scales (Seca, Leicester, United Kingdom), with patients wearing light clothing and without shoes. Height was measured using a portable stadiometer (Seca), according to standard methodology, for patients able to stand; in patients who were unable to stand, recalled height (if judged to be reliable and realistic) or a surrogate measure, that is, height estimated using ulna length, was used.[16] Usual (preillness) weight was obtained from the patient, a relative or carer and medical notes, and the current and usual weight were used to calculate percentage of unintentional weight loss in the previous 3-6 months (<5%, 5%-10%, or >10%). Measured weight and height were used to calculate BMI (weight/height^2). The effect of acute disease and the inability to eat or "nil by mouth" for more than 5 days was assessed by reference to the patient's medical notes. The same researcher (F.G.) collected all the information and completed the MUST, as described in the explanatory MUST booklet (http://www.bapen.org.uk/pdfs/must/must_explan.pdf). Thus, the sum of scores obtained for each question related to BMI, unintentional weight loss, the effect of acute disease, and the inability to eat for more than 5 days results in an overall risk of malnutrition score, which categorizes patients into low (score = 0), medium (score = 1), or high risk (score ≥ 2).

Follow-Up Procedure

Mortality data for each patient for a follow-up period of 6 months after the stroke were obtained from Summary Care Records, an electronic patient record that stores a defined set of key patient data for every patient in England. Information on hospital admissions was obtained as a tailor-made report from the Hospital Episode Statistics (HES) databases. HES is a data warehouse containing