VALIDATION OF A NEW TOOL: THE CALORIE INTAKE TOOL, TO EASILY ESTIMATE THE ENERGY INTAKE OF DISEASED AGED PATIENT

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Abstract: Objective: The aim of the study was to validate the Calorie Intake Tool (CIT), a new tool to estimate energy intake. Design, Setting and Patients: 100 patients older than 75 were randomly selected in seven geriatric units at Toulouse University Hospital. Measurements: Energy intake was calculated for each subject with the CIT and by weighing the food consumed. Results: Total calorie intake did not differ significantly between the two methods, 1318 ± 586 for CIT and 1353 ± 625 for food weighing. The Intraclass Correlation coefficient (ICC) was higher than 0.89 for total calorie intake and the Bland and Altman analysis was consistent with these results and showed a bias for high calorie intake (mean error 35 ± 420 kcal). Conclusion: The study shows that the CIT for the evaluation of calorie intake in elderly diseased patients is valid against the reference method (weighing the food consumed).

Key words: Calorie intake tool, elderly, hospitalized patients, under nutrition.

Introduction

Malnutrition is highly prevalent in hospitals, mainly in geriatric wards, affecting 30-50 % of inpatients in western countries. It has dramatic consequences, such as increased mortality and morbidity, length of stay, and healthcare costs (1-7). An early and systematic malnutrition screening is recommended for all hospitalized patients by the European Society for Clinical Nutrition and Metabolism (ESPEN), and the American Society of Parenteral and Enteral Nutrition (ASPEN) (8, 9). Many validated parameters such as a more than 5 % weight loss , a Body Mass Index lower than 21 kg/ m² or screening tools such as The Mini Nutritional Assessment (MNA), or the Subjective Global Assessment (SGA) have been recommended for use in elderly inpatients (10, 11).

Weight loss or low BMI as the marker of under nutrition, are the consequence of an energy deficit, i.e. either or both reduced calorie intake and/or increased energy requirements (12). Several studies have shown that nutritional status declines during hospitalization (13) and that nutritional intake is often very low, particularly in aged people (4, 14).

Some patients, not yet under-nourished develop a poor nutritional intake and are at high risk of malnutrition. They have to be identified early, before weight loss, to prevent under nutrition and to promote appropriate nutrition therapy. Quantifying food intake is a very important aspect of nutritional assessment, since an optimal nutrition therapy has to compensate for the energy deficit. A recent study confirmed the importance of monitoring food intake to allow the early identification and prevention of nutritional decline in patients during hospitalization (15). The nursing staff’s perception of how well their older patients were eating is often biased (4)

While energy requirements can be estimated with standard equations (16), the routine estimate of calorie intake is more difficult.

Food intake can be evaluated with the meal portion method with a good accuracy, precision, robustness, and feasibility (17). However, to evaluate the energy and macronutrient intake, the use of a food composition table is required to compute energy (macronutrient) intake from the amount of food eaten and from the composition of the meal. All over the world, medical staffs not trained in nutrition or nursing staffs are not trained to use this table. Therefore, this procedure requires a dietician, is feasible for one or few patients, but is impractical in a geriatric ward with many patients especially if malnutrition has a high prevalence.

Therefore, we developed a new tool to perform the evaluation of all patients energy intake by the nursing staff. The aim of the study was to validate this new tool: The Calorie Intake Tool (CIT) to estimate energy intake of diseased elderly patients.

Methods

The study was conducted between April 1st and June 1st, 2010 in the geriatric department of Toulouse University hospital. The department has 4 short-stay units (90 beds in total) and 3 medium-stays units (70 beds). It took 10 days to perform the measurements for 100 subjects (10 subjects per day). Each measurement day involved only one unit. Therefore, 6 short-stay and 4 medium-stay units were used. The subjects were selected in a random order from the list of the eligible patient hospitalized the day of the measurement. To make sure that any day of the week was involved, the day of the measurement was randomized between the weekdays; Saturday and Sunday were not included. The main objective of the study was to compare the energy intake calculated with the CIT and that derived from weighing the food consumed.
Patients

Patients were considered eligible if hospitalized in the unit, older than 65 years and fully orally fed. They had to stay the whole day in the unit for an estimate of all meals (breakfast to dinner).

Non-inclusion criteria were palliative care, enteral feeding and fasting even one meal (for example for performing a scheduled gastric endoscopy).

The Calorie Intake Tool

Ten years ago, all the members of the nursing staff working in the geriatric department were trained to use the meal portion method (17). With this method, the person visually estimates the portion of each item of each meal that is consumed. The quotation is zero (if less than 25% of the item is consumed), 25% (between 25 and 50%), 50% (between 50 and 75%) and 100% (above 75%). Nevertheless, we cannot calculate calorie intake straightaway with this method. Therefore we searched for a common calorie denominator between all the meal items served in our hospital. This common denominator was chosen to be 160 kcal after calculation of caloric intake of all the possible meals proposed in our hospital. We attributed 1 point to it. This method is named: Calorie Intake Tool. Figure 1 gives the number of points per item (for example, fruit juice 0.5 point, meat and vegetable 2 points). Therefore, we established that each meal item served in our hospital was equivalent to x points, each point being worth 160 kcal. Therefore, if a meal is worth 4 points and if the patient consumes half of the meal, his energy intake is: 0.5 x 4 = 320 kcal.

The tool to calculate the number of points has been used in our units for three years, and demonstrated a good acceptability: it is used everyday for all patients of all our units by the nursing staff. The nursing staff was initially trained to use the tool, and then evaluated by the dieticians on a regular basis between 2007 to 2010.

Meals in French hospitals traditionally comprise a starter (or a soup), a main course (meat or fish plus vegetables or carbohydrates), a dairy product, a dessert and a bread roll. The estimation is performed for each patient in each unit every day and the quotation is reported in the patient’s file.

Then the medical nutrition staff calculates the calorie intake (sum of the points consumed x 160 kcal = total calorie intake) and compare it with calculated energy needs.

The present study was designed to validate the tool. Before beginning this study, an extra specific training was implemented in each unit, with 3 sessions, each lasting one hour. The aim of this training was to consolidate the nursing staff’s knowledge about CIT.

Reference method for the evaluation of calorie intake

For this purpose a registered dietician was recruited to calculate the calorie intake from the weight of the food consumed, and from the CIQUAL food composition table (9). The weight of food consumed was the difference between the initial weight of each item and the weight of food remaining in the plate.

Calculation and statistics

The primary objective for this study was to test the validity of the CIT, assessing the agreement between calorie intake estimated by the CIT and by the reference method. Agreement was assessed by calculating the intraclass correlation coefficient (ICC) using the notation of Shrout and Fleiss (19) defined as

$$ ICC = \frac{\sigma^2_{sub} + \sigma^2_{err}}{\sigma^2_{sub} + \sigma^2_{err} + \sigma^2_{true}} $$

ICC can be interpreted as “the proportion of total variance in the measurement ($\sigma^2_{true}$) which is due to ‘true’ differences between subjects ($\sigma^2_{sub}$) (20). An ICC close to 1 means that measurement error due to a lack of agreement between CIT and the reference method is negligible. We also carried out a Bland and Altman plot (21) which gives complementary information about

**Figure 1**

The Calorie Intake Tool