Use of the thickness of the adductor pollicis muscle in the identification nutritional status in different clinical conditions

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Malnutrition is commonly observed in the hospital setting and is associated with increased morbidity and mortality, length of hospital stay and hospital costs, and worsening of response to treatment. Identifying the presence of nutritional risk or malnutrition is essential so that individualized nutritional therapy can be instituted early. One of the main methods of evaluation of nutritional status is Subjective Global Assessment (SGA), and associated with it, anthropometric measures complement the evaluation. The thickness of the adductor pollicis muscle (TAPM) is a measure that can evaluate the muscle compartment and indicate changes in body composition in a simple, practical and noninvasive way. This study presents the main studies that used the TAPM measure with the objective to identify the nutrition status in different clinical conditions. The results showed that TAPM is a promising and reliable, easy-to-perform, low-cost measure with the potential to identify the reduction of muscle mass, due to the process of malnutrition. However, new studies must be performed to identify the reasons for different findings in the literature, especially regarding the cutoff point for this population, taking into account the age range and gender.

Keywords: malnutrition; nutrition assessment; adductor pollicis muscle; anthropometry; hospitalized patients


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Malnutrition in hospitalized patients is a public health problem in several countries around the world, regardless of their level of development. This condition occurs for several reasons, including reduction of dietary intake, hypermetabolism, disease and insufficient nutrient absorption [1]. Hospital malnutrition leads to elevated costs, morbidity and mortality, expanded lengths of hospital stay and the incidence of infections, hypoproteinaemia, oedema, postoperative complications, and a reduction of immune response and healing [2,3].

The prevalence of malnutrition still varies greatly
According to the populations evaluated, the methods used for the diagnosis and the study site. Most studies come from Europe and show results between 20.0% and 30.0%, with higher prevalences in elderly patients and those with malignant neoplasia [4-11].

In Asia, slightly higher values have been reported, varying from 27.0 to 39.0 %but still with a higher prevalence in patients with the same age range as those of the European studies mentioned above in addition to including critical patients as well patients who are candidates or undergoing surgery and those with gastrointestinal cancer [12-16]. In North America and Australia, the values increase even more, reaching 45.0 and 42.0 %, respectively [17-22].

The Brazilian Hospital Nutritional Evaluation Survey (IBRANUTRI) evaluated 4.000 patients hospitalized in public hospitals in large Brazilian cities. The results showed that 48.1% of hospitalized patients showed malnutrition, among which 12.6% were severely malnourished patients and 35.5% were moderately malnourished [23]. In Brazil, a high rate of patients (15-20.0%) are already hospitalized with malnutrition and this can occur due to socioeconomic problems, such as underlying disease, poor socioeconomic conditions and health system deficiency [24].

Given these facts, it is essential to evaluate nutritional status at hospital admission, both to verify the presence or absence of malnutrition, and to identify individuals who may present complications resulting from this condition, in addition to providing early and individualized dietary planning [25, 26].

Several methods can be used to evaluate nutritional status in the hospital environment, such as dietary history, body composition and biochemistry evaluation, clinical history and physical examination, with specific limitations, advantages and disadvantages. Anthropometry is often used for nutritional assessment, although there is no gold standard for total accuracy [3, 24].

Associated with the methods mentioned above, screening and nutritional assessment methods are used for the early detection of patients at risk of malnutrition within the first 48 hours of hospitalisation. Of these, the Global Subjective Assessment (ASG) and Nutritional Risk Screening (NRS) stand out, with ASG considered the gold standard for the nutritional assessment of this population [3, 24, 27].

There is not yet an anthropometric method that is gold standard, so several new methods have been tested to improve the nutritional assessment of hospitalized patients [27]. Among them, the evaluation of the thickness of the adductor pollicis muscle, TAPM, has been described as of great relevance for evaluating the muscle compartment in a more practical, fast, non-invasive way and because it is considered low cost [23].

In addition, TAPM can be used successively, providing information on changes in body composition and overall nutritional status, which is of great value in detecting early changes and assessing nutritional recovery. In this way, the patient could receive the appropriate treatment in the first hours of hospitalization, improving his prognosis [26].

There is still no reference standard for hospitalized patients, however, considering their characteristics of the disease, previous nutritional status, occupational activity and sex. Studies have been carried out with patients in different clinical conditions [29-36] to identify whether the TAPM measurement can detect hospital malnutrition when compared to classic nutritional status.

In surgical patients, studies [29, 32, 35] have demonstrated significant associations between TAPM and the diagnosis of malnutrition, based on SGA and classic anthropometric measures used in the assessment of nutritional status. The results suggest that TAPM can be used in hospital practice, since these associations point out its capacity to identify lean muscle mass reduction and nutritional risk, confirming its relevance in nutritional diagnosis [37].

Arm muscle circumference, ACM and corrected arm muscle area, CAMA, are two measures of conventional anthropometry that have been tested with the TAPM to find associations, however, the studies are still controversial because changes in these parameters may occur later when compared with functional and clinical alterations [31]. TAPM also has the advantage of not using equations and does not need corrections [38].

A study carried out with surgical patients in a teaching hospital in south-eastern Brazil found association of TAPM with gender, age, body weight and malnutrition assessed by body mass index, BMI. In this study, higher TAPM was observed in males than in females. This finding may be due to the body composition of men and their work activity, which may influence the measurement [35].

Two Brazilian studies showed high specificity, indicating that patients not considered malnourished by other methods would not present this malnutrition [29, 32]. Diagnosis through TAPM It is generally agreed that labour activity is positively related to TAPM values, and the loss of working life will be reflected in a decrease in this measure, since an installed disease can generate a decrease in functional capacity and...
catabolism \[30\].

Patients in the intensive care unit have still limited results. Even in the case of a population with such specific characteristics, TAPM correlated with a high risk of death, length of hospitalization and organ failure, proving to be a reliable method for predicting outcomes in intensive care unit, ICU, patients \[30, 36\].

In another ICU study, patients were assessed by SGA, adductor pollicis muscle thickness in both hands and calf circumference, as well as biochemical exams, length of hospital stay, vital signs, data, and electronic chart exams. The main result, demonstrated by the ROC curve, indicated the accuracy of the TAPM measure in relation to SGA. There was still a correlation with BMI and calf circumference (CC) \[33\].

Divergent outcomes were found by Shu-Fen et al in 2015 \[34\], when they evaluated 229 ICU patients. TAPM measured in both hands showed no significant correlation with mortality and length of hospital stay, however, baseline patients had higher TAPM values at hospital admission, indicating a probable absence of nutritional risk.

These results may have appeared due to baseline data, since in this study in Singapore the initial values of thickness were higher, indicating that the individuals arrive at the health service with less nutritional risk than in Brazil, where most studies have been carried out, which may reflect patients’ poor nutrition on admission in Brazil. In addition, the study did not use SGA for comparison, using only BMI \[34\].

In summary, TAPM is a newly included variable in the nutritional assessment of hospitalized patients, and therefore criteria should be adopted for its use, since scientific studies have compiled divergent results. The difference between populations, the methods of analysis, the prior nutritional status and clinical condition of patients, and especially the accuracy, knowledge and training of the evaluators, should be considered in order to avoid any interpersonal variability which will result in measurement errors.

The difference between the populations, the way the results were analysed, the health and nutritional status of the patient, and especially the accuracy, knowledge and training of the evaluators should be considered, to avoid interpersonal variability, which will result in incorrect measures.

Other challenges in the use of TAPM still need to be discussed, such as the lack of cut-off points for specific populations, such as hospitalized, surgical or oncological, so that the results are comparable and feasible for assessments, and consequently able to predict the risk of nutritional intervention, which would imply early and individualized nutritional intervention.

On this basis, the TAPM measurement reveals an anthropometric variable capable of identifying a reduction of muscle mass due to the malnutrition process, which affects most hospitalized and surgical patients. New studies must be performed, however, to identify the reasons for different findings in the literature, especially regarding the cut-off point for this population, taking into account age range and gender.

**Conflicting interests**

The authors have declared that no conflict of interests exist.

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**Authors’ contributions**

K.P.V, M.A.B and N.M.F.S was involved in the conception of the study, data collection and manuscript writing. V.R.G. coordinated the study design, data analysis, manuscript writing and revised of the final manuscript. All authors read and approved the final manuscript.

**Abbreviations**

SGA: Subjective Global Assessment; TAPM: thickness of the adductor pollicis muscle; IBIRANUTI: Brazilian Hospital Nutritional Evaluation Survey; NRS: Nutritional Risk Screening; AMC: arm muscle circumference; CAMA: arm muscle area; BMI: body mass index; CC: calf circumference; ICU: intensive care unit.

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