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Original article

Translation of the modified NUTRIC score and adaptation to the Greek ICU setting

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SUMMARY

Background & aims: Patients in the intensive care unit are experiencing an increased malnutrition risk. The NUTrition Risk in the Critically ill score (NUTRIC) is a validated tool for the identification of patients that will benefit the most, from nutritional intervention. The aim of the study was twofold, including: 1) to translate and adapt the NUTRIC score in the Greek language for more efficient and comprehensive use among clinicians, and 2) to assess its prognostic performance in a pilot sample.

Methods: The translation process followed standardized steps: 1) initial translation, 2) synthesis of different translations, 3) back −translation to the English language, 4) revision and cultural adaptation of the instrument by an expert committee. A pilot application study was conducted on 80 critically ill patients from three ICUs in Greek hospitals. The NUTRIC score was calculated using the final translated version.

Results: The translated score was considered easy to use, fast and comprehensive. No specific corrections were suggested by the expert committee. According to the translated version of the score 56% of the screened patients were classified as of high nutritional risk (score between 5 and 9). Compared to the low − NUTRIC patients, high − NUTRIC patients were older (56.4 ± 16.4 vs. 68.7 ± 12.7 yrs, $p < 0.001$), had increased APACHE (13.8 ± 6.5 vs. 23.8 ± 6.5, $p < 0.001$) and SOFA scores (4.7 ± 3.1 vs. 10.4 ± 3.1, $p < 0.001$) and demonstrated more comorbidities. Elevated 28 −day mortality was observed among high −NUTRIC patients compared to the low − NUTRIC ones (6 vs. 18 patients, $p < 0.05$).

Conclusions: The Greek version of the NUTRIC score is ready for use among health care professionals employed in intensive care units in Greek speaking countries, aiming to discriminate critically ill patients benefiting from enhanced nutritional support.

1. Introduction

Hospital malnutrition is a universal problem, increasing complications and therefore affecting healthcare costs and the use of medical resources [1,2]. Intensive Care Unit (ICU) patients in particular, are at increased risk, with the prevalence of malnutrition ranging from 38% to 78%, depending on the assessment tool used

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and the population under examination [3]. Nutritional risk screening is important to identify patients most likely to benefit from nutritional therapy (NT) and a more detailed nutritional assessment may be able to assure the optimization of NT and thus maximize the potential benefits to the patient [4], reduce the number of potential complications and minimize the length of stay (LoS) [5].

Several scoring systems have been proposed for allocating critically ill patients who would benefit from NT, including the Nutrition Risk Screening –2002 (NRS –2002) [6], the NUTRIC score (The Nutrition Risk in the Critically ill) [7] and most recently, the Patient –And Nutrition –Derived Outcome Risk Assessment Score (PANDORA) which has not yet been validated in the ICU setting [8]. The selection of a practical, simplified, easy to use, and validated tool in the population of interest is of high importance [9]. Such tools allow nutrition screening to become an integral part of routine clinical practice, without imposing extra workload on the hospital staff. However, according to the literature, the reported screening frequency does not agree with the recommendations [10] and a high number of errors have been reported when such a procedure is audited [11,12].

Greece demonstrates a high prevalence of hospital malnutrition [13,14] and the attributable increase in costs per ICU patient due to malnutrition is, on average, 573.18€/day [15]. As effective nutritional screening in the ICU setting would inevitably ameliorate these outcomes, the aim of the present study was to translate and adapt the NUTRIC score, the only validated and suitable tool for ICU nutritional risk screening, to the Greek language, for a more efficient and comprehensive use among carers of the critically ill.

2. Materials and methods

2.1. Translation of the NUTRIC questionnaire

The translation of the NUTRIC scoring questionnaire to the Greek language was performed according to the Beaton et al., 2000 method [16] and the World Health Organization (WHO) guidelines [17]. The step –by –step procedure followed during the translation process is presented in Fig. 1.

The first step involved a forward translation from the English [7], to the Greek language. Two independent bilingual and certified translators, both Greek native speakers, were recruited for this stage. The first was an experienced nutritionist –dietitian, with full knowledge of the questionnaire's scope, its use and the study's purpose. The second translator was not a health professional and as such, was unaware of the study's purpose and the questionnaire's scope. She was recruited only because of the excellent due to his command of both languages. Each translator composed an individual version of the questionnaire in the Greek language, named, GT1 and GT2, respectively. Disagreements by these reviewers were resolved in the next step, where the two translators with their translated versions (GT1 and GT2) cooperated with a researcher (MC) in synthesizing a unanimous translation (GT12).

The third step involved the recruitment of another couple of bilingual translators, with English as their native language. Unaware of the study's aim and the questionnaire's use, each one was asked to translate back to the English language the GT12 version of the questionnaire. Two versions were compiled, one by each translator, ET1 and ET2. The aim of this step was to identify differences and similarities from the original version of the NUTRIC questionnaire suggested by Heyland and associates [7].

In the fourth step, the pre –final version of the questionnaire was created. A committee was formed, consisting of two professional translators, three nutritionists, and two graduated researchers in the field of research methodology and all four

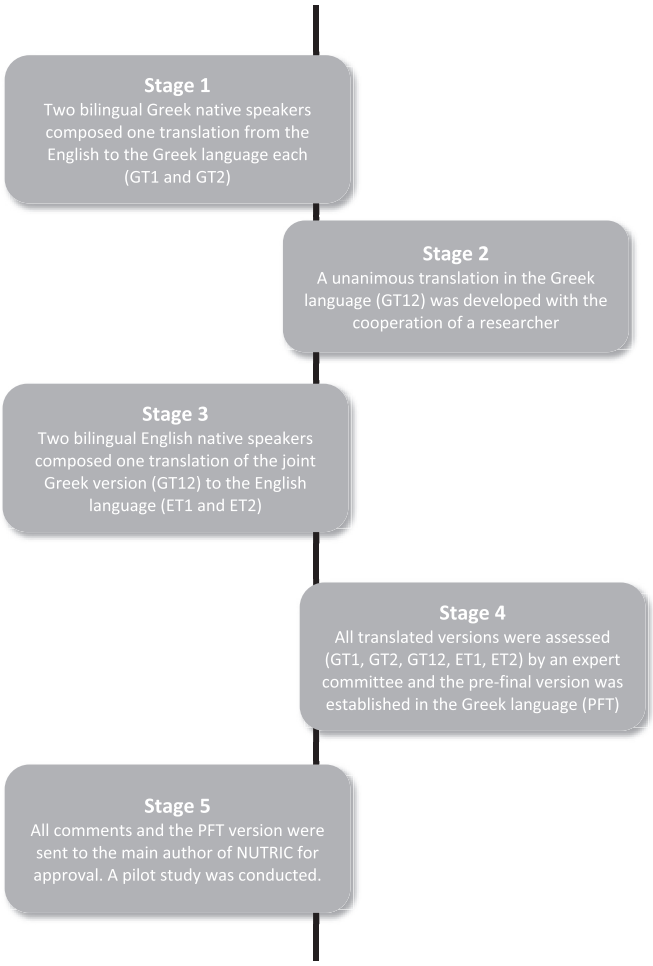

Fig. 1. The stages of translation and adaptation of the NUTRIC Score to the Greek language.

translators used in the previous steps. Having studied all versions (GT1, GT2, GT12, ET1 and ET2) and the corresponding reports of individual translators explaining the rationale for the decisions made in earlier stages of the process, the pre –final version of the questionnaire was established (PFT), with the unanimous approval of the committee. Each question was evaluated according to the viewpoints of all professionals, mainly taking into account the idiomatic, semantic, contextual and cultural idioms of the Greek and English languages. It should be noted that throughout the process translators avoided the use of any jargon, including technical terms not –easily understood, colloquialism, idioms and vernacular terms, according to the WHO guidelines [17].

During the final stage, all reports and forms of the translation and adaptation processes were submitted to the main author of the original NUTRIC instrument (DKH) [7], for approval. Once approval was granted, a pilot study was performed.

2.2. Sample

The sample involved data from 80 adult ICU patients. The study was approved by the Aristotle University Ethics Committee. Recruitment took place in the ICUs of three hospitals, two University hospitals ("AHEPA" and "Hippokration" situated in Thessaloniki) and one General Hospital ("Achilopoulio" in Volos) during 2017. ICU patients were enrolled in the absence of the following

exclusion criteria included: 1) Planning to undergo surgery, 2) Being expected to remain in the ICU for less than 24 h, and 3) ICU admission due to drugs overdose. Characteristics of the patients, including age, sex, length of stay (LoS) in the hospital prior to ICU admission and ICU LoS (LICU), duration of mechanic ventilation enteral and parenteral nutrition (EN and PN), were recorded for all. Patients' body weight and height was measured on admission, and Body Mass Index (BMI) was calculated. For patients who were not able to stand height was calculated from knee height. Additionally, diagnosis at ICU admission and the number of comorbidities were also recorded according to the International Classification of Diseases (ICD −11) and classified into eight domains, as suggested by Rosa et al., 2016 [18]: cardiovascular/vascular, endocrine, respiratory, gastrointestinal, neurologic, malignancies, infectious and renal comorbidities.

Three clinical nutritionists −dietitians were recruited for the pilot calculation of the NUTRIC score with the use of the final translated version. Age, Acute Physiology and Chronic Health Evaluation (APACHE) II [19], Sequential Organ Failure Assessment (SOFA) scores [20], the number of comorbidities, and days from hospital admission until ICU admission were recorded by the three dietitians [7]. As interleukin 6 (IL −6) levels were not assessed [21] in any of the participating sites, the nutritional risk of each patient was classified as low when NUTRIC score was ≤4, and high when NUTRIC score ranged between 5 and 9. Patients were followed for a total of 28 days since ICU admission and mortality was noted.

2.3. Statistical analyses

Statistical analysis was performed using PASW Statistics 21.0 (IBM® SPSS® Inc., Hong Kong). Descriptive data are presented either as means ± standard deviations (SD), as medians with their respective inter −quartiles (Q25 −Q75) for continuous variables, or as counts and percentages, when categorical variables were concerned. Normality of continuous variables was assessed using the Kolmogorov−Smirnov test. Normally distributed continuous variables between NUTRIC categories were compared with independent samples t −tests and not normally distributed comparisons were performed with Kruskal−Wallis tests. Chi−square tests were also applied to evaluate differences between NUTRIC groups.

Given that the NUTRIC score is based on the calculation of dichotomous variables, the Cronbach alpha (CA) was applied, to evaluate the internal consistency of the instrument [22].

3. Results

All clinical nutritionists −dietitians who used the translated NUTRIC tool provided positive feedback on its use. In further detail, the score was considered easy to use, fast and comprehensive. The modified version of NUTRIC tool, without the inclusion of Interleucin − 6 (IL −6) seemed to be more easy to use, especially in cases that this value was not available in the laboratory values of the patients. No specific corrections were suggested by the experts and the final tool is presented in Supplementary Fig. 1. The CA calculated for internal consistency was 0.58.

Table 1 describes baseline characteristics of the study population and Table 2 describes differences in patient characteristics according to NUTRIC score severity. High −NUTRIC patients were older, with increased APACHE and SOFA scores and demonstrated a greater number of comorbidities compared to low −NUTRIC patients. Additionally, increased mortality was observed among high −NUTRIC patients compared to the ones of reduced nutritional risk.

Table 1
Baseline characteristics of the study population (N = 80).

Men/Women (n)	51/29
Age (years)	63.3 ± 15.6
Recruitment Hospital Hippokration/Achilopoulio/AHEPA (n)	31/19/30
BMI (kg/m^2)	27.7 ± 5.2
APACHE II score	19.4 ± 8.2
APACHE score <15/15−19/20-27/≥28 (n)	18/24/29/9
SOFA score	7.9 ± 4.2
SOFA score <6/6−9/≥10	23/27/30
Sum of Comorbidities	2.1 ± 1.7
Hospital LoS until ICU admission (days)	2.0 (0.5, 4.0)
ICU LoS (days)	7.0 (2.0, 16.5)
Mechanic Ventilation (days)	7.0 (1.0, 14.0)

APACHE: Acute Physiology and Chronic Health Evaluation; BMI: Body Mass Index; ICU: Intensive Care Unit; LoS: Length of Stay; SOFA: Sequential Organ Failure Assessment; Data are presented as counts (n), Mean ± SD or Median (25th, 75th inter-quartiles).

4. Discussion

The present study aimed to translate the NUTRIC score to the Greek language, in order to provide a comprehensive version of the tool to Greek speaking physicians and incorporate nutritional screening in the ICU setting in Greece. Additionally, it aimed in applying the translated tool in the Greek ICU setting.

Translation and adaptation of instruments to different languages and countries is a complex procedure of pivotal importance that is needed to enable comparisons between −country settings [16] and consists of a major step in cross −cultural research [23]. In this context, and because of its clinical significance, the NUTRIC score has been used in a variety of different nations, including the Netherlands [24], India [25], Singapore [26] and many more. Greece, on the other hand, is a country with inherent language barriers in the use of health instruments and with very few translations being carried out.

Although no golden standard has been identified for the translation and adaptation of health measures [23], the WHO guidelines (WHO, 2013) adapted herein may have advantages against other suggested processes. The Greek translation of the tool demonstrated a fair reliability, identical to that of the Portuguese translation [18], but lower compared to that presented by Mendes and associates [27]. According to Beck et al., [28], the success of an instrument's translation is multifactorial, depending on the expertise of translators, cultural knowledge and linguistic competence, as well as by their understanding of the objectives and intents of the instrument. In this context, our team of translators exhibited supplementary skills including familiarity with the local culture, knowledge of the field of nutrition, as well as increased expertise with the methodology and translation process, as recommended [23,29].

Among the limitations of the study is that our sample was underpowered to explore the interaction between NUTRIC score, mortality and provision of nutrition. Furthermore, despite the fact that patients with higher NUTRIC score exhibited higher mortality, a cause may be the higher APACHE score that these patients also exhibited, and not necessarily the increased malnutrition risk.

The present translation of the NUTRIC score aimed in introducing malnutrition screening in the Greek ICU. Having a short, valid and comprehensive tool available is a step towards developing institutional culture for NS inside the ICUs of Greek hospitals [9]. Additionally, the use of ICU specific tools facilitates nutritional screening and allocation of all critically ill patients and enables the incorporation of NS into routine care checklists and processes [9]. Unfortunately, despite the evidence −based data, for the majority of ICU specialists, nutrition is not necessarily of pivotal therapeutic priority [30]. This is why, efforts should be construed towards

Table 2
Characteristics of the sample according to NUTRIC score severity.

	Low-NUTRIC patients (n = 35)	High-NUTRIC patients (n = 45)	Significance
Men/Women (n)	21/14	30/15	NS
Age (years)	56.4 ± 16.4	68.7 ± 12.7	0.001
BMI (kg/m^2)	27.7 ± 5.0	27.7 ± 5.4	NS
APACHE II score	13.8 ± 6.5	23.8 ± 6.5	0.001
SOFA score	4.7 ± 3.1	10.4 ± 3.1	0.001
Sum of Comorbidities	1.5 ± 1.4	2.6 ± 1.6	0.002
Hospital LoS until ICU admission (days)	1.0 (0.0, 3.0)	2.0 (1.0, 5.0)	NS
ICU LoS (days)	4.0 (2.0, 19.0)	9.0 (5.0, 16.0)	NS
Mechanic Ventilation (days)	4.0 (1.0, 17.0)	9.0 (3.0, 14.0)	NS
EN feeding duration (days)	1.0 (0.0., 12.0)	4.0 (0.0, 13.0)	NS
PN feeding duration (days)	0.0 (0.0, 2.0)	0.0 (0.0, 5.0)	NS
EN + PN feeding duration (days)	0.0 (0.0, 0.0)	0.0 (0.0, 2.0)	NS
Total ICU feeding duration (days)	2.0 (0.0, 14.0)	8.0 (3.0, 13.0)	NS
Mortality on the 28th day (n)	6	18	0.027

APACHE: Acute Physiology and Chronic Health Evaluation; BMI: Body Mass Index; EN: Enteral Nutrition; ICU: Intensive Care Unit; LoS: Length of Stay; NS: Not Significant; ON: Parenteral Nutrition; SOFA: Sequential Organ Failure Assessment; Data are presented as counts (n), Mean ± SD or Median (25th, 75th inter-quartiles).

including nutritional status and assessment in the essential attributes of medical assessment, monitoring, and care plans [9].

The Greek version of the NUTRIC score, an easy, valid and fast tool used to discriminate critically ill patients who may benefit from enhanced NS, is primed for use among ICU personnel in Greece and Cyprus. We hope that the availability of the instrument will enhance the rate of nutritional assessment in the ICU, improve on patients' outcomes and reduce patient −related costs.

Statement of authorship

MC and MGG wrote the manuscript. Additionally, ZP, IG, MP acquired the data, while ID and EB performed the statistical analyses. MC and LP conceived the study. LP, TL, AK, LP helped at the stage of the translation as well as finalizing the protocol. MC supervised all procedures and designed the study and DKH helped during the revision of the drafts. All authors participated in the interpretation of data, revision of the manuscript for important intellectual content and agreed to be accountable for all aspects of the work. The manuscript has been read and its submission has been approved by all co −authors.

Conflict of interest

The authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnesp.2018.12.003.

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