ORIGINAL RESEARCH

Comparison of Subjective Global Assessment and Protein Energy Wasting Score to Nutrition Evaluations Conducted by Registered Dietitian Nutritionists in Identifying Protein Energy Wasting Risk in Maintenance Hemodialysis Patients

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Objective: To compare the 7-point subjective global assessment (SGA) and the protein energy wasting (PEW) score with nutrition evaluations conducted by registered dietitian nutritionists in identifying PEW risk in stage 5 chronic kidney disease patients on maintenance hemodialysis.

Design and Methods: This study is a secondary analysis of a cross-sectional study entitled "*Development and Validation of a Predictive energy Equation in Hemodialysis*". PEW risk identified by the 7-point SGA and the PEW score was compared against the nutrition evaluations conducted by registered dietitian nutritionists through data examination from the original study (reference standard).

Subjects: A total of 133 patients were included for the analysis.

Main Outcome Measures: The sensitivity, specificity, positive and negative predictive value (PPV and NPV), positive and negative likelihood ratio (PLR and NLR) of both scoring tools were calculated when compared against the reference standard.

Results: The patients were predominately African American (n = 112, 84.2%), non-Hispanic (n = 101, 75.9%), and male (n = 80, 60.2%). Both the 7-point SGA (sensitivity = 78.6%, specificity = 59.1%, PPV = 33.9%, NPV = 91.2%, PLR = 1.9, and NLR = 0.4) and the PEW score (sensitivity = 100%, specificity = 28.6%, PPV = 27.2%, NPV = 100%, PLR = 1.4, and NLR = 0) were more sensitive than specific in identifying PEW risk. The 7-point SGA may miss 21.4% patients having PEW and falsely identify 40.9% of patients who do not have PEW. The PEW score can identify PEW risk in all patients, but 71.4% of patients identified may not have PEW risk.

Conclusions: Both the 7-point SGA and the PEW score could identify PEW risk. The 7-point SGA was more specific, and the PEW score was more sensitive. Both scoring tools were found to be clinically confident in identifying patients who were actually not at PEW risk.

Introduction

IN THE UNITED States, approximately 14% of the population has chronic kidney disease (CKD).[1] One in 2 of the CKD patients on maintenance hemodialysis (MHD) will die within 3 years after the initiation of MHD.[1] Such a high death rate is a serious public health issue causing high cost in human loss and substantive burden in medical expenses.[1]

Protein energy wasting (PEW) is one of the independent risk factors associated with the high mortality rate among CKD patients on MHD.[2-7] PEW is a critical condition characterized by inadequate nutrient intake, accumulation of uremic toxins, inflammation, and catabolism.[6,8] The International Society of Renal Nutrition and Metabolism (ISRNM) defines PEW as "a state of decreased body stores of protein and energy fuels" and proposed that the

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Support: This work was supported by the National Institutes of Health (grant numbers 1R15DK090593-01A1, 6R15DK090593-02, and 3R15DK090593-02S1).

Financial Disclosure: The authors declare that they have no relevant financial interests.

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1051-2276/$36.00
http://dx.doi.org/10.1053/j.jrn.2017.04.006

diagnostic criteria of PEW be comprised of 4 categories: abnormal biochemical indicators; low body weight, low body fat, or significant weight loss; reduced muscle mass; and low energy or protein consumption.[5,9]

There is no gold standard for identifying PEW risk. Nutrition evaluations (NutrE) conducted by registered dietitian nutritionists (RDNs) on stage 5 CKD patients on MHD using the ISRNM diagnostic criteria is a common clinical practice for PEW risk identification. However, different nutrition screening and assessment scoring tools have been modified or developed in an attempt to aid in identifying PEW risk.[6,10-12] An example of a nutrition screening tool in identifying PEW risk is the PEW score.[6] Examples of nutrition assessment scoring tools in identifying PEW risk include subjective global assessment (SGA), dialysis malnutrition score, malnutrition inflammation score, geriatric nutritional risk index, and composite score of protein energy nutritional status.[7,10,11,13]

Nevertheless, there is still no consensus regarding which tool should be used for identifying PEW risk. Most studies have investigated the use of these scoring tools in predicting mortality instead of identifying PEW risk or diagnosing PEW.[6,7,11] Early nutrition intervention is critical for patients identified with PEW risk to maintain and improve health outcomes.[5,8,9]

The purpose of the study was to compare the 7-point SGA and the PEW score as diagnostic tools against NutrE conducted by RDNs using ISRNM diagnostic criteria for PEW to identify PEW risk in stage 5 CKD patients on MHD. The 7-point SGA, recommended by the Kidney Disease/Dialysis Outcomes and Quality Initiative, is a validated nutrition assessment tool for stage 5 CKD patients on MHD.[14] It was not designed to identify PEW risk or diagnose PEW but is already applied in this manner in studies.[14,15] While the 7-point SGA is validated to conduct nutrition assessment, it is uncertain if it can be used to properly identify PEW risk because PEW is a result of multiple nutrition and nonnutrition mechanisms due to the progression of CKD patients on MHD but not just undernutrition.[5]

The PEW score is a simplified screening tool developed by Moreau-Gaudry et al.[6] to identify PEW risk. The PEW score is based on readily available clinical and biological values that comprise the ISRNM diagnostic criteria for PEW.[6] The PEW score was found to be useful in predicting survival in CKD patients on MHD but has not been validated for use in clinical practice.[6] While the PEW score is a screening tool and not like a nutrition assessment tool as the 7-point SGA, it is uncertain if they would identify PEW risk similarly.

Methods

This study is a secondary analysis of a cross-sectional study, and the research reported in this publication was supported by the National Institute of Diabetes and Digestive and Kidney Disease of the National Institutes of Health under Award Numbers 1R15DK090593-01A1, 6R15DK090593-02, and 3R15DK090593-02S1. The title of the original study was "*Development and Validation of a Predictive energy Equation in Hemodialysis,*" and the methodology of the study was previously published by Olejnik et al.[16]

Study Population

From September 2012 to August 2015, patients were recruited from 3 research institutions in the Northeastern region of the United States (Rutgers University, Case Western Reserve University, and Pennsylvania State University—Hershey Medical Center). The inclusion criteria were adults aged 18 years or older, diagnosed with stage 5 CKD initiated on MHD 3 times per week for at least 3 months, and the ability to answer study-related questions. Patients were excluded if they were hospitalized or had active infection; nonhealing wound; any cardiac-related events; surgical procedures less than 30 days prior to study enrollment; self-reported routine use of dietary supplements or recreational drugs that may impact metabolic rate; and were pregnant, lactating, or 3 months postpartum. A total of 133 cases were available for the analysis.

The 7-Point SGA

The 7-point SGA was conducted by trained study personnel in the original study, and the data were extracted for the secondary analysis of the current study. The 7-point SGA utilizes a 7-point Likert scale for the subjective ratings of 6 components to reflect nutritional status.[14,15] The 6 components include weight change, dietary intake, gastrointestinal symptoms, functional capacity, disease state/comorbidities, and physical examination.[14] The overall SGA score is rated subjectively based on the ratings of the 6 individual components. There are 3 overall SGA ratings: well nourished (score 6 or 7), moderate or suspected malnourished (score 3, 4, or 5), and severe malnourished (score 1 or 2).[17] For the purpose of this study, the criteria for administering the SGA described by Steiber et al.[14] were followed. The results of the 7-point SGA were dichotomized in order to compare against the results of the NutrE conducted by RDNs. The overall SGA ratings of 6 or 7 were categorized as "not at PEW risk," whereas the overall SGA ratings of 1 to 5 were all categorized as "at PEW risk" since patients having ratings of 1 to 5 were considered as moderate malnourished or severe malnourished according to the protocol of the 7-point SGA.[14]

The PEW Score

The PEW score was calculated retrospectively in the current study according to the protocol described by Moreau-Gaurdy et al.[6] using the data from the original study. The 4 components for the PEW score are serum albumin level, body mass index (BMI), predialysis serum creatinine normalized by body surface area, and normalized protein nitrogen appearance. The threshold values for each