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Validation of the MEDFICTS dietary questionnaire: A clinical tool to assess adherence to American Heart Association dietary fat intake guidelines

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Published: 13 June 2003

Nutrition Journal 2003, 2:4

Received: 28 October 2002

Accepted: 13 June 2003

This article is available from: <http://www.nutritionj.com/content/2/1/4>

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Abstract

Background: Dietary assessment tools are often too long, difficult to quantify, expensive to process, and largely used for research purposes. A rapid and accurate assessment of dietary fat intake is critically important in clinical decision-making regarding dietary advice for coronary risk reduction. We assessed the validity of the MEDFICTS (MF) questionnaire, a brief instrument developed to assess fat intake according to the American Heart Association (AHA) dietary "steps".

Methods: We surveyed 164 active-duty US Army personnel without known coronary artery disease at their intake interview for a primary prevention cardiac intervention trial using the Block food frequency (FFQ) and MF questionnaires. Both surveys were completed on the same intake visit and independently scored. Correlations between each tools' assessment of fat intake, the agreement in AHA step categorization of dietary quality with each tool, and the test characteristics of the MF using the FFQ as the gold standard were assessed.

Results: Subjects consumed a mean of $36.0 \pm 13.0\%$ of their total calories as fat, which included saturated fat consumption of $13.0 \pm 0.4\%$. The majority of subjects (125/164; 76.2%) had a high fat (worse than AHA Step 1) diet. There were significant correlations between the MF and the FFQ for the intake of total fat ($r = 0.52$, $P < 0.0001$) and saturated fat ($r = 0.52$, $P < 0.0001$). Despite these modest correlations, the currently recommended MF cutpoints correctly identified only 29 of 125 (23.3%) high fat (worse than AHA Step 1) diets. Overall agreement for the AHA diet step between the FFQ and MF (using the previously proposed MF score cutoffs of 0–39 [AHA Step 2], 40–70 [Step 1], and >70 [high fat diet]) was negligible (kappa statistic = 0.036). The MF was accurate at the extremes of fat intake, but could not reliably identify the 3 AHA dietary classifications. Alternative MF cutpoints of <30 (Step 2), 30–50 (Step 1), and >50 (high fat diet) were highly sensitive (96%), but had low specificity (46%) for a high fat diet. ROC curve analysis identified that

a MF score cutoff of 38 provided optimal sensitivity 75% and specificity 72%, and had modest agreement ($\kappa = 0.39$, $P < 0.001$) with the FFQ for the identification of subjects with a high fat diet.

Conclusions: The MEDFICTS questionnaire is most suitable as a tool to identify high fat diets, rather than discriminate AHA Step 1 and Step 2 diets. Currently recommended MEDFICTS cutpoints are too high, leading to overestimation of dietary quality. A cutpoint of 38 appears to be providing optimal identification of patients who do not meet AHA dietary guidelines for fat intake.

Background

Dietary fat intake is a risk factor for coronary heart disease and the modification of dietary habits is important for the prevention of cardiovascular disease. The assessment of dietary fat intake is a critically important first step in clinical decision-making regarding dietary and pharmacotherapeutic advice on coronary risk reduction. Thus, a rapid and accurate tool to assess dietary fat intake would be a clinically useful screening tool for physicians to counsel patients about diet and coronary risk reduction.

Commonly used dietary assessment tools include dietary history, 24-hour recall, seven-day recall, seven-day record, and food frequency questionnaire. [1-7] Impediments to more widespread clinical use of these tools include their length, and the difficulty and expense of their analysis. Furthermore, nutrition researchers tend to focus on a method's ability to yield precise and accurate measurement of a nutrient rather than to evaluate whether a tool can simply and quickly identify an individual's distribution or pattern of food intake. We compared the accuracy of the MEDFICTS (MF) questionnaire,[8] a brief instrument developed to assess fat intake according to the American Heart Association (AHA) dietary "steps,"[9,10] to the standardized Block Food Frequency Questionnaire[11,12] (FFQ) in a sample of active duty US Army personnel without known coronary artery disease.

Methods

Subjects

This study contains data from 164 active-duty U.S. Army personnel who completed both the MF and Block FFQ. Subjects completed the surveys during the same intake interview for a primary prevention intervention trial – the Prospective Army Coronary Calcium (PACC) Study. The study was approved by the Department of Clinical Investigation of the Walter Reed Army Medical Center.

The methods of the PACC Study have been previously described.[13] Briefly, since October 1998, active-duty Army personnel from 39 through 45 of age who were stationed in the National Capital Area of the Walter Reed Health Care System were recruited at the time of a periodic, Army-mandated physical examination. Persons who had a history of coronary heart disease or who reported a

history of angina pectoris on the Rose questionnaire were ineligible. Between October 26, 1998 and November 4, 1999, 705 eligible participants were screened and 630 provided written informed consent to undergo electron beam computed tomography (EBCT) in addition to the required physical examination procedures. A subset of these subjects also volunteered to participate in a randomized, controlled trial to assess the impact of the knowledge of EBCT results and nurse-based case management on risk factor modification. The 164 subjects included in this dietary assessment study are a consecutive sample of subjects who both consented to participate in the randomized controlled trial and who also completed the MF and Block FFQ questionnaires. Demographic characteristics of the study participants are shown in Table 1.

Dietary Assessment Tools

Each participant filled out a series of questionnaires that included the 2 dietary assessment tools: the validated and reduced version of the Block FFQ and the full version of the MF. The reduced version of Block FFQ is a validated food survey that contains 60 food items and is intended to capture all nutrients in the diet including dietary fat intake. The survey requires approximately 15 minutes to self-administer, however, the survey requires a relatively detailed analysis, thus the results are not immediately available for patient counseling. This study focuses only on those variables from the Block FFQ that are relevant to dietary fat intake within the dietary guidelines of the American Heart Association (AHA). This includes total calories, percentage of calories from fat and saturated fat, and cholesterol intake.

The MF questionnaire was specifically designed to evaluate patient adherence to the National Cholesterol Education Program (NCEP) Step 1 and Step 2 diets adopted by the American Heart Association (AHA). The main objective of these dietary steps is incrementally reduce coronary heart disease risk through diet-induced reduction in LDL cholesterol. Both the AHA Step 1 and 2 diets focus on reducing total fat to 30% or less of daily energy, and progressively reducing saturated fat and cholesterol intake (Step 1: 7-10% of energy from saturated fat and <300 mg cholesterol; Step 2: <7% of energy from saturated fat and <200 mg cholesterol). The AHA Step 1 diet is recom-

Table 1: Demographic Characteristics and Select Cardiac Risk Factors of the PACC Participants (N = 164)

Variable	Value*
Demographic Characteristics:	
Male gender (%)	79.9
Age (yr)	42 ± 2
Caucasian (%)	65.9
College educated (%)	78.4
Cardiac Risk Factors:	
Total cholesterol (mg/dl)	203 ± 34
LDL (mg/dl)	130 ± 33
HDL (mg/dl)	52 ± 14
Triglycerides (mg/dl)	117 ± 64
BMI	27 ± 4
Waist girth (cm)	92 ± 10

*Plus-minus values are means and standard deviations.

mended for all healthy persons for the prevention of coronary heart disease, and is recommended to precede pharmacotherapy of LDL cholesterol. The Step 2 diet is recommended to further reduce LDL cholesterol for patients that have already achieved their Step 1 dietary goals. Additionally, the Step 2 diet is the initially recommended diet for patients with either a high-risk cholesterol level (>240 mg/dL) or with known coronary heart disease.

The MEDFICTS questionnaire is a brief instrument consisting of 8 food categories: Meats, Eggs, Dairy, Fried foods, fat In baked goods, Convenience foods, fats added at the Table, and Snacks. The first column of the questionnaire addresses each of these food categories. Within each category, food items are assigned to either group 1 (desirable) or group 2 (undesirable) based upon total fat content. Numeric values are assigned to each food group, with weightings based upon weekly consumption and serving size. The questionnaire is scored using totaling the quality-adjusted intake quantity yielding a possible range of scores from 0 to 216 points. Lower MF scores indicate diets containing less dietary fat. Prior validation literature indicated that a score of <40 points is consistent with a Step 2 diet, a score between 40 to 69 is consistent with a Step 1 diet, and a score of >70 is considered as high fat diet. The MF can be self-administered in 3 to 5 minutes, and scored by the healthcare provider in approximately 2 minutes. Thus, the MF is an efficient tool enabling health care providers to quickly assess the adherence of patients to the fat components of a Step 1 or 2 diet, and identify patients consuming a diet higher in total fat, saturated fat, and cholesterol.

Statistical Analysis

The two dietary questionnaires were independently scored. The reduced version Block FFQ was coded and analyzed by the same investigator to provide consistency in scoring. The validation of MF scores with Block FFQ dietary variables (percent of fat, percentage of saturated fat, and cholesterol level) was evaluated by Spearman's rho, because both dietary scores were not normally distributed. The level of inter-test agreement between the two dietary instruments was assessed using the kappa statistic. Receiver operating characteristic (ROC) Curve analysis was applied to measure the sensitivity and specificity of the alternative MF cutpoints. All analyses were performed using SPSS for Windows (v 10.05, Chicago, IL). Data are presented as mean ± SD. A two-tailed P value of ≤ 0.05 was considered to indicate statistical significance.

Results

Mean daily intake values included total fat (% calories) of 35.5 ± 13.0%, saturated fat 13.0 ± 0.4%, and cholesterol 267 ± 283 mg/dL. These data, obtained with the Block FFQ, indicated that 76.2% of the participants had a high fat (worse than the AHA Step 1) diet. In contrast, the MF questionnaire identified only 17.7% of the group as having a high fat diet (Table 2). The other subjects (82.3%) were indicated as having a low fat diet, and were approximately equally divided between AHA Step 1 and 2 diets.

There were significant correlations between the MF and Block FFQ for the percentage intake of fat ($r = 0.52$, $P < 0.0001$), saturated fat ($r = 0.52$, $P < 0.0001$), and cholesterol ($r = 0.55$, $P < 0.0001$). Subjects within the different MF diet categories did significantly differ with respect to fat intake (Table 3). Despite these modest correlations, the MF (based on the currently-recommended MF score cutoffs of 0–39 for Step 2, 40–70 for Step 1, and >70 for

Table 2: Dietary data for the study group

Dietary Data	Male (N = 131)	Female (N = 33)	Total (N = 164)
MEDFICTS Data:			
Diet Group Distribution (%)*			
High fat diet	19.8	9.1	17.7
Step 1 diet	44.3	39.4	43.3
Step 2 diet	35.9	51.5	39.0
Total MEDFICTS Score	49 ± 27**	41 ± 27	48 ± 27
Block Dietary Data:			
Total Calories	1576 ± 674	1321 ± 530	1525 ± 654
% fat	35.8 ± 14.0	34.4 ± 1.0	35.5 ± 13.0
% saturated fat	12.7 ± 0.4	12.2 ± 0.4	12.6 ± 0.4
Cholesterol (mg/dl)	283 ± 311	201 ± 98	267 ± 283

* MEDFICTS Diet Groups: High fat diet group: MEDFICTS score >70 Step 1 diet group: MEDFICTS score: 40–70 <30% fat, <10% saturated fat, <300 mg/dl cholesterol Step 2 diet group: MEDFICTS score <40 <30% fat, <7% saturated fat, <200 mg/dl cholesterol Data shown are means ± standard deviations.

Table 3: Comparisons of daily caloric, fat and cholesterol intake within MEDFICTS Diet Groups

Block Dietary Variable	High Fat Diet	Step 1 Diet	Step 2 Diet	ANOVA F	Sig.
Total calories	1980	1540	1302	12.3	.0001
% fat	40.9	38	30.3	10.1	.0001
% saturated fat	15.7	13.1	10.6	22.1	.0001
Cholesterol	351	309	181	5.3	.006

Table 4: MEDFICTS Diet Groups and AHA Diet Steps Crosstabulation

MEDFICTS Diet Groups	AHA Diet Steps			Total
	High Fat	Step 1	Step 2	
High Fat Diet	29 (100.0%)* (23.2%)**			29 (100.0%) (17.7%)
Step 1 Diet	62 (87.3%) (49.6%)	5 (7.0%) (19.2%)	4 (5.6%) (30.8%)	71 (100.0%) (43.3%)
Step 2 Diet	34 (53.1%) (27.2%)	21 (32.8%) (80.8%)	9 (14.1%) (69.2%)	64 (100.0%) (39.0%)
Total	125 (76.2%) (100.0%)	26 (15.9%) (100.0%)	13 (7.9%) (100.0%)	164 (100.0%) (100.0%)

* % within MEDFICTS diet groups. ** % within AHA diet steps.

high fat diets) correctly identified only 29 of 125 (23.3%) high fat (worse than AHA Step 1) diets, and 19.2% of Step 1 diets (Table 4). The overall agreement for the AHA diet steps between the Block FFQ and MF was negligible (kappa statistics = 0.036). The MF was accurate at the extremes of fat intake, but could not reliably separate patient groups into 3 AHA dietary classifications.

Exploratory analysis showed that alternative MF cutpoints of <30 (Step 2), 30–50 (Step 1), and >50 (high fat diet) were highly sensitive (96%), but had low specificity

(46%) for a high fat diet. Receiver operating characteristic (ROC) curve analysis showed that a single MF score cutoff of 38 yielded optimal sensitivity of 75% and specificity of 72% (Figure 1), and had modest agreement (kappa statistics = 0.39, P < 0.001) with the Block FFQ for the identification of patients with a high fat diet (Figure).

Discussion

The effective identification of patients requiring dietary intervention for the reduction of fat intake requires an accurate, efficient, clinically applicable dietary assessment

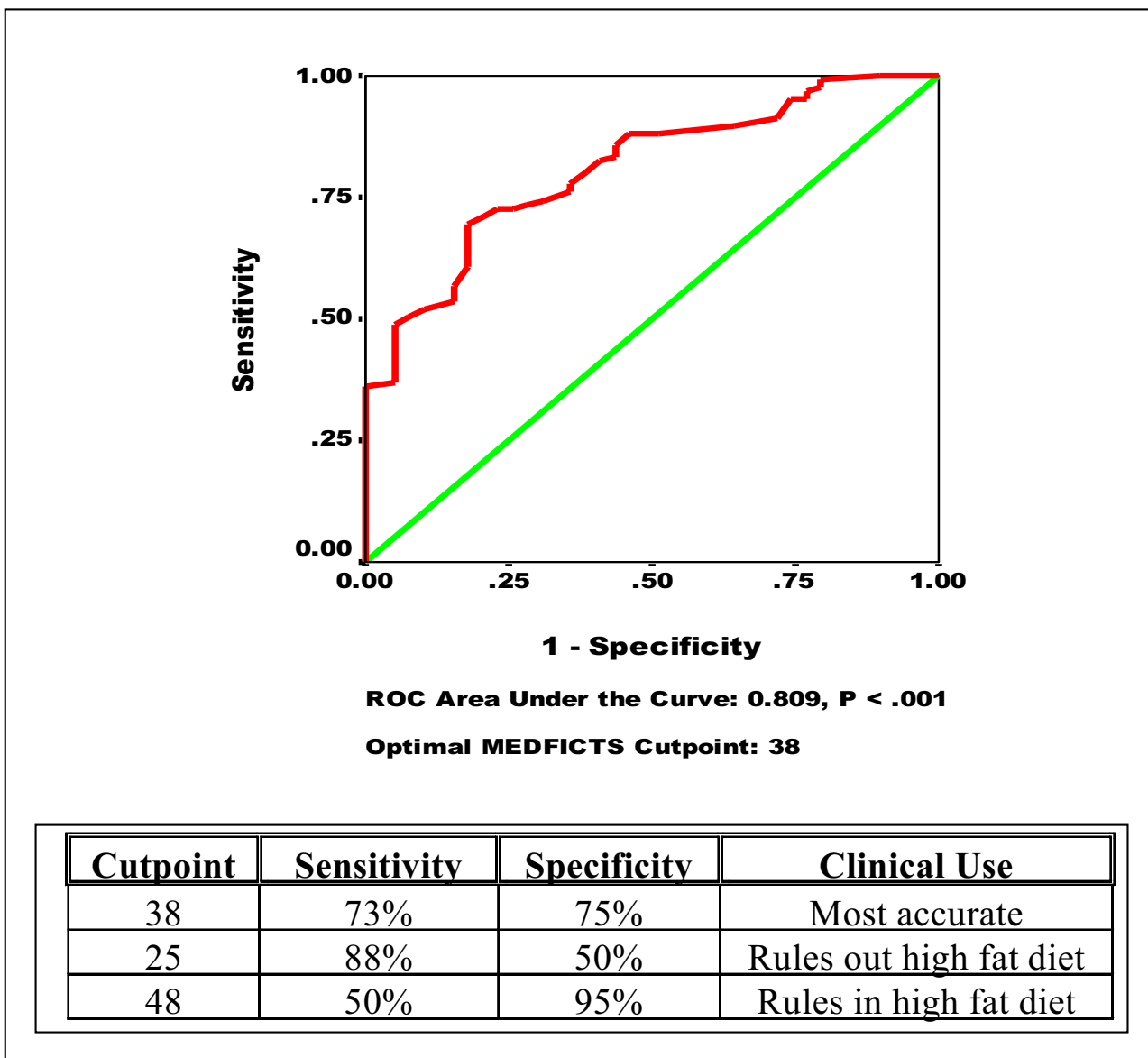


Figure 1
ROC curve showing the relationship between AHA Diet Steps and MEDFICTS Diet Groups at a MEDFICTS score cutpoint of 38.

tool. In this study, we compared the accuracy of the MEDFICTS dietary survey to the Block FFQ for the identification of compliance with the AHA dietary guidelines for fat intake. These data indicate that the MF questionnaire has moderate accuracy for the semi-quantitation of dietary fat and saturated fat intake. However, the currently-recommended MF cutpoints resulted in marked over-estimation of dietary quality, including an inability to accurately detect high fat diets. Furthermore, this tool does not

appear to have adequate test characteristics to accurately discriminate Step 1 and Step 2 diets. This is likely due to the small differences in fat intake between these 2 diets, and the relatively crude nature of the MF survey. However, our data suggest that a revised cutpoint of 38 for the MF questionnaire resulted in modest accuracy for the detection of a high fat diet.

Beyond ease of administration, an additional advantage of the MF survey may be its utility as a tool for dietary education and lifestyle modification. The content and design of the MF is clear and simple, but comprehensive enough to categorically provide dietary fat intake guidance for a wide variety of food goods. The survey provides rapid depiction of the greatest contributors to dietary fat intake within a given patient's diet, and suggests strategies (alternative food choices, or reduced portion size) for the reduction of dietary fat. However, whether the MF would serve as a useful tool to guide dietary modification will require further study.

Conclusions

The MF questionnaire is an efficient tool that can be used by health professionals to quickly assess the dietary fat intake. It provides immediate identification of patients consuming a diet higher in total fat, saturated fat, and cholesterol than currently recommended by the American Heart Association. However, the current recommended cutpoints of the MEDFICTS questionnaire are unable to discriminate the AHA Step 1 and Step 2 diets. Current MEDFICTS cutpoints are too high, leading to overestimation of dietary quality. A cutpoint of 38 appears to be providing optimal identification of patients who do not meet AHA dietary guidelines for fat intake.

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