Fibromyalgia Assessment Screening Tool: Clues to Fibromyalgia on a Multidimensional Health Assessment Questionnaire for Routine Care

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ABSTRACT. *Objective.* To develop feasible indices as clues to comorbid fibromyalgia (FM) in routine care of patients with various rheumatic diseases based only on self-report multidimensional Health Assessment Questionnaire (MDHAQ) scores, which are informative in all rheumatic diagnoses studied.

Methods. All patients with all diagnoses complete an MDHAQ at each visit; the 2011 FM criteria questionnaire was added to the standard MDHAQ between February 2013 and August 2016. The proportion of patients who met 2011 FM criteria or had a clinical diagnosis of FM was calculated. Individual candidate MDHAQ measures were compared to 2011 FM criteria using receiver-operating characteristic (ROC) curves; cutpoints to recognize FM were selected from the area under the curve (AUC) for optimal tradeoff between sensitivity and specificity. Cumulative indices of 3 or 4 MDHAQ measures were analyzed as fibromyalgia assessment screening tools (FAST).

Results. In 148 patients, the highest AUC in ROC analyses versus 2011 FM criteria were seen for MDHAQ symptom checklist, self-report painful joint count, pain visual analog scale (VAS), and fatigue VAS. The optimal cutpoints were $\geq 16/60$ for symptom checklist, $\geq 16/48$ for self-report painful joint count, and $\geq 6/10$ for both pain and fatigue VAS. Cumulative FAST indices of 2/3 or 3/4 MDHAQ measures correctly classified 89.4–91.7% of patients who met 2011 FM criteria.

Conclusion. FAST3 and FAST4 cumulative indices from only MDHAQ scores correctly identify most patients who meet 2011 FM criteria. FAST indices can assist clinicians in routine care as clues to FM with a general rheumatology rather than FM-specific questionnaire. (First Release January 15 2020; J Rheumatol 2020;47:761–9; doi:10.3899/jrheum.190277)

Key Indexing Terms:

FIBROMYALGIA ASSESSMENT SCREENING TOOLS

FIBROMYALGIA

MULTIDIMENSIONAL HEALTH ASSESSMENT QUESTIONNAIRE

Fibromyalgia (FM) is a common disorder in the general population¹, with a considerably higher prevalence in people with rheumatic diseases^{2,3,4,5}. As with most rheumatic

diseases, no gold standard diagnostic marker is available for FM. In an effort to standardize the identification of FM, the American College of Rheumatology (ACR) developed FM classification criteria in 1990⁶, based on the clinical information of 558 consecutive patients, 293 with FM according to experts in FM versus 265 controls. The combination of widespread pain and > 11 over 18 tender points identified on physical examination yields a sensitivity of 88% and specificity of 81%. These criteria were modified in 2010, with no tender point examination, but rather a patient questionnaire for widespread body pain and symptom severity as well as physician ratings, and designated as “preliminary diagnostic criteria” rather than classification criteria⁷. A further modification was introduced in 2011, based entirely on the patient self-report widespread pain index and symptom severity scale questionnaire, without any requirement for physician assessment, and was designed for “epidemiologic and clinical studies” but not intended for diagnosis of FM⁸.

FM criteria are not used in most routine clinical care, other than by subspecialists. It is not feasible to ask patients with different diagnoses to complete different patient self-report questionnaires in busy clinical settings. As a consequence,

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Dr. Pincus holds a copyright and trademark on MDHAQ and RAPID3 (Routine Assessment of Patient Index Data 3), for which he receives royalties and license fees, all of which are used to support further development of quantitative questionnaire measurements for patients and doctors in clinical rheumatology care.

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Accepted for publication August 6, 2019.

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clinicians may both fail to identify or incorrectly identify patients as having FM⁹.

A multidimensional Health Assessment Questionnaire (MDHAQ) has been found informative in most rheumatic diseases studied¹⁰, based on a RAPID3 (Routine Assessment of Patient Index Data 3 — an index within the MDHAQ). Additional MDHAQ scales have been reported to provide clues to FM, including a high pain score relative to physical function score¹¹ and a high number of positive responses on a symptom checklist¹².

This study examines an additional feature of the MDHAQ to provide clues to the presence of comorbid FM, without the need for administration of a separate, condition-specific FM questionnaire, recognizing that a clinical FM diagnosis requires the judgment of a clinician to synthesize all available information about a patient.

MATERIALS AND METHODS

Patients. All patients with all diagnoses at Liverpool Hospital, Australia, complete an MDHAQ at all visits before seeing the rheumatologist. The treating clinician assigns 1 or more diagnoses at the first and subsequent patient visits. Most of the patients included in this study (79%) had their first clinic visit and diagnosis(es) assigned prior to the study onset. All clinical diagnoses and all MDHAQ data are included in a database. All data were exported for analyses to STATA 12.0 for Mac (StataCorp LP).

Patients seen between February 2013 and August 2016 by KAG at a weekly clinic also completed a 2011 FM criteria questionnaire at the same time as the MDHAQ questionnaire to compare with candidate FM Assessment Screening Tool (FAST) indices. Patients included in the study were older than 18 years, had a primary diagnosis of any rheumatic condition except FM, and had complete MDHAQ and 2011 FM criteria cross-sectional data at a random visit during the study period. The primary diagnosis was assigned by the treating physician, who did not examine the 2011 FM criteria results when each diagnosis was assigned. Approval by the district Human Research and Ethics Committee was obtained for this study (LNR/13/LPOOL/370 Local project number 13/229LNR). All patients consent to the use of their anonymized data for research purposes, including publication.

Design of MDHAQ. The MDHAQ (Figure 1) is designed for use in routine care with a primary purpose to improve the quality of clinical care and patient outcomes¹³. It includes 10 queries concerning activities of daily living to evaluate physical function (FN) and 3 (0–10) visual numerical scales (VNS) for pain, patient's global assessment (PtGA), and fatigue. RAPID3 is a composite index that includes the 3 rheumatoid arthritis (RA) core dataset measures, FN, pain, and PtGA, each scored 0–10 for a total of 0–30. MDHAQ/RAPID3 has been found informative in osteoarthritis (OA), systemic lupus erythematosus (SLE), ankylosing spondylitis (AS), psoriatic arthritis (PsA), vasculitis, gout, and FM, in addition to RA^{10,12,14–20}.

The MDHAQ also includes 3 queries to rate how difficult it was to “get a good night's sleep” (sleep quality), to “deal with feelings of anxiety or being nervous” (anxiety), and to “deal with feelings of depression or feeling blue” (depression) in the traditional, patient-friendly HAQ format²¹. A self-report RA Disease Activity Index (RADAI) painful joint count is recorded²² on the MDHAQ. The RADAI queries patients to score pain in 16 specific joint groups, 8 each on the right and left sides: fingers, wrists, elbows, shoulders, hips, knees, ankles, and toes. Scoring options are 0 (none), 1 (mild), 2 (moderate), or 3 (severe) pain; total scores range from 0 to 48. RADAI self-report joint counts have been shown to be useful in patients with different rheumatic diseases²³. In addition, the MDHAQ includes a 60-symptom checklist¹² and recent medical history information²⁴. Demographic data include sex, date of birth, ethnicity, and years of formal education²⁵.

2011 FM criteria. The 2011 FM criteria⁸ were developed as a patient

self-report questionnaire for epidemiologic and clinical studies, and consist of 2 scales: the Widespread Pain Index (WPI) and the symptom severity scale (SSS). The WPI component queries patients to indicate whether they have had pain or tenderness over the previous week in specific joints and areas, including the shoulder girdle, hip, jaw, upper back, lower back, upper arm, upper leg, chest, neck, abdomen, lower arm, and lower leg. Patients grade the right and left side of the body separately from 0 or 1 with a maximum total score of 19. The SSS queries patients to indicate the severity of 6 symptoms over the previous week. Three symptoms [fatigue, trouble thinking or remembering, and waking up tired (unrefreshed)] are scored 0–3: 0, no problem; 1, slight or mild problems, generally mild or intermittent; 2, moderate, considerable problems, often present and/or at a moderate level; and 3, severe, continuous, life-disturbing problems. The other 3 symptoms [pain or cramps in the lower abdomen, depression, or headache during the previous 6 months] are scored 0–1 (0 No, 1 Yes). When summed, the 6 items result in a total score between 0 and 12. A patient meets 2011 FM criteria if the following conditions are met: WPI ≥ 7 and SSS ≥ 5 or WPI between 3–6 and SSS ≥ 9 , symptoms have been present at a similar level for at least 3 months, and the patient does not have a disorder that would otherwise sufficiently explain the pain. These criteria are used in our study as the reference standard against which the proposed MDHAQ/FAST indices are compared.

FAST indices based on MDHAQ scores. FAST composite cumulative indices were developed from MDHAQ candidate measures, including FN, pain visual analog scale (VAS), PtGA VAS, RAPID3, sleep quality, anxiety, depression, fatigue VAS, RADAI painful joint count, and a 60-symptom checklist. Receiver–operating characteristic (ROC) curves were constructed to recognize those that provided the highest area under the curve (AUC) compared to the 2011 FM criteria as the reference standard (Figure 2). ROC curves were computed for RAPID3 and PtGA, but these variables were not regarded as candidates for FAST indices because they appeared clinically more likely to be associated with somatic symptoms that could be observed by a clinician, such as dyspnea or joint swelling, and were not included in the 2011 FM criteria. The cutpoint for each score to be included in a FAST cumulative index was selected on the basis of the best tradeoff values between sensitivity and specificity on the ROC curve. An optimal cutpoint was identified for each measure on the basis of the ROC curve for that measure.

Statistical analysis. The proportions of patients who met 2011 FM criteria or a clinical diagnosis of FM [assigned by the treating rheumatologist (KAG)] were calculated. Means and SD of demographic measures and clinical characteristics in patients who did and did not meet FM by criteria were compared using *t* tests, and percentages using chi-square tests.

FAST3 and FAST4 composite cumulative indices were constructed from the optimal cutpoints of the candidate MDHAQ measures with the highest AUC under the ROC curves as described above. Agreement of FAST indices with the 2011 FM criteria as the reference standard was analyzed using the κ statistic²⁶ and ROC curves (of the indices) for AUC.

RESULTS

Patient characteristics. The study included 148 patients: 55 (37%) with RA, 21 (14%) with OA, 14 (10%) with PsA, and the remaining 58 (39%) with other rheumatologic diagnoses (Table 1). Among these patients, 24% with RA, 38% with OA, and 21% with PsA met 2011 criteria, while 22%, 38% and 29%, respectively, had a clinical diagnosis of comorbid FM. There were 13%, 29%, and 14%, respectively, who both met 2011 FM criteria and had a clinical diagnosis of FM (Table 1). Among all patients, 29 (20%) met the 2011 FM criteria, 31 (21%) were assigned a clinical diagnosis of FM, 18 (12%) had both a clinical diagnosis and met criteria, while 106 (72%) met neither a clinical diagnosis nor FM criteria (Table 1). Agreement between clinical and 2011 FM criteria was moderate (83.8%, κ 0.50, $p < 0.001$).

☐ Fever	☐ Lump in your throat	☐ Paralysis of arms or legs
☐ Weight gain (>5 kg)	☐ Cough	☐ Numbness or tingling of arms or legs
☐ Weight loss (>5 kg)	☐ Shortness of breath	☐ Fainting spells
☐ Feeling sickly	☐ Wheezing	☐ Swelling of hands
☐ Headaches	☐ Pain in the chest	☐ Swelling of ankles
☐ Unusual fatigue	☐ Heart pounding (palpitations)	☐ Swelling in other joints
☐ Swollen glands	☐ Trouble swallowing	☐ Joint pain
☐ Loss of appetite	☐ Heartburn or stomach gas	☐ Back pain
☐ Skin rash or hives	☐ Stomach pain or cramps	☐ Neck pain
☐ Unusual bruising or bleeding	☐ Nausea	☐ Use of drugs not sold in stores
☐ Other skin problems	☐ Vomiting	☐ Smoking cigarettes
☐ Loss of hair	☐ Constipation	☐ More than 2 alcoholic drinks per day
☐ Dry eyes	☐ Diarrhea	☐ Depression - feeling blue
☐ Other eye problems	☐ Dark or bloody stools	☐ Anxiety - feeling nervous
☐ Problems with hearing	☐ Problems with urination	☐ Problems with thinking
☐ Ringing in the ears	☐ Gynecological (female) problems	☐ Problems with memory
☐ Stuffy nose	☐ Dizziness	☐ Problems with sleeping
☐ Sores in the mouth	☐ Losing your balance	☐ Sexual problems
☐ Dry mouth	☐ Muscle pain, aches, or cramps	☐ Burning in sex organs
☐ Problems with smell or taste	☐ Muscle weakness	☐ Problems with social activities

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USE ONLY**

5. ROS:

11

If "No," please go to Item 7. If **"Yes,"** please indicate the number of minutes _____, or hours _____ until you are as limber as you will be for the day.

☐ 3 or more times a week (3) ☐ 1-2 times per month (1)
☐ 1-2 times per week (2) ☐ Do not exercise regularly (0) ☐ Cannot exercise due to disability/ handicap (9)

FATIGUE IS A MAJOR PROBLEM

0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10

FATIGUE IS NO PROBLEM

☐ No	☐ Yes	An operation or new illness	☐ No	☐ Yes	Change(s) of arthritis or other medication
☐ No	☐ Yes	Medical emergency or stay overnight in hospital	☐ No	☐ Yes	Change(s) of address
☐ No	☐ Yes	A fall, broken bone, or other accident or trauma	☐ No	☐ Yes	Change(s) of marital status
☐ No	☐ Yes	An important new symptom or medical problem	☐ No	☐ Yes	Change job or work duties, quit work, retired
☐ No	☐ Yes	Side effect(s) of any medication or drug	☐ No	☐ Yes	Change of medical insurance, Medicare, etc.
☐ No	☐ Yes	Smoke cigarettes regularly	☐ No	☐ Yes	Change of primary care or other doctor

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Figure 2. Receiver-operating characteristic (ROC) curve analysis of multidimensional Health Assessment Questionnaire (MDHAQ) variables versus 2011 FM criteria. FM: fibromyalgia; PN: pain; PATGL: patient's global assessment; RAPID3: Routine Assessment of Patient Index Data; RADAI: Rheumatoid Arthritis Disease Activity Index; JC: joint count; FN: function; FT: fatigue.

Table 1. Proportion of patients with different diseases meeting 2011 FM criteria and/or a clinical diagnosis of FM.

Diagnosis	Total	2011 FM Criteria Positive	Total Clinical FM Diagnosis	Both Meet 2011 FM Criteria, and FM Diagnosis Positive	Only 2011 FM Criteria Positive	Only Clinical FM Diagnosis Positive	Neither Meet 2011 FM Criteria nor FM Diagnosis
RA	55	13 (24)	12 (22)	7 (13)	6 (11)	5 (9)	37 (67)
OA	21	8 (38)	8 (38)	6 (29)	2 (10)	2 (10)	11 (52)
PsA	14	3 (21)	4 (29)	2 (14)	1 (7)	2 (14)	9 (43)
Other diagnoses	58	5 (9)	7 (12)	3 (5)	2 (3)	4 (7)	49 (85)
Total	148	29 (20)	31 (21)	18 (12)	11 (7)	13 (9)	106 (72)

Except for totals, data are n (%). FM: fibromyalgia; RA: rheumatoid arthritis; OA: osteoarthritis; PsA: psoriatic arthritis.

The majority of patients (80.4%) was female and white (68%) or Asian (12%). No statistically significant differences were seen in ethnicity or education level between those who did or did not meet 2011 FM criteria in this study (Table 2).

Comparison of MDHAQ scores with 2011 FM criteria. Patients who met 2011 FM criteria had significantly poorer scores on all MDHAQ scales, including for physical function, pain VAS, patient global VAS, self-report joint counts, symptom checklist, and fatigue VAS, compared to patients who did not meet criteria ($p < 0.001$; Table 2). ROC analyses indicated that the highest AUC values were seen for symptom checklist (0.926), self-report joint count (RADAI; 0.917),

RAPID3 (0.881), pain VAS (0.887), PtGA (0.831), and fatigue VAS (0.811). Lower AUC versus the 2011 FM criteria (range 0.716–0.799) were seen for remaining MDHAQ scores including physical function, anxiety, depression, and sleep quality (Figure 2). These variables were not analyzed further despite being significantly different from scores in people with no FM, to develop an optimal, feasible index for clinical settings. PtGA and RAPID3 were not regarded as candidates for FAST indices.

The optimal cutpoints were ≥ 16 for symptom checklist and self-report painful joint count and ≥ 6 for pain and fatigue VAS. FAST3 cumulative indices include a cumulative score

Table 2. Characteristics of patients according to 2011 FM criteria.

Characteristics	Total, n = 148	FM		p
		2011 FM Criteria Positive, n = 29	2011 FM Criteria Negative, n = 119	
Age, yrs, mean ($\pm$ SD)	56.4 (15.0)	57.3 (14.4)	56.2 (15.2)	0.72
Female, n (%)	119 (80.4)	24 (82.8)	89 (74.8)	0.36
Ethnicity, n (%)				
White	100 (68)	22 (75.9)	78 (65.5)	0.51
Asian	18 (12)	1 (3)	17 (14)	
Black	1 (1)	0 (0)	1 (1)	
Hispanic	7 (5)	2 (7)	5 (4)	
Others	22 (15)	4 (14)	18 (15)	
Formal education	11.8 (4.1)	12.0 (3.8)	11.8 (4.2)	0.83
MDHAQ Function (0–10), mean ($\pm$ SD)	2.4 (2.1)	4.2 (1.9)	2.0 (1.9)	< 0.0001
MDHAQ Pain (0–10), mean ($\pm$ SD)	4.4 (2.9)	7.6 (2.3)	3.6 (2.5)	< 0.0001
MDHAQ Global (0–10), mean ($\pm$ SD)	4.3 (2.8)	7.1 (2.4)	3.7 (2.5)	< 0.0001
MDHAQ Fatigue (0–10), mean ($\pm$ SD)	4.3 (3.0)	7.1 (2.0)	3.6 (2.8)	< 0.0001
RAPID3 (0–30), mean ($\pm$ SD)	11.2 (6.8)	18.8 (5.5)	9.3 (5.8)	< 0.0001
RADAI (0–48), mean ($\pm$ SD)	10.5 (10.1)	24.1 (10.5)	7.1 (6.4)	< 0.0001
Symptom checklist (0–60), mean ($\pm$ SD)	10.8 (9.3)	22.3 (9.3)	8.0 (6.2)	< 0.0001
Clinical FM+, n (%)	31 (21)	18 (62)	13 (11)	< 0.001
Clinical FM–, n (%)	117 (79)	11 (34)	106 (89)	

FM: fibromyalgia; MDHAQ: multidimensional Health Assessment Questionnaire; RAPID3: Routine Assessment of Patient Index Data 3; RADAI: Rheumatoid Arthritis Disease Activity Index.

of the symptom checklist, painful joint count, and either a pain VAS called FAST3-P, or fatigue VAS called FAST3-F. A FAST4 cumulative index includes a cumulative score of the symptom checklist, painful joint count, and both pain and fatigue VAS (Figure 1).

FAST3-P of ≥ 2 correctly classified 90.9% of patients versus 2011 FM criteria, with a sensitivity of 81.5% and a specificity of 93.3% (Table 3). FAST3-F ≥ 2 correctly

classified 89.4% of patients versus 2011 FM criteria, with a sensitivity of 77.8% and a specificity of 92.4% (Table 3). FAST4 ≥ 3 correctly classified 91.7% of patients versus 2011 FM criteria, with a sensitivity of 70.4% and a specificity of 97.1% (Table 3).

Agreement with a clinical diagnosis of FM was 81.1% for FAST3-P, 85.6% for FAST3-F, and 58.8% for FAST4 (Table 4). The κ values for FAST3-P, FAST3-F, and FAST4 versus

Table 3. Sensitivity and specificity of MDHAQ measures and FAST indices versus 2011 FM criteria.

Variables	Cutoff Point	Sensitivity, %	Specificity, %	Correctly Classified, %
Individual items on MDHAQ				
Symptom checklist, n = 148	≥ 16	79.3	84.9	83.8
RADAI, n = 132	≥ 16	74.1	87.6	84.8
MDHAQ-Pain, n = 148	≥ 6	86.2	73.9	76.3
MDHAQ-Fatigue, n = 148	≥ 6	75.8	75.6	75.7
FAST3-P (0–3)	≥ 1	96.3	70.5	75.7
	≥ 2	81.5	93.3	90.9
	3	43.9	90.7	90.1
FAST3-F (0–3)	≥ 1	96.3	65.7	72.0
	≥ 2	77.8	92.4	89.4
	3	51.8	99.1	89.4
FAST4 (0–4)	≥ 1	96.3	59.1	66.7
	≥ 2	88.9	85.7	86.4
	≥ 3	70.4	97.1	91.7
	4	48.1	99.1	88.6

MDHAQ: multidimensional Health Assessment Questionnaire; FM: fibromyalgia; FAST: FM Assessment Screening Tool; RADAI: Rheumatoid Arthritis Disease Activity Index self-report painful joint count; FAST3-P: FAST cumulative score of pain, self-report painful joint count, and symptom checklist; FAST3-F: FAST cumulative score of fatigue, self-report painful joint count, and symptom checklist; FAST4: FAST cumulative score of pain, fatigue, self-report painful joint count, and symptom checklist.

2011 criteria were 0.73, 0.68, and 0.72, respectively, and versus the clinical diagnosis were 0.44, 0.57, and 0.51, respectively (Table 4).

DISCUSSION

We found that FAST indices based on MDHAQ scales provide clues to the presence of FM in patients with other rheumatic diseases compared to the 2011 FM criteria as the reference standard, against which the proposed FAST criteria were examined in this study. The 2011 FM criteria are designated in the report title as “for clinical and epidemiological studies,”⁸ but also may provide clues to the diagnosis of FM in the clinic. The total 2011 FM criteria score derived from this questionnaire as a continuous variable also provides information regarding the degree of “fibromyalgians” that patients experience²⁷.

The 2011 report indicated that 21.1% of patients with RA, 16.8% with OA, and 36.7% with SLE met the revised FM criteria⁸. The symptom severity burden is similar in patients with other rheumatic diagnoses, and it has been suggested that a distinction between “primary” and “secondary” FM is not needed²⁸. This recommendation supports use of these criteria to classify patients who have other rheumatic diagnoses and FM in the current report.

Agreement between the 2011 FM criteria and the clinical diagnosis of FM in this study was moderate (83.8%, κ 0.50, $p < 0.001$), a level somewhat higher than reported in another study (79.2%, κ 0.41)⁹. It is noteworthy that about 25% of previously diagnosed patients with FM did not satisfy the ACR 1990 classification criteria at the time of the 2010 study⁷, and the modified ACR 2010 criteria were satisfied by 60% with a prior diagnosis of FM in the 2011 study⁸. These minor differences reflect differences between the clinicians, patients, and clinical environments in these studies, but general agreement in the range of 70–85% has been found.

One advantage of using the MDHAQ to identify FM is that it has been found informative in all rheumatic diseases studied¹⁰. It is not feasible in most busy clinical settings to add administration of another questionnaire, such as an additional FM-specific questionnaire. In addition, the FAST3 and FAST4 scores are easily calculated directly from the MDHAQ during the consultation.

Previous reports have identified clues to diagnosis and characterization of FM exclusively by self-report on the Fibromyalgia Impact Questionnaire²⁹ and MDHAQ^{11,12}. FAST3 and FAST4 indices provide relatively high sensitivity and specificity for alerting the clinician to a possible diagnosis of FM compared to the 2011 FM criteria. An additional report from Rush University supports the use of MDHAQ indices to provide clues to the diagnosis of FM³⁰.

This study has a number of limitations. First, it is a cross-sectional study and patient symptoms may fluctuate over time; further longitudinal data may help to recognize the possible stability or sensitivity to change of the FAST indices, as well as whether a particular FAST3 or FAST4 may perform substantially better than others. Second, dichotomous criteria for the presence or absence of FM may obscure FM as a “spectrum” disorder of “fibromyalgians”²⁷, although cutpoints may serve as convenient “anchors” for many continuous variables, including laboratory tests such as erythrocyte sedimentation rate, serum glucose, etc. Third, this study does not use the 2016 modification of the FM criteria³¹, which was reported after commencement of this study, although no patients in the study had regional pain syndromes; therefore, it appears unlikely the modifications would have meaningfully changed the results. Fourth, FAST3 and FAST4 scores misclassify some patients according to the 2011 criteria; and further investigation in larger populations of patients with rheumatic disease is required.

It is not suggested that FAST indices are in any way a substitute for a careful evaluation to determine whether a

Table 4. Classification of FM according to FAST3-P, FAST3-F, and FAST4 compared to 2011 FM criteria and clinical diagnosis (n = 132).

N = 132	2011 FM Criteria		Clinical Diagnosis	
	Criteria Positive	Criteria Negative	Criteria Positive	Criteria Negative
FAST3-P–positive FM	22 (81.5%)	7 (6.7%)	16 (57.1%)	13 (12.5%)
FAST3-P–negative FM	5 (18.5%)	98 (93.3%)	12 (42.9%)	91 (87.5%)
	Correct: 90.9%, κ 0.73		Correct: 81.1%, κ 0.44	
FAST3-F–positive FM	21 (77.8%)	8 (7.6%)	19 (67.9%)	10 (9.6%)
FAST3-F–negative FM	6 (22.2%)	97 (92.4%)	9 (32.1%)	94 (90.4%)
	Correct: 89.4%, κ 0.68		Correct: 85.6%, κ 0.57	
FAST4–positive FM	19 (70.4%)	3 (2.9%)	14 (50%)	8 (7.7%)
FAST4–negative FM	8 (29.6%)	102 (97.1%)	14 (50%)	96 (92.3%)
	Correct: 91.7%, κ 0.72		Correct: 83.3%, κ 0.51	

FM: fibromyalgia; FAST3-P: Fibromyalgia Assessment Screening Tools cumulative score of pain, self-report painful joint count, and symptom checklist; FAST3-F: FAST cumulative score of fatigue, self-report painful joint count, and symptom checklist; FAST4: FAST cumulative score of pain, fatigue, self-report painful joint count, and symptom checklist.

patient has FM, or that there may not exist other reasons for certain patients to meet cutpoint values for FAST3 and FAST4. A definitive diagnosis of FM requires a careful history and examination of the patient, and interpretation of laboratory tests and other ancillary data. Nevertheless, it may be of considerable value to assess the presence of FM in patients with other rheumatic diseases using quantitative criteria from the 2011 FM questionnaire or the FAST indices to assist clinicians in recognizing this frequent diagnosis.

We have developed simple FAST cumulative, composite indices that provide clues to the presence of FM in patients with primary diagnoses of other rheumatic diseases. These indices are based entirely on the patient self-report MDHAQ questionnaire, which is used in routine care in the setting of the research and other rheumatology settings, and does not require a disease-specific FM questionnaire. FAST3 provides greater sensitivity but lower specificity than FAST4 for clues to FM; it may be desirable to use a FAST3-P index as the first screening tool for greater sensitivity, and check positive patients according to FAST4 for greater specificity. The FAST indices can be incorporated easily into routine care and may assist clinicians to identify patients with FM in the context of other comorbid rheumatic diseases. They remain a tool to support clinical judgment and are not a substitute for appropriate and thorough clinical history, physical examination, and comprehensive patient assessment for a diagnosis of FM.

REFERENCES

- Queiroz LP. Worldwide epidemiology of fibromyalgia. *Curr Pain Headache Rep* 2013;17:356.
- Wolfe F, Cathey MA, Kleinheksel SM. Fibrositis (fibromyalgia) in rheumatoid arthritis. *J Rheumatol* 1984;11:814-8.
- Thune PO. The prevalence of fibromyalgia among patients with psoriasis. *Acta Derm Venereol* 2005;85:33-7.
- De Marco G, Cattaneo A, Battafarano N, Lubrano E, Carrera CG, Marchesoni A. Not simply a matter of psoriatic arthritis: epidemiology of rheumatic diseases in psoriatic patients. *Arch Dermatol Res* 2012;304:719-26.
- Wolfe F, Braehler E, Hinz A, Hauser W. Fibromyalgia prevalence, somatic symptom reporting, and the dimensionality of polysymptomatic distress: results from a survey of the general population. *Arthritis Care Res* 2013;65:777-85.
- Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. The American College of Rheumatology 1990 Criteria for the Classification of Fibromyalgia. Report of the Multicenter Criteria Committee. *Arthritis Rheum* 1990;33:160-72.
- Wolfe F, Clauw DJ, Fitzcharles MA, Goldenberg DL, Katz RS, Mease P, et al. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. *Arthritis Care Res* 2010;62:600-10.
- Wolfe F, Clauw DJ, Fitzcharles MA, Goldenberg DL, Hauser W, Katz RS, et al. Fibromyalgia criteria and severity scales for clinical and epidemiological studies: a modification of the ACR preliminary diagnostic criteria for fibromyalgia. *J Rheumatol* 2011;38:1113-22.
- Wolfe F, Schmukler J, Jamal S, Castrejon I, Gibson KA, Srinivasan S, et al. Diagnosis of fibromyalgia: disagreement between fibromyalgia criteria and clinician-based fibromyalgia diagnosis in a university clinic. *Arthritis Care Res* 2019;71:343-51.
- Castrejon I. The use of MDHAQ/RAPID3 in different rheumatic diseases: a review of the literature. *Bull Hosp Jt Dis* (2013) 2017;75:93-100.
- Callahan LF, Pincus T. A clue from a self-report questionnaire to distinguish rheumatoid arthritis from noninflammatory diffuse musculoskeletal pain. The P-VAS:D-ADL ratio. *Arthritis Rheum* 1990;33:1317-22.
- DeWalt DA, Reed GW, Pincus T. Further clues to recognition of patients with fibromyalgia from a simple 2-page patient Multidimensional Health Assessment Questionnaire (MDHAQ). *Clin Exp Rheumatol* 2004;22:453-61.
- Pincus T, Maclean R, Yazici Y, Harrington JT. Quantitative measurement of patient status in the regular care of patients with rheumatic diseases over 25 years as a continuous quality improvement activity, rather than traditional research. *Clin Exp Rheumatol* 2007;25:69-81.
- Pincus T. Can RAPID3, an index without formal joint counts or laboratory tests, serve to guide rheumatologists in tight control of rheumatoid arthritis in usual clinical care? *Bull NYU Hosp Jt Dis* 2009;67:254-66.
- Pincus T, Mandelin AM 2nd, Swearingen CJ. Flowsheets that include MDHAQ physical function, pain, global, and RAPID3 scores, laboratory tests, and medications to monitor patients with all rheumatic diseases: an electronic database for an electronic medical record. *Rheum Dis Clin North Am* 2009;35:829-42, x-xi.
- Askane AD, Castrejon I, Pincus T. Quantitative data for care of patients with systemic lupus erythematosus in usual clinical settings: a patient multidimensional health assessment questionnaire and physician estimate of noninflammatory symptoms. *J Rheumatol* 2011;38:1309-16.
- Castrejon I, Bergman MJ, Pincus T. MDHAQ/RAPID3 to recognize improvement over 2 months in usual care of patients with osteoarthritis, systemic lupus erythematosus, spondyloarthropathy, and gout, as well as rheumatoid arthritis. *J Clin Rheumatol* 2013;19:169-74.
- Danve A, Reddy A, Vakil-Gilani K, Garg N, Dinno A, Deodhar A. Routine assessment of patient index data 3 score (RAPID3) correlates well with Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) in the assessment of disease activity and monitoring progression of axial spondyloarthritis. *Clin Rheumatol* 2015;34:117-24.
- Annapureddy N, Elsallabi O, Baker J, Sreih AG. Patient-reported outcomes in ANCA-associated vasculitis. A comparison between Birmingham Vasculitis Activity Score and Routine Assessment Of Patient Index Data 3. *Clin Rheumatol* 2016;35:395-400.
- Cinar M, Yilmaz S, Cinar FI, Koca SS, Erdem H, Pay S, et al. A patient-reported outcome measures-based composite index (RAPID3) for the assessment of disease activity in ankylosing spondylitis. *Rheumatol Int* 2015;35:1575-80.
- Pincus T, Swearingen C, Wolfe F. Toward a multidimensional health assessment questionnaire (MDHAQ): Assessment of advanced activities of daily living and psychological status in the patient-friendly health assessment questionnaire format. *Arthritis Rheum* 1999;42:2220-30.
- Stucki G, Liang MH, Stucki S, Bruhlmann P, Michel BA. A self-administered rheumatoid arthritis disease activity index (RADAI) for epidemiologic research. Psychometric properties and correlation with parameters of disease activity. *Arthritis Rheum* 1995;38:795-8.
- Castrejon I, Yazici Y, Pincus T. Patient self-report RADAI (Rheumatoid Arthritis Disease Activity Index) joint counts on an MDHAQ (Multidimensional Health Assessment Questionnaire) in usual care of consecutive patients with rheumatic diseases other than rheumatoid arthritis. *Arthritis Care Res* 2013;65:288-93.
- Pincus T, Swearingen CJ. The HAQ compared with the MDHAQ: "Keep it simple, stupid" (KISS), with feasibility and clinical value

- as primary criteria for patient questionnaires in usual clinical care. *Rheum Dis Clin North Am* 2009;35:787-98, ix.
25. Pincus T, Sokka T, Kautiainen H. Further development of a physical function scale on a MDHAQ [corrected] for standard care of patients with rheumatic diseases. *J Rheumatol* 2005;32:1432-9.
26. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;33:159-74.
27. Wolfe F. Fibromyalgianess. *Arthritis Rheum* 2009;61:715-6.
28. Wolfe F, Walitt B, Rasker JJ, Häuser W. Primary and secondary fibromyalgia are the same: The universality of polysymptomatic distress. *J Rheumatol* 2019;46:204-12.
29. Burckhardt CS, Clark SR, Bennett RM. The Fibromyalgia Impact Questionnaire: development and validation. *J Rheumatol* 1991;18:728-33.
30. Schmukler J, Jamal S, Castrejon I, Block JA, Pincus T. Fibromyalgia Assessment Screening Tools (FAST) based on only Multidimensional Health Assessment Questionnaire (MDHAQ) scores as clues to fibromyalgia. *ACR Open Rheumatol* 2019; 1:516-25.
31. Wolfe F, Clauw DJ, Fitzcharles MA, Goldenberg DL, Häuser W, Katz RL, et al. 2016 revisions to the 2010/2011 fibromyalgia diagnostic criteria. *Semin Arthritis Rheum* 2016;46:319-29.